Issues on food safety from a perspective of information ecology

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Abstract
A recent trend of food safety issues in Japan is discussed from a perspective of information ecology. The Japanese food safety policies have gradually introduced a set of methods of the risk analysis that has embodied in the 2003 Basic Food Safety Law and the Food Safety Commission after the discovery of BSE cows in 2001. The outcomes include an introduction of the traceability system for food products. Besides, a public arena of debates on food safety has emerged with issues on food pollution by dioxins, genetically modified (GM) foods and foods with disguised origins. In the arena, diverse arguments and practices have come out from different actors that include consumer unions, environmental groups, the food-distribution industry, the food-processing industry, farmers and some newly-entered industries. Contested strategies of these actors, interacting with policy change mentioned above, seem to bring a new design of information about food safety. The arena can be considered as a hybrid forum comprised of actors with different qualities. This paper analyses the hybrid forum by using three ideal types of strategies taken up by different actors in order to alleviate risks derived from food: informational, cooperative and technological strategies, in relation to three elements of the risk analysis.

Keywords
food safety, risk analysis, hybrid forum, traceability

1. An approach of information ecology

The concept of information ecology denotes *ecology of information* that indicates participatory designing of information. It may also connote *ecology by information* or designing of information toward ecology, where ecology means coexistence of human and nature. In this sense, on one hand, *ecology by information* implies openness of its designing processes for considering factors in the natural environment. On the other hand, participatory designing of information means openness of the designing processes for considering its social aspects. It suggests that the difference between the original and transferred meanings of information ecology only comes from difference in actors, i.e., natural or social actors, to be recruited for the designing processes. In other words, the different valuation between `society' and `nature' makes the meaning of information ecology complex.

However, the difference does not seem obvious. For instance, to ameliorate an environmental problem, in most cases, it may require not only taking into account of natural factors affected by human activities, but also participation of a wide range of social stakeholders, since it may have an aspect of social problems. The process may entail designing information more open for public. This has already happened in many cases, such as industrial pollutions and public projects.

Similarly, issues on food risks, which have spread over western societies and also recently in Japan, closely relate to natural environment through the production, distribution and consumption of food. The issues on food risks may not resolve with just participatory management of the information about how food are produced and distributed. It is also important to elucidate how the processes of food production through consumption may affect human health and natural environment. Thus, I argue that a process of ecological designing information requires participation of not only public but also `nature' that includes soil, water, plants, animals and humans. In a broad sense, information ecology should entail considering human and nature in designing information. This presentation examines some trends in Japanese society concerning food safety from the perspective of the broad meaning of information ecology.

2. Risk analysis of food and a concept of traceability

In Japan, food safety policies have gradually introduced a set of methods about risk analysis after the discovery of BSE cows in 2001 (and 6th and 7th cases were detected on January 2003). A report by the research committee on BSE issued in the next year pushed this direction, and finally the trends have enacted the Basic Food Safety Law and established the Food Safety Commission in this year. Its outcomes include a concept of traceability of food products. The Ministry of Agriculture, Forest and Fishery (MAFF) have recently issued guidelines of

the traceability of beef and food in general. This governmental change follows the similar processes already occurred in Europe.

Besides, a public arena of debates on food safety has emerged with issues on food pollution by dioxins, genetically modified (GM) foods and foods with disguised origins, which has been mushrooming since the end of the last century. In the arena, diverse arguments and practices have come out from different actors that include consumer unions, environmental groups, the food-distribution industry, the food-processing industry, farmers, some newly-entered industries and experts of natural and social science. Contested strategies of these actors, interacting with policy change mentioned above, seem to bring a new design of information about food safety and also about its ecological aspect. The arena can be considered as a hybrid forum (Gibbons et al., 1994) comprised of actors with different qualities.

For example, food-distribution companies may use traceability as one of strategies for supply chain management that has been widely used in the industrial sector in order to rationalise their distribution processes. For entrepreneurial farmers, traceability may function as a strategy for product differentiation, since the identity of food now serves as an important part of brands of food. Some consumer organization plans to introduce traceability in order to block the contamination of GM materials. Some companies from the information and the pharmaceutical industry aim to create new markets for food inventory systems and for food test kits, respectively. On the contrary, some farmers and consumers who would bear the burden of additional works and prices for traceability may complain such costs. The information design for traceability will shape/dissolve with intermingled interests of these diverse actors.

