

【論文】

Resilience of Local Food Systems to the Fukushima Nuclear Disaster : A Case Study of the Fukushima Soybean Project

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Abstract

The theme of this paper is reconstruction of local food systems in Fukushima. To advance recovering industries of food and agriculture, it is considered to be essential not only to restore agriculture, but to rebuild local food systems linking from the stages of the agriculture, processing, distribution, and to the last stage of consumption.

In Fukushima, the “Fukushima Soybean Project (FSP)” has been developed since 1998. It is a project in which farmers, farmers’ unions, soybean processors and consumer groups have collaborated, processed locally produced soybeans, and supplied them to residents of the prefecture. In spite of huge damages incurred by the Great East Japan Earthquake and the subsequent nuclear disaster, the project continues with efforts of each actor such as producers, processors and cooperatives. This article therefore focused on the actions of the FSP after the nuclear disaster, and by clarifying the difficulties and problems that they face as well as their efforts for recovery, examines a direction of reconstruction of local food systems in Fukushima.

The main findings of this paper are summarized as follows. The prime characteristic of the FSP is a collaboration between cooperatives. Through the supply of soy foods, agricultural cooperatives as producers’ organizations, and consumers’ cooperatives as consumers’ organizations joined hand in hand to make a substantive organization and build a win-win business model, which enabled its sustained development. The trusting relationship and social capital among farmers, food manufacturers and consumers nurtured through the efforts happened to function effectively after the nuclear disaster. It emphatically shows that local food systems such as the FSP can exert an effect not only as a countermove to globalization as a problem that “gradually erodes regional societies”, but also as a mechanism of “resilience” against the nuclear disaster as a “rapid and strong exogenous shock”.

Keywords : nuclear disaster, Fukushima, local food systems, collaboration between cooperatives, resilience

1. Introduction

1) Purposes of the Study

The theme of this paper is reconstruction of local food systems in Fukushima. A food system, in the first place, is a concept that regards a series of processes from the production to the consumption of food as one social system (Niyyama, 2001 ; Takahashi and Saito, 2002 ; Tansey and Worsley, 1995). While it is based on chains of various industries, such as agriculture, food manufacturing, wholesaling, food service and retailing industries, it also encompasses the interrelationships of actors including farmers, workers, consumers, local and national governments and related institutions as a whole. Geographical reach of food systems varies widely from global, involving multinational corporations, to local, based on the models of community supported agriculture (CSA). Although there is little doubt about the

growing significance of geographically extensive food systems (Fold and Pritchard, 2005 ; Whatmore, 1995), this paper focuses explicitly on local food systems because they are closely related with regional economic and industrial revitalization, sovereignty of the people and the way a local society should be. As mentioned before, food systems are made up of a variety of industries. Recently in rural and provincial areas of Japan, there have been an increasing number of active movements to connect these industries with consumers supporting them by buying local foods within a certain range of regions for building a circular regional economy. To advance recovering regions and industries of food and agriculture in Fukushima, it is considered to be essential not only to restore agriculture, but to rebuild local food systems linking from the stages of the agriculture, processing, distribution, and to the last stage of consumption.

In Fukushima, cooperative and private sectors have long aimed at building a variety of local food systems. These efforts include farmers' markets, CSA based on organic produces, local sourcing of ingredients by local food manufacturers, collaboration between different types of cooperatives, and so on that have been developed within the prefecture.

Amid such circumstances, the Great East Japan Earthquake and tsunami, and the subsequent accident occurred of the Fukushima Daiichi nuclear power plant. The radioactive contamination and collateral unfavorable reputations critically harmed local food systems in Fukushima Prefecture. However, it is important to note that the local food systems did not break down even after the nuclear accident. Even though suffering from a number of damages, there are many efforts that each of actors like farmers, manufacturers and cooperatives strives hard to continue. This article looks to this challenge.

“Fukushima Soybean Project” is a case in point. The project started in 1998, to locally process and locally consume soybeans grown in Fukushima through a partnership among agricultural cooperatives responsible for production, private manufacturers responsible for processing, and consumers' cooperatives responsible for distribution and consumption. The project won the sympathy of many people. They go on the project in spite of a lot of problems even after the nuclear disaster. Therefore, by describing difficulties and problems that they have faced and how they have met the challenge of the recovery, and the resilience to such a crisis as the tremendous disaster, this study explores a direction of rebuilding local food systems in Fukushima.

