

Chapter 5

Global Population Explosion and the Scramble over Food

Problems caused by an advanced and sophisticated food system

Those over age 40 may remember a saying to the effect that “Japanese think water and safety are given out free of charge.” Information might also be included, as a third free thing. But the world situation has changed today, and the business environment has changed more than anything else. The circumstances surrounding food have also changed, including agriculture and the food distribution industry.

This shift can be expressed with just one phrase: Vertical integration. The mechanisms for production and procurement of raw materials, as well as manufacturing and distribution, while dealing with official and informal affiliates, have all become vertically integrated. From the consumer's point of view, this shift has made people suddenly aware of the safety and security of their food supply. The food system is the social system, whether we speak of livestock products or processed food, and it includes everything that supports our daily diet, from production to consumption. The network for managing this food system consists of small-scale local components as well as huge global ones, and they are complicated, existing in parallel and overlapping with each other. As I mentioned in chapter 1, this food system functions as an invisible infrastructure.

However, the more advanced and sophisticated the food system becomes, the blurrier its whole picture gets to consumers. If nothing is done to simplify this complicated food system, then it could happen more and more that children don't associate a piece of sashimi with the swimming fish in the sea.

Consequently, misunderstanding or speculation could be caused by asymmetric information. Trouble could arise from miscommunication among the parties involved, and problems could show up in the least expected areas of production and distribution, even a minuscule human error could cause a dysfunction in the entire food system.

Food issue and dietary issue

In this chapter, I would like to review the relation among the world population, food production and biotech crops. It is not easy for us to see the whole picture, because as I mentioned before, food, agriculture and the food distribution industry are intricately intertwined. I will also show the basic standpoints that will help those in agriculture and the food industries as well as consumers to understand better the situation surrounding world population, food production and biotech crops.

Let us consider briefly the difference between food sufficiency and dietary sufficiency.¹ I wonder how many people really understand the precise difference, because even some experts and media people often mix them up. As an example, both self-sufficiency in food and self-sufficiency in diet often appear in the media.

Simply put, dietary sufficiency means only the staple food, whereas food sufficiency means all the food groups including fish, meat, vegetables and fruit. Dietary sufficiency just refers to staple foods such as rice and wheat in Japan.

One may think this is a problem specific to Chinese characters that are ideograms, but it happens even for the other languages. A similar question you can ask is the meaning of “corn”.² If I ask such a question to my students in my university classes or at the lectures outside, all the persons answer correctly. However, if I ask a question, “Does anyone know the other meaning of corn?,” some people have different opinions. One may say that it is an ice-cream cone, and the other says it is a traffic cone.

¹Food and dietary have the same pronunciation, “Shokuryo”, in Japanese.

²Similarly, both corn and cone have the same pronunciation, “kohn” in Japanese.

Next, if you ask a Briton, “Do you like corn?” What answer do you expect? In England, corn means the staple food in the region, not like the definition of corn used by the Americans. You can confirm this in the dictionaries, if you like. For example, in England wheat is corn, and oats are also corn in Scotland. The yellow grain that we are familiar with is called maize in England.

If you would like to go the extra mile, please consult with various dictionaries. You may find even more definitions of corn than wheat and oats.

This is an example of how little we know about food, even if we think we know a lot. I myself know about food and grains as far as trading are concerned and supply and demand, but not so much about the nutrition and process engineering. Therefore, what I offer here is rather limited, but I still believe this information can provide some hints to you when you think about food for today and tomorrow.

Five perspectives to understand a complicated situation

I always think that these five approaches help us understand this complicated situation.

1. Start from the common reality.
2. View the subject matter from the mid-term, long-term and even longer-term perspectives.
3. Acknowledge basic figures and use these figures as a foundation for further thought.
4. Always ask yourself, “What if this had not been here?”
5. Try to think about the mechanisms for providing the basic essentials in our life, and the invisible infrastructure.

Let us view the population of the world and Japan, and let us consider food, especially grains, based on the above-mentioned five points.