3. The hybrid forum

This presentation analyses the hybrid forum on the food safety in Japan by using three ideal types of strategies taken up by different actors in order to alleviate public unease and evade risks derived from food: informational, cooperative and technological strategies (see Table 1).

First, the informational strategy promotes informationalisation of the food production and distribution by introducing standardization and third-party certification system in the agricultural production and distribution in addition to traceability. Major advocates of the strategy include the food distribution and retailing industries, agricultural administrative agencies and agricultural economists. Because it signifies market coordination, considerations for natural environment usually may not have major priority.

Second, the cooperative strategy originated from a farm-support movement by consumer groups in the 1970s in Japan, which closely linked to the movements of organic agriculture and campaigns against pesticides and post-harvest agrochemicals. Some consumer and farmer organizations have lead the strategy, and some environmental groups and rural sociologists have supported the idea. Although the strategy significantly takes into account of natural environment, it has never grown as a major trend in the food market.

Finally, the technological strategy has implicitly supported the former strategies by defining the safety standards of agrochemicals, innovating methods in food analyses and

Table 1. Contested strategies on designing information about food safety and its ecological aspects

Strategies	Informational	Cooperative	Technological
Major actors	Food distribution & retailing companies, governmental agencies, agricultural economists	Consumer & farmer organizations, environmental groups, rural sociologists	Newly entered (bio, pharmaceutical & IT) industries into the food chain
Problems of food chain	Incompleteness, asymmetry & unreliability of information flows	Absence of cooperative relationships between producers and consumers	Lack of public acceptance of technology
Designing of information	Traceability, standardization & third-party certification	Sustain partnerships, and least burden on producer & consumer	Based on sound science
Referenced model for information	Global market and SCM in the industrial sector	Communal relationship in the traditional societies	Scientific journals with peer review
Unit of weighing risks and benefits	Individuals	Communities (not spatial but occupational & value-based)	Experts
Political stance & rationality	Liberalism (openness and self-determination) Market rationality	Communitarianism (identity politics)	Elitism Essentialism Scientific rationality

constructing the information systems for the safety management. The newcomer industries into the food market and governmental agencies have mainly directed the strategy. The technology and its design, however, had long been invisible from public. Accordingly, now the strategy sometimes disagrees with other strategies in the openness and appropriateness of technological expertise. It suggests that the technological strategy tends to keep the predominance of experts over public, while the informational and cooperative strategies may entail the involvement of public in designing technologies.

These three strategies, in some cases, conflict with each other, while in other cases collaborate, with regard to three elements of risk analysis; risk evaluation, risk management and risk communication. Regarding risk evaluation, the cooperative strategy disagrees with the technological strategy. In the same way, the informational strategy conflicts with the technological one about the risk management, and the informational contradicts with the cooperative about the risk communication in spite of their recent convergence in their positive attitudes for traceability. Such conflicts among different strategies may point out some problems in the present risk analysis and the information ecology.

(1) The informational strategy vs. the cooperative strategy: risk communication

Both strategies problematize the `agriculture-food divide', i.e., the gap between agricultural production and food consumption, though the meanings are rather different. The informational strategy attributes the cause of the gap on spatial and social distance between both ends of the complicated and pre-modern structure of the food chain; hence the absence of appropriate information flows between them. The information flows within and between markets in the food chain have a tendency to be incomplete, asymmetric and unreliable. It implies not only that the demand side may not have appropriate information about the supply side to choose products, which may make consumers unease on the food products, but also that the each market may not become aware of misconduct or malfunction in the production or distribution system. The latter has appeared as inabilities of producers and governmental agencies to trace back the cause of contaminations of BSE prions and disallowed GM ingredients. Consequently, the informational strategy strongly advocates those policy changes appeared in the Basic Food Safety Law to achieve traceability of food products.

However, the cooperative strategy criticizes the basic structure of the food chain per se. The problem is the absence of a kind of collective consciousness that may result from a face-to-face relationship between agriculture and food, between the producer and the consumer, between the rural and urban areas. Accordingly, the cooperative strategy identifies social and cultural, rather than economic, meanings in the agricultural production and the food consumption. Eating food entails a sense of solidarity with its producer, as producing food has the similar feeling with its consumer. Furthermore, practices of producing and eating food involve interactions with nature, which still remains in the everyday life as some symbolic representations. From these interpretations of agriculture and food, the recent attempts for informational sophistication in the food chain may jeopardize such social and cultural embeddedness by the `logic of commodity market' in the industrial sector (Furusawa, 1988). Considering such an emphasis on contextual embeddeness, this strategy relates to communitarianism, in contrast with the connection of the informational strategy to liberalism that attaches importance to self-determination (Table 1).