2) Outline

This paper is organized as follows. Section 2 briefly reviews trends of local food systems in Japan as well as Western countries. As two significances to foster local food systems, the section demonstrates (1) the social significance, which helps local communities to regain food sovereignty and aim at reconstructing local societies, and (2) the economic significance, which strengthens promoting local agriculture and collaborating between agriculture and food industry, and aim at development of a circular regional economy. Also, it relates an overview of how local food systems in Fukushima have been affected by the nuclear disaster of this time. Next, the third section provides an overview of “Fukushima Soybean Project”, which was established in the late 1990s and summarizes social backgrounds then, as well as its development before the disaster. This project is managed by a collaboration between agricultural and consumers' cooperatives. This collaboration between the cooperatives is actually the strong mechanism of trust that resists the nuclear disaster, which is to discuss in Section 4 in detail. Although it is a fact that radioactive contamination brought about by the nuclear accident has posed great difficulties to the project. The section approaches to this from two crises : (1) shortages in local ingredients caused by radioactive contamination ; and (2) anxieties among consumers over radioactive con-

tamination. These two crises are important issues that are common to the whole local food systems in Fukushima after the disaster. How did this project overcome these two crises? This study illuminates this question in an attempt to see a steady light for restoration of local food systems in Fukushima.

2. Local Food Systems and the Nuclear Disaster

1) Trends on Local Food Systems in the West and Japan

Once again, local food systems are supply systems of food in which sectors of processing and distribution as well as consumer sector are connected within a certain geographical rangeⁱ based on agriculture and site of production in rural villages. Such local food systems start to garner attention not only in Japan, but also the United States and Europe these days.

This concept of local food systems has been discussed largely in two contexts. First is to position it as an alternative distribution system that overcomes adverse effects brought about by mass distribution systems, which have been formed by advances in globalization. It is the case for the theory of local food systems developed primarily in the West. Lyson (2000) pays an attention to that as a countermove to modern food systems that tread the path of industrialization and globalization, there is a movement totally opposite to that, localization of agriculture and food production in the United States and other industrialized countries. He calls such a resurgence of community-based agriculture and food production “civic agriculture”. Henderson and Van En (2007) similarly recognize a mechanism of connections between producers who farm paying attention to natural environment and safety of agricultural produces, and consumers who support the producers through eating their produces as CSA, and depict its developments across the United States. As a theory to analyze close relations between food production and consumption from social and economic dimensions, short food supply chain has been developed in the West (Morris and Buller, 2003 ; Renting et al., 2003 and so on). The main object is placed on spatial and social “reduction of distances” between actors comprising the chains here.

In Japan, a similar movement encouraging local consumption of local produces has been developed in various regions since the 1990s, and has been called *chisan-chisho* (or “buying local”) as an alternative food system (Ito, 2012). It was initially developed as a type of consumer movement in which some consumer groups concerned with environmental problems and food safety actively purchase safe local agricultural produces in collaboration with producers. There are more and more cases in recent years that have been evolved into movements aiming at gaining regional identity and pride of local residents, while deepening exchanges between producers and consumers (Kimura and Nishiyama, 2008 ; Nishiyama and Kimura, 2005). To summarize, local food systems imply a social significance to regain food sovereignty from global economy to the region, and aim at reconstructing a regional society.

Another context of local food systems is revitalization of the regional economy. Formation of food industry clusters, which are applied “industrial clusters” advocated by Porter (1990, 1998 and so on) to the sector of food and agriculture, has been pursued in various parts of recent Japan with policy support

ⁱ A geographical scope of local food systems varies such as community around a farm, extent of municipality, precinct of prefecture and so on, but what is valued is quality of connection, in addition to largeness of geographical scope. Important points include natural environment and culture of food production area, biological processes with regard to food supply, and closeness of social relations between actors (Iga, 2008).