Supply-and-demand balance of major grains in the world

The supply-and-demand balance of major grains is reported by the USDA every month, as mentioned in chapter 3. Wheat, rice, coarse grains and oilseed are shown as of October 2011 in the following chart. Total production and demand of major grains are 2.7 billion tons. Among that, coarse grains constitute 1.1 billion tons, including 800 million tons of corn.

Strictly speaking, oilseed including soybeans is not grain. There are 300 million tons of potatoes produced aside from grains, and the figure for rice is not based on brown rice but milled rice, which we must take into account, but what is important for us is to know that these quantities of grain are produced and consumed in the world annually.

We need to know these numbers because the individual information about each grain, which we get from various media, usually does not tell how these amounts relate to the total numbers. Therefore, it is hard for us to judge the influence of the numbers on the entire grain market, and we may end up with a biased judgment.

**Supply and demand forecast for major grains in the world
(2011/2012)**

(Unit: 1,000 tons)

	Wheat	Rice, milled	Coarse Grains	Oilseeds	Total
Beginning Stocks	195,604	97,803	168,185	80,020	541,612
Output	681,195	461,394	1,136,275	453,460	2,732,324
Total Supply	674,434	457,783	1,148,481	460,460	2,741,158
Ending Stocks	202,365	101,414	155,979	73,020	532,778
(Stocks to Use Ratio)	30.0%	22.2%	13.6%	15.9%	19.4%
Gain and Loss	6,761	3,611	▲12,206	▲7,000	▲8,834

Source: The USDA data (Oct. 2011)

How much grain Japan imports

Now most of us know that food self-sufficiency in Japan is about 40 percent in terms of calories, but can you answer to this question: “How many tons of grain does Japan import every year?” Perhaps it is not easy to answer.

Not many of us can answer this question, perhaps because Japan’s education has made most of us so we “cannot see the forest for the trees,” or because we have never been accustomed to think about such facts. But we should have an idea how much it is, if we look ahead to the future.

I mentioned that according to the USDA data as of October 2011, Japan has imported 5.8 million tons of wheat, 700,000 tons of rice, 19.14 million tons of coarse grains and 5.77 million tons of oilseeds from the U.S. And the total amount of agricultural produce imported from the U.S. per year amounts to about 31 million tons. That means we have been importing more than 30 million tons of grain every year just to maintain our ordinary life.

For those who cannot imagine the quantity due to its immensity, I would just explain the situation surrounding corn. Among coarse grains, which make up some 60 percent of the entire import of grain, corn accounts for 16 million tons and is the largest single item of all. Four million tons of corn is for industrial use, such as production of corn starch, and 12 million tons of corn is for livestock feed, as mentioned before.

Domestically grown beef, pork and poultry are very important foods not only for household consumption, but also for the food service industry such as restaurants and food manufacturers. There is high demand among consumers for meat, but unfortunately corn, the most common feed grain, is barely produced domestically. Only a small amount of corn is grown in Japan for unripe harvesting, seed and food.









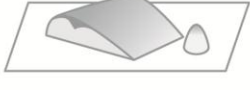
We can sustain a viable livestock industry and eat domestically grown meat only because we import 12 million tons of corn for feed (about 1 million tons per month), a steady and constant flow of imported grain. Domestically grown corn is only a minuscule amount compared to the imported corn. This



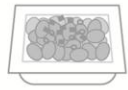



is hard to face up to, but it is a reality we should not deny.

Those engaged in trading and distributing grains are making constant efforts even though such efforts are unseen by consumers, because they understand what needs to be done in order for this invisible infrastructure to work smoothly and not be blocked for some reason.