As a result, the informational and the cooperative strategies differ on the ideal communications in the food chain confronted with problems of food risks. The former tries to enrich the information in order to achieve the risk communication, while the latter seeks the way to shorten the food chain by the cooperation between the consumers and the producers so as to achieve the same goal. The latter attempts firstly appeared in 1971 as the `teikei' (or `sanchoku') system, a voluntary producer-consumer co-partnership initiated by grass-root groups of consumers and farmers with the purpose to self-distribute uncontaminated food without chemicals in the context of rapid industrialization of Japanese agriculture (Japan Organic Agriculture Association, 1993). After the Chernobyl accident in 1986, as demands for safe food grew, many fake `organic' and `no-chemical' food came out. Subsequently, the MAFF enacted the Special Labelling Guideline on Organically-grown Vegetables and Fruits in 1992, and it also established the JAS (Japanese Agricultural Standard) of Organic Agricultural Product in 2000. These legislations together with their certification and labelling systems can be considered as a manifestation of the informational strategy. Indeed, the new JAS 2000 introduced a third-party certification system for organic agricultural products in the context of global standardization, though the `teikei' system has comprised of mutual understandings of product quality between the producer and the consumer. Not surprisingly, the `teikei' groups and co-op unions basically opposed to these legislations.

However, recently some cooperative groups have begun to not only agree with the JAS certification but also positively employ new information systems including traceability. For example, Daichi, a major `teikei' group and Co-op Kobe as well as Aeon Co., one of the largest Japanese supermarket chains, joined a `SEICA net' project linked with the Virtually Identified Produce System developed for food traceability that was mainly constructed by the National Food Research Institute of the MAFF. In addition, some co-op unions including the Seikatsu Club, a `teikei' style union, considers the traceability system in order to detect and eliminate GM ingredients, as mentioned earlier.

Such a trend does not seem contradictory to their original

stance, since the cooperative strategy has regarded supplying information about farms as important, as in the case of the Radish Boya, a `teikei' union which started to provide the name of farmers in 1978. Moreover, growing invisibility of the production processes of food, in the course of emerging globalisation, biotechnologies and environmental contamination, information of such changes become more important for even groups tied with a close partnership. Thus, a convergence of strategies could occur if the information were designed appropriately not only for the market rationality but also for the partnerships between the producer and consumer, especially when expert knowledge is hidden from public.

(2) The informational strategy vs. the technological strategy: risk management

Opening the information of producing and distributing food to public is prerequisite for the informational strategy toward alleviating consumers' anxiety and evading real risks derived from food. It is not, however, always possible, because information about food risks are based on scientific and technological expertise and devices, which may not be entirely accessible by lay public. As a result, such expertise and devices have been unquestionable and even unnoticed. Although the technological strategy has been major responses, especially in the governmental sector, against the issues of food risks, most of the public has been alienated from the constructing processes of the strategy. So, there is a problem of the `professional-lay divide' in addition to the `agriculture-food divide'. After the BSE disputes, however, this divide has become visible and the technological strategy has turned to potentially contestable with other strategies in the hybrid be forum.

The 'professional-lay divide' could be problematized in two ways: openness and relevance of the expertise. The informational strategy can challenge the openness of the technological strategy, since it deals with the incompleteness and asymmetry of information flows, while the cooperative strategy questions the relevance of technology itself.

In the forum of food risks, the openness of expert knowledge matters mainly in the area of the risk management: e.g., food labels informing its ingredients and producing methods, regulations of food additives and chemicals using scientific information, international food trade negotiations concerning biosafety (safety of GM materials), opening the processes of risk evaluation to public, etc. In the case of the labelling policy for GM foods, on one hand, most of the EU countries have legislated mandatory labelling so that consumers can decide by themselves whether they accept it or not, which would show a variation of the informational strategy in the risk management. On the other hand, the authorities of the USA (and also Canada) have insisted voluntary labelling, as their experts have concluded that there were no facts to discriminate GM products from other foods (Table 2). This would be regarded as the technological strategy. Namely, the former manage risks by leaving the determination process to public sphere where politics and science are mixed, while the latter intend to protect the scientific rationality that alone can determine what the truth is. In this sense, the technological strategy has an epistemological position relating to essentialism, which can be contrasted to other strategies with more constructive positions. Of course, even though the disagreement between the EU and the USA may also come from economic reason (Busch, 2002), these strategies may actually function as grounds of justification for their policies.