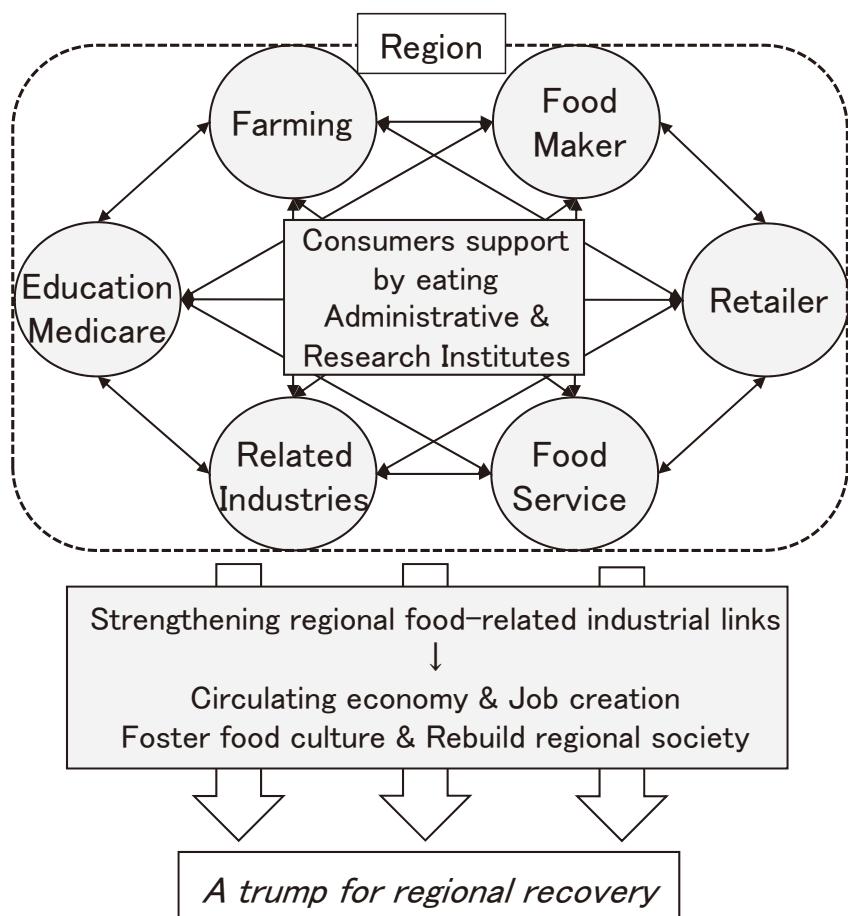


Figure 1. Concept of industrial links on food and agriculture
Source : Created by author.

of the governmentⁱⁱ.

As discussed above, deepening local food systems in a way that regional agriculture, food industry, related sectors (tourism, education, welfare and medical care, etc.) and consumers strengthen their ties, with the institutional support of governments can promise effects on the regional economy including circulation of added value and job creation (Figure 1). Furthermore, a methodology of regional development comes into effect by combining with aforementioned social significance of aiming at reconstructing regional society. In my view, it is endogenous development that is based on the two significances which the local food systems hold, and that are key to Japan's future regional policy as well as essential to restoration of communities in Fukushima from nuclear disasterⁱⁱⁱ.

Furthermore, amid various “crises” such as global financial crisis in the 2000s and the Great East

ⁱⁱ Formation of food industry clusters are policy issues not only in Japan, but also in South Korea and Taiwan (Chung, 2009 ; Hwang, 2008). Their common issue is slumping food self-sufficiency ratio, and they aim to improve self-sufficiency by strengthening relations between agriculture and food industry.

ⁱⁱⁱ For systematic findings of the research on local food systems, see Saito and Sato (2014).

Japan Earthquake in 2011 challenge our society in a way how we should face up to them, there is an increasing attention on the concept of “resilience” — “the ability of people or things to feel better quickly after something unpleasant” — in the field of social science (Yamamoto, 2011). It is considered that the concept of resilience should be important for this paper that discusses reconstruction of local food systems and regional resurgence after the nuclear disaster ; I will thus carry out analyses with such an awareness.

2) Effects of Nuclear Disaster

A wide range of agriculture has been developed in Fukushima ; not only rice is mainly produced, but other crops also include fruits, vegetables, dairy and livestock. Taking an advantage of the diversity of produces, food manufacturing is also flourishing. There are producers' unions that are organized with counterparts for *sake* (rice wine), Japanese-style pickles, noodles, dairy products, soy sauce, *miso* (fermented soybean paste), *tofu* and *natto* (fermented soybeans). Most of them are small and medium-sized enterprises (SMEs), not a few of which emphasize a strategy to actively use local ingredients and sell products highly with regional characteristics to local retailers and consumers, in order to differentiate their products from nationwide manufacturers.

In retails, while large national supermarkets are generally increasing the market shares in Japan, local supermarkets with local interests and consumers' cooperatives retain the strength in Fukushima. They are eager to carry local produces and locally processed foods. It is because there are a large number of consumers who value locally produced vegetables and meat, and locally processed foods. In addition, farmers' markets have been growing in number over the past decade. Such local supermarkets, consumers' cooperatives and farmers' markets are important actors who support the demand side in local food systems.