**Our meals would be completely different
if domestic agricultural produce was all we had available.**

Sample one-day menu using only domestically grown produce

Seasoning for one day Six teaspoons of sugar, 0.6 teaspoons of oil	Breakfast  A bowl of rice (75 grams of milled rice)	Lunch  Two baked sweet potatoes (200 grams of sweet potatoes)	Supper  A bowl of rice (75 grams of milled rice)	
	 Two boiled potatoes (300 grams of potatoes)	 One steamed potato (150 grams of potato)	 One baked sweet potato (100 grams of sweet potato)	
	 Pickles (90 grams of vegetable)	 A quarter of an apple (50 grams of apple)	 One piece of grilled fish (84 grams of fillet)	

One bowl every other day  Udon noodles (53 grams of wheat flour/day)	One bowl every other day  Miso soup (9 grams of soybean paste/day)	+	One package every three days  Fermented soybean (natto) (33 grams of soybean/day)	One glass every six days  Milk (33 grams of milk/day)
One every week  Egg (7 grams of egg/day)		One dish every nine days  Meat (12 grams of meat/day)		

Note: This model menu is designed to total 2,020 kcal/day based on the premise that there is 4.5 million hectares of tillage in Japan (2015's estimated tillage area) with the maximized calorie efficiency.

Source: "The Food Situation in Japan at Present" by MAFF in July 2007

In July 2007, the MAFF produced an interesting document called “The Food Situation in Japan at Present,” and the most interesting data in this document is shown in the above chart. There was also a TV program broadcast by NHK in 1978, when I was a high school student, and its title was “Your Diet: One Day without Imported Food.” The MAFF’s document seems to be a re-creation of this TV program based on updated data.

If we try to prepare our meals only with domestically produced ingredients, we could eat one bowl of udon noodles and one bowl of miso soups every two days. We could drink one glass of milk every six days. We could use one egg per week and enjoy one meat dish every nine days. And on and on it goes. The same data also shows that a bowl of soba buckwheat noodles with tempura, a typical Japanese traditional dish, is an example in which we rely on imports for 80 percent of the ingredients. (See the chart below.)

The data tells us that our dietary level will return to that of the 1940s if food and grain imports are stopped, and I guess no one would hope for that to happen. At the same time, we should not let food-producing countries take complete control over Japan’s diet.

Tempura soba buckwheat noodles, part of Japanese traditional cuisine since the Edo era, relies on imported products for 80 percent of its ingredients



80 % of ingredients are imported

Self-sufficiency (based on calories) percentage of ingredients

Ingredient	Self-sufficiency percentage	Country of origin
Buckwheat	21%	China (60%)
Prawns	5%	Vietnam, Indonesia (20% each)
Wheat flour	13%	USA (50%)
Eggs	11%	USA (90% of feed for chicken)
Canola oil	0%	Canada (80%)
Sugar	34%	Thailand (30%), Australia (20%)
Bonito broth	94%	
Soy sauce	0%	Most soybeans are from the USA
Sweet cooking rice wine	95%	

Note: Data as of 2005 fiscal year.

90 percent of feed for egg layers is imported.

All the material for soy sauce (soybeans) is imported.

Source: "The Food Situation in Japan at Present" by MAFF, July 2007

Therefore, we need to constantly seek the best and most realistic measures to secure our food supply by understanding the status quo with a cool head, instead by drawing some vague and pleasant-looking blueprint.

What it takes to import 1 million tons of corn monthly to Japan

Back to corn. How much ship capacity is needed to import 1 million tons of corn every month? From the Corn Belt in the U.S., barges follow the Mississippi River down to the Gulf of Mexico, but there is the Panama Canal to go through before reaching the Pacific Ocean. The capacity limit for ships going through the Panama Canal is about 50,000 tons. So it takes at least 20 ships to carry 1 million tons of corn every month.

Those ships, however, will be loaded with other grains besides corn, such as soybeans and sorghum, so the number of ships carrying grain to Japan will actually be well over 30 every month. At least one ship must discharge its grain cargo at a Japanese port every day.

Another important point we must understand is that the ocean transport of grains must be secured safe and sound in order for Japan's food industry to be safe and sound. Ocean transport is the basic route not only for the grain, livestock and meat industries but the entire food industry. We shouldn't make the huge mistake of taking for granted this transport system. We shouldn't assume everything will move smoothly without accident to deliver our commodities without delay. We also can't assume this invisible infrastructure will continue no matter how circumstances may change.

It cannot be over-stressed that this invisible infrastructure, as well as the electricity, gas and water utilities, has been maintained only because of dedicated people and organizations who are making every effort. This essential infrastructure does not run smoothly by itself.