In the framework of risk analysis, generally speaking, risk management belongs to the political and governmental sphere. The technological information derived from the risk evaluation is balanced with political and socio-economic considerations in this sphere and incorporated into the decision making processes. Eventually, the management of food risks potentially involves a conflict between the technological and informational strategies. This heterogeneity could become more evident if the perceptions on risks and uncertainty of technology are different among stakeholders (Sagar, Daemmrich & Ashiya, 2000), as in the case of BSE in addition to GM foods described above. Concerns by lay public would vary broadly, from risks on health and environment to anxiety for economic dependency on monopolistic corporations as well as ethical and religious unease, whereas experts usually take into account only of objective risks as probability of hazardous outcomes. Moreover, the latter does not consider uncertainty as unknown unknowns (Wynne, 1992). As a result, precautionary measures have been called for the risk management.

However, the informational and technological strategies have

Table 2. Comparison between the EU, Japan and the USA in policies for agricultural biotechnology

	EU	Japan	USA
Commercial growing	De facto moratorium	De facto moratorium	Approve positively
Substantial equivalence	Against	Pro	Pro
Precautionary principle	Pro	Neutral	Against
Traceability	Pro (mandatory)	Pro (mandatory)	Wary (voluntary)
Labelling	Pro (mandatory)	Pro (mandatory)	Wary (voluntary)
Regulation	New legislation	New legislation	Present laws
Policy	Demand-driven	Demand-driven	Supply-driven

a common ground. Both assume that qualities, and in some cases risks, of food are measurable and transacted as information. Consequently, the technological strategy has developed a wide range of concepts and objects which includes the substantial equivalence of food composition, test kits for BSE prion, GM genes and emerging viruses, and devices for the electric data interchange (EDI). Only the presumption for measurability can make the complete application of labelling or traceability by using such technology to give consumers choice of foods effectively. Yet the possibility to describe and inform qualities of foods depends on technology that can be attacked as being uncertain. It may be naive, from the view of the cooperative strategy, to expect that risk management with opened information can achieve real safety and public trust in the food chain.

(3) The technological strategy vs. the cooperative strategy: risk evaluation

As mentioned in the last section, the cooperative strategy questions the relevance of technology itself. First, the `teikei' groups started their activities against health risks derived from modern technologies on agriculture and food industry, most of which had controversies from late 1960s to 1970s: contamination of pesticides (BHC, dieldrin) in milk, carcinogenic chemicals for preservatives (e.g., AF2) and sweeteners (e.g., cyclamate), and post-harvest chemicals (OPP, TBZ) found in imported citrus fruits. Hence, the cooperative strategy essentially opposes the industrialisation of agriculture that deepens the gap between consumers and producers.

Second, as a result, they grew a strong favour for the organic and non-chemical, i.e., `natural', agriculture, which connected concerns for health and those for environment. This trend has continued to the recent case of GM organisms that can never arise from a `natural' breeding, and that may pose an environmental uncertainty in addition to health risks.

Third, their position, particularly in Japan, linked to an issue of food security in the growing conditions for the free trade of agricultural products (Jussaume, Hisano & Taniguchi, 2000). The food security had been a major issue of consumer activities since the end of the Second World War. When Japanese government banned import of grapefruits, in 1975, from the USA by a reason that they had been sprayed with post-harvest chemicals, it was two years after the US ban of export of soybeans to Japan. As the consumers in `teikei' system have sympathy with farmers, they can afford paying premium for domestic products. Besides, a label indicating `domestic' has been working as a brand of safer food for some Japanese consumers. To put it in another way, chemical technology for foods, as well as recent biotechnology, has been regarded by such consumers as market- and trade-oriented but not as consumer- or environment-oriented, since it serves for cost efficiency and for long-distance transportation.

Finally, a controversy on intellectual property on GM organisms has caused another opposition to biotechnology. It may not be `natural' to patent living organisms from a view that excludes agriculture from modernisation and industrialisation and give it a special treatment. Also sympathy to the agricultural sector may compatible with that to people in developing countries who would suffer, according to some international NGOs, by the implementation of intellectual property and monopolistic domination of seeds for major crops. Collectively, the cooperative strategy principally conflicts with technology of this area; hence it challenges the risk evaluation by the experts of exactly the same discipline of that technology.