This is how local food systems rich in local connections among agriculture, food industry and consumers were pursued and achieved steady development in Fukushima since before the disaster. However, the terrible Great East Japan Earthquake had a profound impact on them (Figure 2). First, the point of production was harmed by the earthquake, tsunami and radioactive contamination (Koyama, 2013). It is radioactive contamination that is especially making a nuisance of farmers over a lengthy period of time. Radioactive materials that exceeded the safety limits set by the government were found

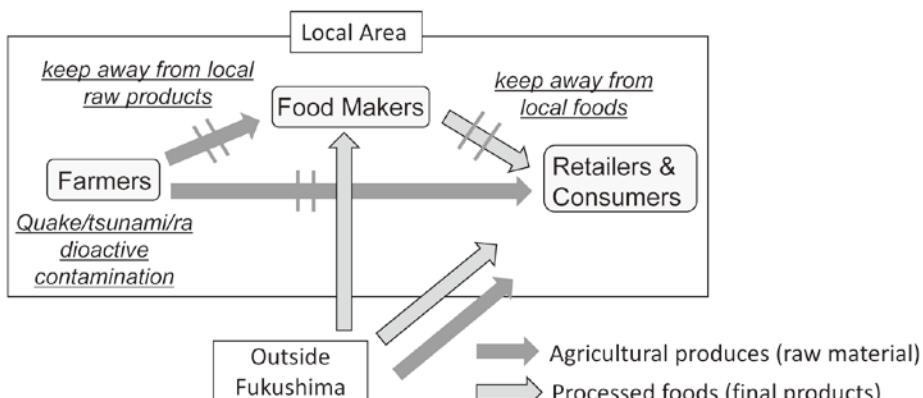


Figure 2. Local food systems damaged by nuclear disaster
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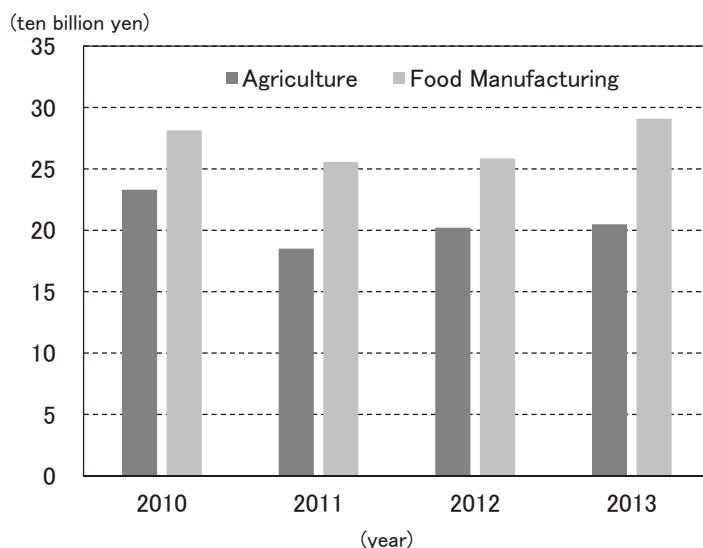


Figure 3. Trends of Agricultural Output and Food Manufacturing Production and Shipment Values in Fukushima Prefecture

Source : Ministry of Agriculture, Forestry and Fisheries of Japan “Productive agriculture income statistics” and Ministry of Economy, Trade and Industry “Industrial statistics”

in some of rice and vegetables in 2011, when the nuclear power plant accident occurred. Many items were issued restriction to ship, and farmers were temporarily unable to do farming. Meanwhile, in order to ensure food safety, both of radioactive contamination abatement measures in farm fields and monitoring inspection systems for agricultural produces were prepared in a hurry for a mechanism to distribute only safe foods to the market. Nevertheless, there were some people in Fukushima who stayed away from local foods one after another due to unfavorable reputation, resulting in a situation that local foods were hard to sell. Mothers with small children in particular who feared internal exposure of their children appeared to take actions of avoiding local foods. In response to their requests, there were some supermarkets within the prefecture that stopped placing local foods on the shelves, which led to reactions of many food manufacturers within the prefecture to switch their ingredients from locally-grown to those made outside the prefecture or overseas. This is how passing of the baton from local farmers, to food manufacturers, retailers and consumers ceased, and local food systems became terribly hurt.

Here is some presentation of basic figures to indicate the situations of recovery on food and agriculture. Figure 3 exhibits the trends on agricultural output values and food manufacturing and shipment values in Fukushima Prefecture. Although the agricultural output decreased to 180 billion yen (approximately US\$ 1.5 billion) in 2011 from 230 billion yen (US\$ 1.9 billion) before the disaster, it was recovered to 200 billion yen (US\$ 1.68 billion) in the next year. Meanwhile, shipment value for food manufacturing industry plunged in 2011, though in the next year it went back to the level before the disaster. These data can mistakenly be understood as damages on agriculture and food manufacturing have been almost restored to the formal state, but such an understanding of damages with sales figures overlooks damages on aforementioned local food systems to connect regional agriculture, food manufacturing industry and consumers. While scale of each industry is on the recovery, the division shown in Figure 2 has not been fully recovered yet.