At least 13 million tons of biotech corn is imported to Japan

In Japan public opinion about biotech crops has not changed much for the past 10 years, I think. The public opinion is formed from certain extreme

advocates as well as extreme opponents, and a majority of people, both in the food industry and consumers, simply want to avoid discussing the issue and keep silent about biotech issues.

The fact that we don't even know the total amount of crops being imported to Japan is a big problem when we try to discuss whether it is good or bad, or how much biotech grain should be imported. Now I would like to figure out how much Japan imports in terms of biotech crops, based on a certain premise.

In the previous chapter, it was explained that 16 million tons of corn is imported to Japan annually, and that biotech corn accounts for about 13 million tons. A total of 17 million tons of biotech crops, including the biotech corn, soybeans and canola, are imported every year. I would like to present three points relating to the attitude we should take toward imported biotech crops.

First, we should be properly aware that our life and the status quo are built upon imported biotech crops. I have stated that ordinary consumers don't know what huge amounts of biotech crops are imported to Japan. Even many experts who know the reality only accept biotech grains as livestock feed and that unwillingly. They still think biotech crops are not needed as food for humans.

But this is quite strange, isn't it? The Organization for Economic Cooperation and Development (OECD), of which Japan is a member, showed its scientific principles relating to the environmental safety of biotech crops, and the OECD made clear its stance and principles relating to the way of assessing biotech crop safety, and that was published in 1993 after a decade of review. The OECD member nations have sorted out their domestic laws in accordance with these guidelines and principles. As for the impact that biotech crops may have on the ecosystem, this has also been tested and assessed based on the rules detailed under the Cartagena Protocol, an international agreement which aims to ensure the safe handling, transport and use of living modified organisms (LMOs) resulting from modern biotechnology. Such tests and assessments are handled officially, and they abide by the applicable

international rules. It is very strange that Japan has acted against the international rules despite being a member of the international community.

The Japanese government should openly announce that a certain safety level is approved for biotech crops, and it should address the unclear labeling issue. If Japan's regulatory authority, food companies, media and consumer groups keep acting as if biotech crops are bad and non-biotech crops good, then consumers will never see what is right about biotech crops. How long, I wonder, will we continue to have this attitude?

Second, is it impossible for people who refuse to accept biotech crops to import non-biotech crops into the future? I don't think so. The basic and important fact is that agriculture is a business both in Japan and the U.S.

We may feel like looking at the romantic aspect of agriculture, but to those who produce livestock and grain, agriculture is their livelihood and business. The market value of non-biotech crops is not just as a complement for biotech crops. Non-biotech crops have their own distinguishing status. Simply put, it is entirely possible to ensure a certain supply of non-biotech crops if consumers are ready to pay high enough prices. In that regard, farmers in the U.S., Argentina and Brazil are very practical. On the other hand, the overwhelming majority of farmers today in the U.S. are growing biotech crops. We can buy non-biotech crops only if there are farmers who agree to produce them.

Third, all the stakeholders in the agriculture industry should take measures to improve on the status quo based on facts that have been verified over the course of time. We consumers are still discussing whether biotech crops are acceptable or not, based on their herbicide tolerance features or insect resistant features, which were introduced more than 10 years ago. But scientific progress is advancing very fast and steadily. In many cases, the concerns people had in the early stages have been proven incorrect, but not much attention has been paid to such verifications. Only sensational speeches and press reports tend to remain in our minds, but we should always look at the status quo with cool heads.

Responsiveness to change and insight for the future

The EU research commission reported in 2009 that at least 124 different varieties of biotech crops will reach the final state of development or start commercial cultivation by 2015. As of 2009, only one herbicide tolerance soybean is commercially cultivated, but another 17 varieties will be added along with 24 varieties of corn, 10 varieties of canola, 27 varieties of cotton, 15 varieties of rice, eight varieties of potato and 23 varieties of other crops by 2015.

The number of crop types, sorted by region of production, gives us a clear picture of the reality. Among the 124 new varieties of crops, 67 varieties will be produced in the U.S. and European countries, and 54 new varieties are supposed to be produced in Asian countries. If the circumstances do not improve in the field of biotech crop production, Japan will not produce even a single biotech crop.