As in the previous comparisons, however, the cooperative strategy, to some extent, depends on the other types of scientific expertise that can criticise inappropriateness and irrationality of the mainstream science, in other words it depends on reflexivity and diversity of science. The diversity is sometimes expressed as extremes between the reductionism and holism. The risks of agriculture and food for health and environment have been authenticated by critical and regulatory scientific practices, which may have affected the shaping of the alternatives for methods in the organic and non-chemical agriculture. It implies that the cooperative strategy shares the same essentialism and elitism to some extent. Indeed, there have been some expectations among NGOs and development experts in developing world for eco- and poor-friendly agricultural biotechnology. Also, the emerging genome, proteome and metabolome sciences, which might enable holistic view of living organisms and profiling methods for detecting hazardous by-products in genetic engineering, may present difficult options for the cooperative strategy. In addition, in Japan, the ecological partnerships between consumers and producers have been incorporated into the protectionist policy as a technocratic discourse of `multi-function of agriculture' in the international trade negotiations.

4. From the perspective of information ecology

Designs of information for food safety could arise from a hybrid forum in which different strategies contest (Figure 1). Of course, this schema indicates just a proposed framework for understanding *ecology of ideas for information* that conflict and simultaneously cooperate each other. The important point is that it enables to examine controversies in the three elements of risk analysis for food. Actual situation now in Japan shows a tendency to exclude the cooperative strategy from governmental sector, e.g., the newly established Food Safety Commission and its expert subcommittees, despite expanding informational technology and businesses that are observed in retail and newcomer industries with the collaboration of governmental agencies. Viewing from this schema, the prominence of the informational and technological strategies in policy may bring further controversies in the areas of risk

communication and evaluation.

For risk communication of food, information about producing area, method, date, person and the certification of such information may not help consumers to get reality of food production, indicating continuing cultural discrepancies between agriculture and food. There will be some `teikei'groups in addition to large retail chains adopting the informational strategy on one hand, while the majority of petty farmers and small businesses as well as consumers with small incomes, on the other hand, will remain working with and buying food with existing qualities without any information or premium, since mandatory traceability will not become possible, for the moment, for most of groceries, processed and ready-to-eat foods and imported foods. It is likely to give rise to market fragmentation into three categories: cheap ordinary foods without information and slightly premium foods with information, in addition to expensive high-quality foods already existing. Risk evaluation is now assigned to the Food Safety Commission. However, there are already some arguments about its personnel arrangement, policies for risk evaluation and relation to agencies in charge of risk management by some consumers'unions and by NGOs for anti-pesticides and anti-GM foods. Although the area of risk management seems harmonious domestically, it may potentially have conflicts internationally with food exporter countries.

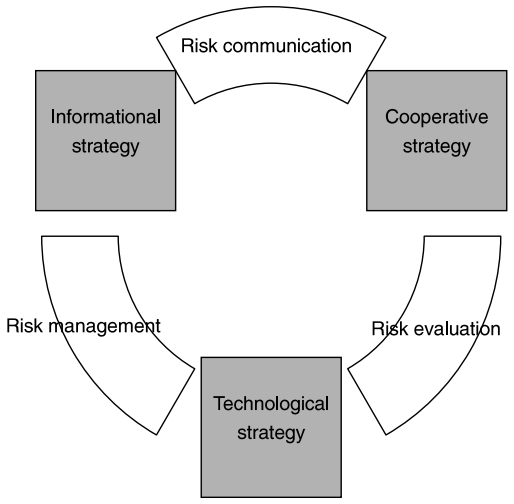

Figure 1. Contested strategies for food safety

Another question is how the present strategies affect *ecology by information*. In the case of GM foods, independent strategies with different interests, such as intellectual property protection (within the technological strategy), trade liberalisation and biosafety (within the informational strategy) resulted in twisted policy options for sustainable agriculture (Otsuka, 2003). The framework presented here also suggests potential triangular inconsistency unless there is some coordinating factor for strategies. Indeed, as described above, lack of the cooperative strategy, which involves alternative technology with the ecological orientation, in the policy making processes, along with the lack of social acceptance and hence business opportunities for newly developed technologies to potentially mitigate environmental impacts, implies a pessimistic possibility in future. The major problem seems that technology- and market-driven risk evaluation and communication can not integrate most of producers and consumers into their frame of risk analysis.

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