However, as emphasized in the introduction, the local food system, i.e. regional connection on food

and agriculture, has not been ruined completely by the nuclear disaster. There are many activities which keep working on through efforts of each actor, such as farmers, processors and cooperatives in spite of major damages including radiation contamination and reputational damage. The below examines their hardship and challenges after the disaster from the case of Fukushima soybean project.

3. Fukushima Soybean Project before the Disaster

The Fukushima Soybean Project (hereinafter called FSP) was organized in 1998 as a collaborative effort among agricultural and consumers' cooperatives and local food manufacturers, as an association for facilitating manufacture of soybean products and its consumption within Fukushima Prefecture. Here is to outline the background of launching FSP, a mechanism of the local production and consumption, and the developmental process.

1) Background of the FSP launch

Soybeans are the main ingredient of fermented seasonings such as *miso* and soy sauce, which are indispensable for Japanese cuisine, and *tofu* and *natto*, which are processed from soybeans, are daily essential foods in Japan. Many people often think of rice as the most representative of Japanese food culture, but it is not an exaggeration to claim that soybeans are equally essential part of it.

Nevertheless, postwar Japanese agricultural policies ruled out soybeans from the protected items early. Soybean imports were liberalized and most of them came to depend on cheap foreign-grown ones, in sharp contrast to rice, which has been placed at the center of Japanese agricultural protection policies. Japan currently depends approximately 80 percent of edible soybeans and over 90 percent of overall soybeans (including those for animal feed) on imports from overseas.

Meanwhile, since the late 1990s, soybeans have been recognized as a typical item of genetically modified organisms that Japanese consumers have a deep sense of concern, and there have been calls for improving self-sufficiency in soybeans even from the perspective of food safety. Would it be possible to resurrect local production and consumption of soybeans, which have been integral to Japanese? This is where Fukushima Soybean Project started.

Compared to other areas, Fukushima has a larger consumption of soy products such as *tofu* and *natto*. That is, there is a constant demand in soybeans. However, there was a problem on the supply side. Fukushima is one of Japan's leading production areas of rice, but the government has strongly pushed a policy to promote cultivation of wheat, soybeans and vegetables amid intensifying overproduction of rice, and soybeans came to be produced even in Fukushima. Nevertheless, soybean production in Fukushima was far too small in the 1990s, because farmers were unable to earn sufficient income with soybeans due to competition with cheap foreign-grown ones. Furthermore, the government is involved in distribution of grains including soybeans and wheat to make up supply systems on the national level, which makes them difficult to circulate locally. The soybeans grown in Fukushima have been taken out of the prefecture, and most of soybean products consumed in Fukushima have depended on "imports" from outside the prefecture. This is how the food system for soybeans has been divided between the sides of demand and supply.

2) Mechanism of "buying local"

In 1998, agricultural cooperatives, consumers' cooperatives and food manufacturers in the prefecture joined hand in hand to build a local food system supporting producers through purchase. It is the

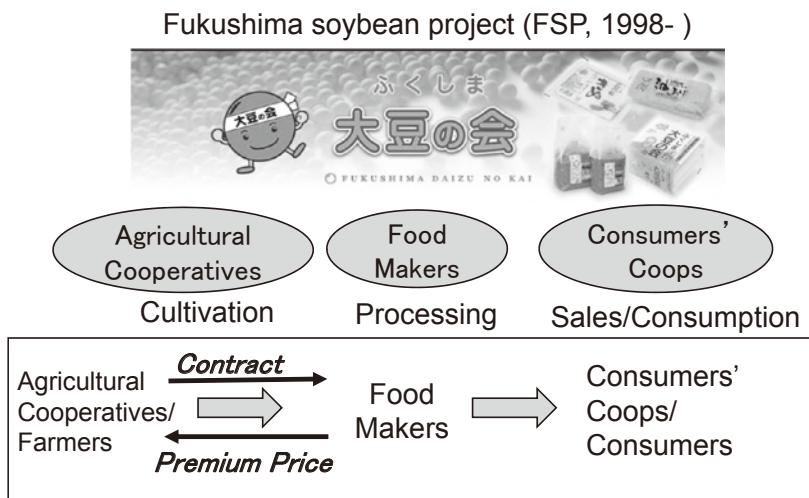


Figure 4. The Fukushima soybean project illustrated

Source : Created from the FSP website (<http://f-daizunokai.com/>) and interviews.