It is not hard to imagine what impact Japan will suffer in terms of international competition as well as Japan's future as a country that aims to be a world leader in science and technology. We cannot break through this situation as long as we continue a vague discussion about biotech crops based merely on our superficial opinions about whether they are good or bad.

Furthermore, I think I am not the only one who gets dismayed at the current situation in which all biotech crops have been put in one basket, even though there are some biotech products that have been produced, distributed and consumed for over 10 years, and others that are now being tested in laboratories.

The EU, in contrast to Japan, has been cool-headed and realistic. The EU gives us the general impression that it is simply against biotech crops, but the reality is a lot more complicated. The EU has taken member states' interests into account and has been streamlining its environmental laws surrounding biotech crops. It has also been promoting research, along with a selected moratorium, to meet halfway with the opposing parties. The EU has maintained its biotechnology research at a certain level.

The EU has set up moratoriums and policies to guide the coexistence of biotech crops with non-biotech crops. In July 2010, it laid a framework and made a proposal allowing member states and individual regions to make their own decisions with a certain amount of discretion about cultivation of biotech crops.

Basically, the decisions will be made by the individual states about whether to cultivate biotech crops or non-biotech crops, but the research and development that is essential for world-class competition will continue based on a certain rules. This move by the EU is quite different from Japan's very cautious attitude, and I wonder where this huge gap in attitude comes from.

I guess the difference comes from one group being more insightful about the future. Or perhaps the difference is that one group understands the necessity of a completely new type of comprehensive and cautious approach for examining the potential of biotech crops. It is not enough just to examine them one by one. For now, Japan is among the countries that have benefited most from biotechnology, but Japan's attitude toward this technology is very backward and negative.