beginning of Fukushima soybean project (Figure 4). The goods supplied include *tofu*, *natto*, soy sauce and *miso* that are essential soybean foods at general Japanese homes. In this project, food manufacturers, which are responsible for processing, procure soybeans as raw materials through a contract with agricultural cooperatives within the prefecture, and support farmers by adding a premium price of 3,000 yen (approximately US\$ 25) per 60 kg to the regular price^{iv}. However, adding a premium to already relatively expensive domestic soybeans substantially raises production costs for soybean products at manufacturers, which has no choice but to charge more for final products' prices. Nevertheless, consumers' cooperatives thought that it would have made only part of high-income people buy them and would have made the project fail to be widely known, and they set the product prices at a slightly higher level than conventional products that use foreign ingredients. However, if it was done, the manufacturers would had to carry the burden and would have been unable to continue the business. Thus, the consumers' cooperatives collected ten thousands of subscribers supporting the project and created a mechanism for the members to purchase a continuous and constant volume of items to realize reduction of the manufacturers' burden and risks. As they become the subscribers, a given amount of soy foods are delivered to home weekly. Although some of the goods are also sold at cooperative stores and farmers' markets, their steady demands are achieved by the subscribers continuously buying for support. Still, for the manufacturers, it is a business far from profitable, but their corporate beliefs to contribute to the development of the region as locally-based food companies led them to participate in the project.

3) Organizational factors to sustain growth

The FSP won the sympathy of many people and continued to expand since its launch (Figure 5). The sales increased 67 million yen (approximately US\$ 564,000) in the financial year of 1999 to more than 250 million yen (US\$ 2,100,000) in 2010. This substantial growth and success of the project can be attributed to the win-win relationships among agricultural cooperatives (producers), consumers' coopera-

^{iv} The market price for domestic soybeans varies with year, variety and production area, but standard price range is approximately from 10,000 to 12,000 yen (US\$ 80-100), the premium of 3,000 yen is a price far from cheap.

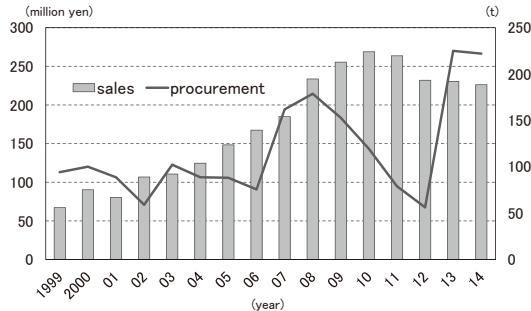


Figure 5. Trends in raw procurement volume and product sales for FSP

Source : Created from documents by FSP

tives (consumers) and manufacturers (processing firms), designed by the architects of the FTP. Amid the fact that not a few of efforts on local production and consumption as well as collaboration among agriculture, industry and commerce end up with temporary booms or events, an important factor for sustainable growth of the FSP may lie in its organizational form of collaboration between cooperatives.

As mentioned before, a basic characteristic of FSP's organization is collaboration between cooperatives, i.e., agricultural cooperatives and consumers' cooperatives. FSP is a non-juridical, private organization since Japan's laws currently do not allow a form of cooperative that agricultural cooperative and consumers' cooperative are connected. However, they established articles of association that include rules and philosophies of the project, which clarify roles and apportionment of responsibilities of each actor. It can be considered that building a substantive organization for doing business has sustained a stable business growth.

Moreover, the scale of organization is also worth noting. The agricultural cooperative, which is responsible for the sector of production, is the Central Union that is organized by several agricultural cooperatives in the prefecture. As the Central Union with the center facility serves as the primary point of contact for the production sector, they could respond to an expansion of consumer demand quickly. On the other hand, while consumers' cooperatives, which are responsible for the sector of distribution and consumption, also comprise several consumers' coops within the prefecture, it is Coop Fukushima, the prefecture's largest consumers' coop, that plays its central role^v. Coop Fukushima makes its headquarters in Fukushima City, and has a wide range of operations within the prefecture. The number of cooperative members is 182,000, the financed amount is 6,690 million yen (approximately US\$ 56,000,000) and the supplied amount is 20.8 billion yen (US\$ 174,000,000) as of year 2013. Such certain scales held by each side of both agricultural and consumers' coops serve as the basis to sustain the project's growth.

It is certain that largeness of organization or business in scale is not necessarily a desirable condition of sustainable local food systems. It is because in general, the larger the scale, the more difficult to sustain a close relationship between sectors of production and consumption. FSP has not become so because activities of cooperative members are vigorous as cooperatives. Especially, Coop Fukushima, as a consumers' coop, has vigorous members' activities. As far as the FSP is concerned, they have been involved in campaign against genetically modified organisms, food mileage movement that aims at reducing CO₂ by switching from imported to prefecture-grown foods, as well as "School of the Field" to deepen

^v For detailed information on Coop Fukushima, see the website at : <http://www.fukushima.coop/>

exchanges with producers through visit of the cooperative members to soybean fields as consumers and experiencing to grow soybeans together with producers. It is an effort special to cooperatives of such vigorous cooperative members' activities and deep exchanges between producers and consumers that is a substantive factor for FSP's growth.

Furthermore, Uchiike Jozo Co., Ltd., a private manufacturer which is responsible for the sector of processing for the FSP, is also a food manufacturer with a certain size that represents Fukushima Prefecture, and has its corporate philosophies of contribution to the local region^{vi}. It is another characteristic of FSP to have a private manufacturer which emphasizes connection with this region.

However, amid expectations that local consumption of locally grown soybeans would take root in Fukushima and be further developed in the future, major earthquake and tsunami hit the east Japan including Fukushima on March 11, 2011. It led Fukushima Daiichi nuclear power plant to cause hydrogen explosion, and horrible nuclear disaster became a reality. How did the problem of radioactive contamination affect activities of FSP? And how did they overcome the damages? What the project has been like after the nuclear disaster is described as follows.

4. Fukushima Soybean Project after the Disaster

The Great East Japan Earthquake is said to be a complex disaster made up with earthquake, tsunami and radioactive contamination. At Uchiike Jozo which is responsible for manufacturing *miso* and soy sauce in the FSP, a manufacturing tank for soy sauce was partly destroyed by the earthquake, and a large amount of soy sauce in the making was spilled, as indicated in Photo 1. Even though these damages of production facilities were not small, most of them were restored in about half a year. For tsunami damages, soybean fields in the coastal region were submerged by tsunami and harmed by salt, but the damages were partial. As is well known, it is radioactive contamination caused by the nuclear power plant accident that brought about major damages over large areas as well as a lengthy period.

The below is to look at difficulties and challenges of FSP after the nuclear disaster. To jump to the conclusion, the radioactive contamination inevitably damaged the FSP and its local food system, too; yet, the system has shown noticeable resilience. After the incidence, two issues were initially con-



Photo 1. Factory of Uchiike Jozo Just After the Disaster (March 11, 2011)

Source : Provided by Uchiike Jozo Co., Ltd.

^{vi} For detailed information on Uchiike Jozo Co., Ltd., see the website at : <http://www.uchiike.co.jp/>

cerned : (1) raw material shortages and (2) consumer anxieties. The second one was particularly concerned as a serious issue. It is because many consumers' cooperative members which are responsible for consumption are women, and mothers with children. Coop Fukushima has had coop members' activities related to the environment and food safety including the food mileage movement and campaign against the genetically modified organisms. The project's administration thought that it was no wonder that they must have shown strong concern and anxieties about the radioactive contamination issue, and even if there were a number of people who wanted to support local agriculture, not a few subscribers would withdraw from the FSP. But fortunately, there was little decrease in sales. That is, the subscribers to the project belonging to consumers' coops continued to purchase the items. Why did these subscribers keep buying the items, while reputations led local consumers shun even what were actually not contaminated by radiation in many other activities on buying local ? This is a focus of the section. In the meantime, it is raw material shortages that have posed a grave danger to them. There was a problem that soybean production drastically decreased in Fukushima Prefecture due to radioactive contamination, and the project failed to secure raw materials sufficient for processing. How did they overcome this problem ? This section looks to the details.

1) Raw Material Shortages

Soybeans require a flat land to grow, but most part of Fukushima Prefecture is occupied by mountain areas. Therefore, there are only very few soybean production areas in this prefecture. Before the disaster, the Fukushima soybean project bought soybeans from three areas in the prefecture : Souma area along the eastern coast, Fukushima area in the central basin and Aizu area in the western region. However, the radioactive contamination due to the nuclear power plant accident largely damaged the sites of agricultural production.

Unfortunately, soybeans relatively absorb radioactive materials easily. Over 50 Bq/kg of radioactive cesium, the safety limits for foods set by the government, were detected in some of the harvested soybeans in the prefecture in 2011. Then the production areas with which the FSP could buy soybeans were decreased only to Aizu area of the western region distant from the Fukushima Daiichi nuclear power plant.

Figure 5 shows the trends of soybeans procured (as raw materials) in volume. For two years between 2011 and 2012, the volume of raw soybean procurement dropped sharply due to the effects of radiation contamination. Fortunately, dry soybeans keep well, so they were able to use the raw material stocked before the disaster without running out of the raw material immediately from the year 2011 to 2012. Nevertheless, the stock would last about two years, and severe raw material shortages were supposed to be in sight after 2013.