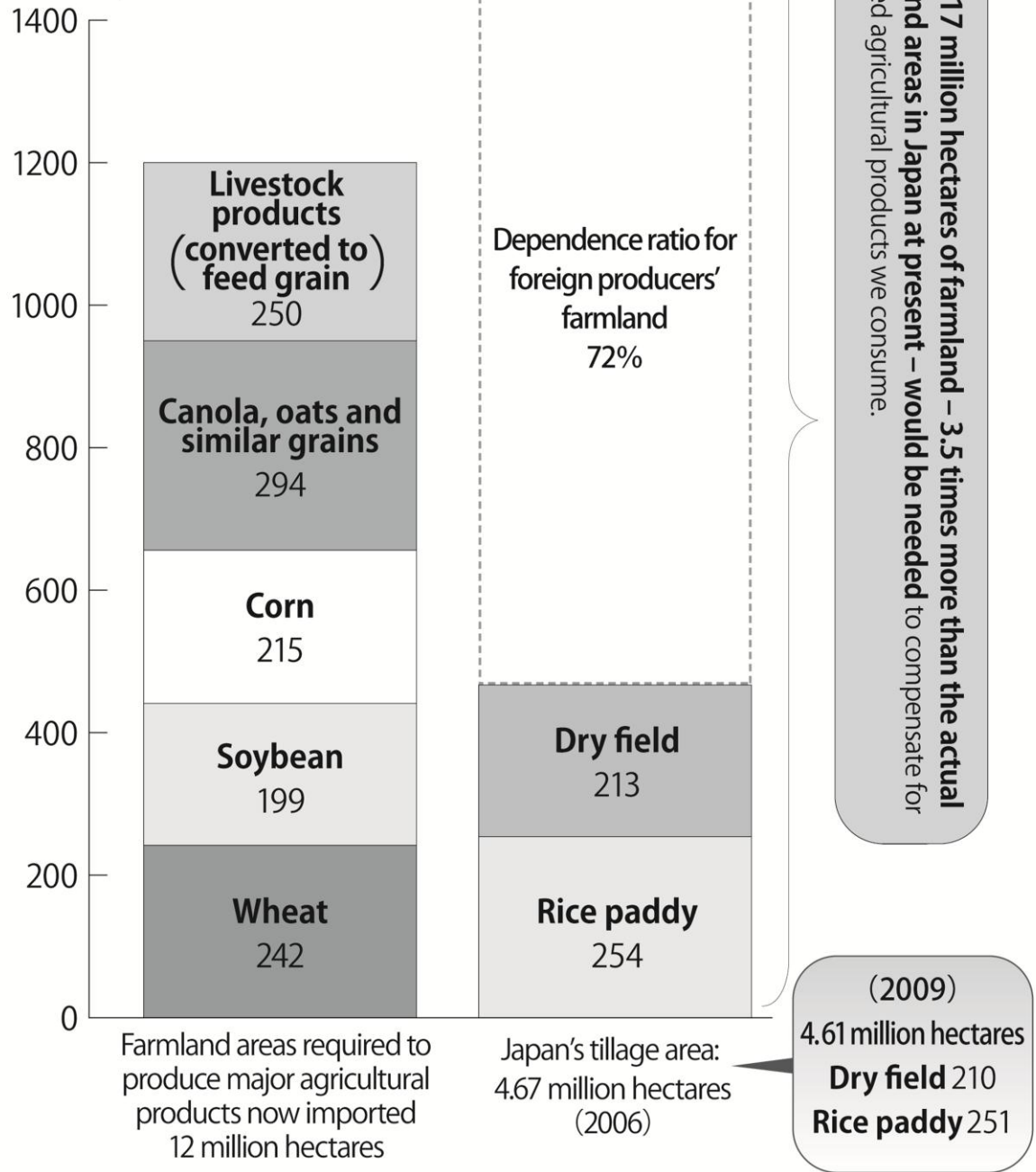
The farmland that Japan would need

The chart as following is one I modified based on the data provided by MAFF. The total area of farmland in Japan as of 2009 was 4.61 million hectares. By dividing the amount of imported grain per year by each item's average yield per hectare, we can see the area of farmland Japan would need to produce the same amount of grain as it imports every year. The result is about 12 million hectares. This chart indicates that Japan would need about 3.5 times as much farmland (a total of about 17 million hectares) in order to grow all the agricultural produce that the Japanese population consumes. This is yet another reality that we may try to deny.

The farmland that Japan would need

Required farmland area in Japan

(Unit: 10,000 hectares)



Note: Farmland areas needed to produce imported major agricultural products—the amounts of imported wheat, soybeans, corn and other imported grain were divided by each producer's yield/hectare.

Source: MAFF data compiled by the author

If there were 17 million hectares of farmland in Japan, that means 1 hectare of farmland would yield enough agricultural produce to feed seven or eight people.

Suppose Japanese farms could be enhanced somehow, perhaps with some special fertilization treatment, so that 1 hectare could yield enough crops to feed 10 persons. Even then, the entire Japanese farmland could only feed 46.1 million people. Even if we could somehow double farm yields, we would still have more than 30 million people going hungry. This is the reality that Japanese people seem to turn a blind eye to.

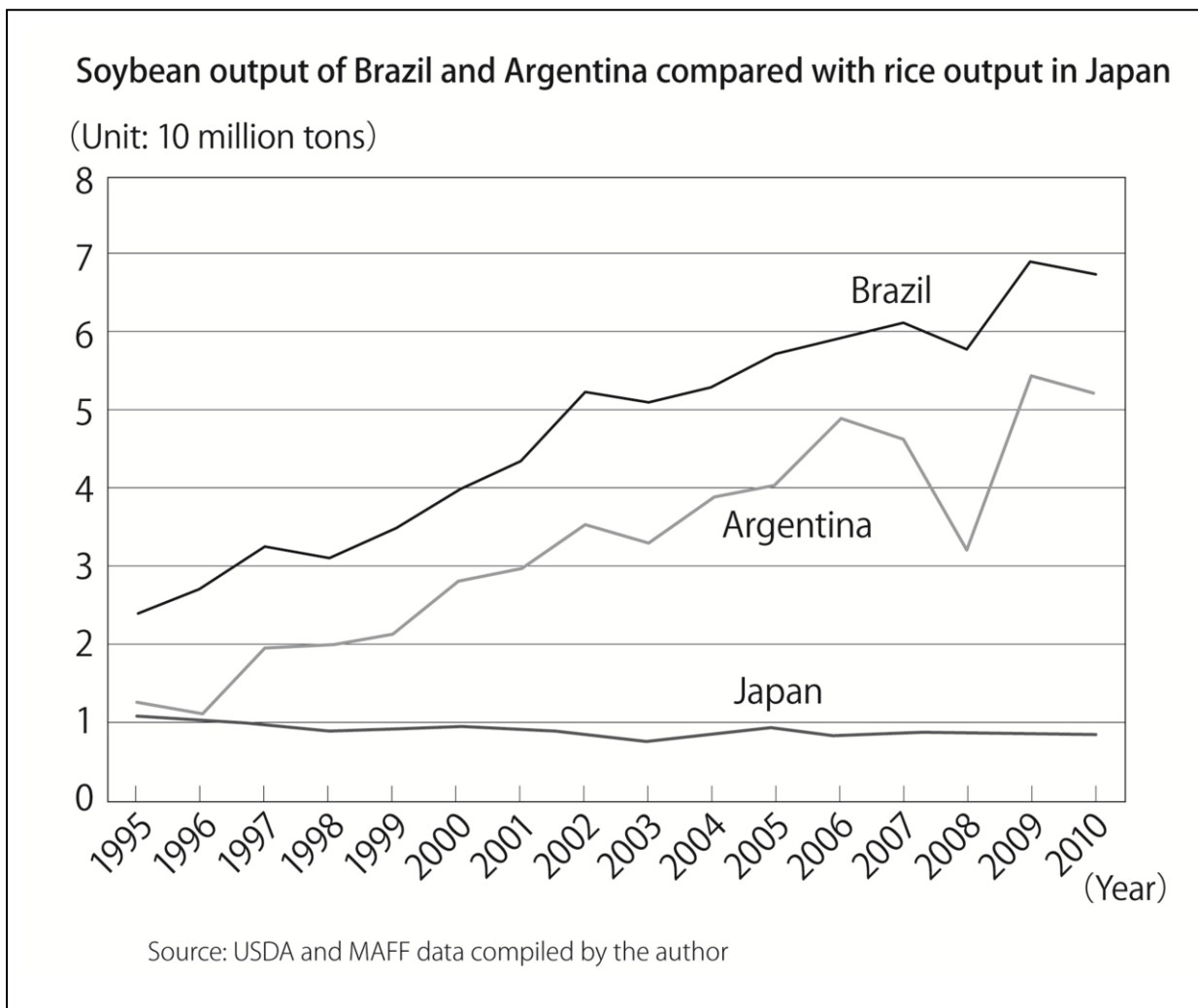
In fact, we have barely succeeded in sustaining our current living standards by maintaining good relations with our agricultural producing partners for quite a long time. In other words, we cannot afford to break up with such partners even if trading conditions get truly tough, but that doesn't mean we should feel inferior to them.

The most important point is that Japan should build positive and enduring interdependent relationship with its trading partners and not depend on them in a one-sided relationship. Since trading can only be feasible through agreement between the parties involved, the partner who imports agricultural produce in a stable and steady way is truly valuable. We should try much harder to find the best way to build the best possible interdependent relationship with our trading partners.

The chart below compares the trends of rice production in Japan with soybean production in Brazil and Argentina. The homeland profiles and climates in Brazil and Argentina are very different from that in Japan, although one simple but important fact would be missed if we paid attention only to the obvious differences. We become aware of this very interesting fact by comparing the trends of soybean production in these countries with our rice production over the past 15 years.

The trend of Japanese rice production has remained unchanged or else has seen a very slight decrease, whereas soybean production in Brazil and Argentina has been increasing at an amazing pace. This reality can easily be

overlooked if we see the production trends in comparison item-by-item. If you apply the impact of five times more production over 15 years to the rice production in Japan, we will easily see how broad the scope of impact would be. Demand in the world market has already expanded to take in all the increased soybean production.



Prospects for world population growth and various uncertainties

It is vital to consider the trends in world population when considering not only biotech crops but also the food distribution and agriculture industries in the future, because environmental science, medicine and agriculture are the fields where technology will likely have the biggest impact. And our civilization has developed into a broadly technological civilization that can

afford to feed very large population.

Japan's population is predicted to decline gradually after its peak in 2004, but the world's population is supposed to increase greatly from now on. According to the 2010 revision of the U.N. World Population Prospects, the world population in 2050 is expected to be some 9.3 billion, which is 2.4 billion more than today. Among that 9.3 billion in total, the population of Asian countries will be 5.1 billion. Thus, Asian population is estimated to increase 1 billion in the next 40 years, accounting for almost half the worldwide population increase of 2.4 billion. In Africa, the current population is about 1 billion, but this is estimated to double to some 2.2 billion by 2050. This increasing trend is predicted to continue until world population exceeds 10 billion by 2085.

Among countries most closely related to Japan, China's population is estimated to peak in around 2025, and India will reach its peak in around 2060 with 1.7 billion people or even more. Meanwhile Japan's population is estimated to be around 100 million in 2050.

Unfortunately, supply and demand of food has not been forecast for 2050, but since the world's population will likely be 1.3 times the present population, it can be predicted by simple calculation that food demand will be at least 3.5 billion tons (current food demand is 2.7 billion tons). The question here is how to meet the increased food demand. And scientific technologies are the key to the solutions, if we take today's world's cultivated areas into consideration.

What factors matter most when we look into the future of food, considering both agriculture and the food-distribution industry? I would like to point out five factors: land, water, climate change, energy and technology. Among these, we already see some heated competition over land in the world, which is called a "Land Rush." Individual companies have actively embarked on acquiring land in foreign countries, and some nations such as China and certain Middle Eastern countries have also been acquiring foreign land quite actively as part of their national policy. It is true that such moves have been criticized, but it has not been widely recognized in Japan as a new business

model to acquire farmland that the owners, perhaps young people who have recently inherited the land, do not farm. The ownership of such land cannot change, and owners might simply lease these farmlands to tenants.

Factors to be considered

The water issue is not so conspicuous compared to the land issue represented by the Land Rush phenomenon, but it has become a serious issue in Africa as well as in China. The water issue includes shortages of water itself and financial constraints that hinder the building of necessary infrastructure to distribute water. In some cases, infrastructure has not been set in place even though water is available. Climate change and energy are also both very important. The consensus has been almost formed in the world that global warming is happening, although there is no consensus about the extent of its effects among the major economies. Agricultural producers know how big an impact every degree of higher temperature has on farming, so global warming must be addressed in every possible way for as long as it takes.

The energy issue has something closely to do with increasing population. Basically, as a population grows, its economic activity is boosted, and consequently its energy demand also increases, although the factor of energy efficiency should also be considered. That also has a long-term impact on the market.

Last but not the least important factor is technology, which surely includes the influence of biotechnology such as biotech crops. I think what we need in the future is a mechanism that facilitates a consensus in society about how to control and utilize the development of technology, instead of ignoring or blocking development of technology.

The number of stakeholders will increase as the scope of food production and distribution widens. Even domestically produced agricultural produce may be linked with foreign producers if fertilizers and feed are taken into consideration, so Japanese agriculture may even become part of the global food production system. The key to establishing food security is to build a highly transparent and flexible mechanism for the food system so we can

more efficiently manage a variety of uncertainties. Our approach to biotech crops should be reviewed and developed in above mentioned mechanism.

Differentiation or low cost?

The biggest attraction for foreign tourists visiting Japan is Japanese food, along with our safe streets and communities, clean environment and quality services. I am proud of all that. On the other hand, I feel a little strange because I know the reality about Japan's self-sufficiency in food.

Michael E. Porter, a world-leading business scholar, says business strategy boils down to just two key aspects: low cost and differentiation. The Japanese food that foreign tourists long for is not the product of a low-cost strategy. What foreign visitors expect from Japanese food is the value created purely by Japanese tradition and skill, which is what greatly differentiates the Japanese food industry. We should take a bold step forward to understand the foundation that our food and agricultural industries rely on, in order to maintain established Japanese foods and food brands.