The FSP sought to solve the procurement problem by contracting with agricultural cooperatives in new areas. Around that time, the Shirakawa area in the southern region of the prefecture was unable to cultivate rice due to severe damages on waterway from the earthquake. The agricultural cooperatives in the Shirakawa area gave an eye to soybeans as an alternative crop to rice, but starting soybean production anew would require not only cultivation techniques but also a large amount of investment in various machinery needed for production. It was difficult for them to afford the expenses only with subsidies and the own funds of agricultural cooperatives and producers. Who saved the situation was the disaster-affected agricultural cooperatives located in the coastal regions near the Fukushima Daiichi nuclear power plant. It is difficult to resume cultivation in the coastal regions due to severe radioactive contamination anytime soon. Thus, they offered agricultural cooperatives of Shirakawa area a lease of machin-

ery that could still be used in order not to waste. Thanks to this offer, Shirakawa farmers could start soybean production with a small initial investment. FSP could start a trade anew with the Shirakawa by contract. It enabled the project to purchase soybeans from Aizu and Shirakawa areas, and the project evaded from the risk of raw material shortages. It should be remembered that there was a collaboration on provision of machinery between disaster-affected agricultural cooperatives for that.

2) Consumer Anxieties

Look at Figure 5 again. As it exhibits the sales of soybean products, the sales surprisingly declined only marginally after the 2011 nuclear disaster. Here is another data to look at. Figure 6 shows the recent trends on the number of FSP subscribers. There is no sign of decrease in the number of the subscribers either. It indicates that many consumers' coop subscribers continued to buy the items of the FSP. What kept them buying the products while there were some others who were reluctant to buy? Three factors appeared to have played a role.

First, the FSP established a secure, adequate inspection system to satisfy consumers. The primary objective of the inspection system on radioactive materials is to prevent contaminated foods from entering into the market. It is also the most important act to gain the trust of consumers and clients. The inspection can be broadly classified into two : national and municipal government-stipulated mandatory testing, and voluntary testing. While structured mandatory testing systems are constructed for agricultural produces by the national and municipal governments, the mandatory testing is not sufficient for processed foods, and food manufacturers and distributors carry out voluntary testing. FSP conducts the testing at the stage of production, at the warehouse, and at the stage of processing, as shown in Figure 7. Only those soybeans and soy products that passed the three-fold testing would be shipped. Moreover, the FSP widely publicized their inspection system through a number of workshops and brochures.

Second, consumers' coop members have been spontaneously involved in activities to measure and confirm reality of radioactive contamination^{vii}. The scope of measurement has ranged from (1) farmland,

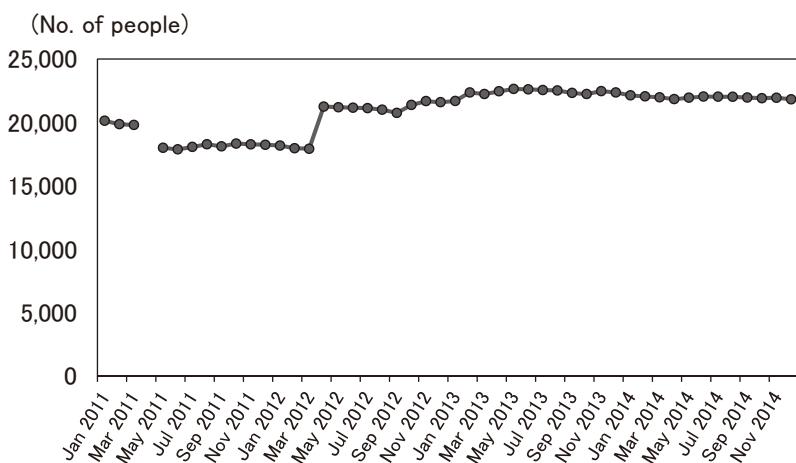


Figure 6. Number of members registered to the FSP
Source : Created from documents of the FSP

^{vii} Files summarizing activities on measurement of and learning about radioactive materials by consumers' coop groups can be downloaded from : <http://shokunou.net.fukushima-u.ac.jp/cooperation.html>



Figure 7. Inspection systems at FSP

Source : Created from documents by and interviews with FSP

(2) vegetables and fruits, (3) diets, to (4) human body – they have been doing their efforts to measure and verify the safety of every stage from the soil to the body. For (1), they went to measure radioactivity concentration of each piece of farmland in cooperation with agricultural and consumers' coops to create maps on distribution of radioactive materials under the name of the soil screening project. The consumers' coop members have volunteered to gather not only within the prefecture but also from nationwide to measure and support. The volunteers who participated from nationwide consumers' coops are expected to play a role of “preachers” to return home, speak on agriculture in Fukushima and contribute to dispelling reputational damages. With regard to (2), food radiation meters (Becquerel monitors) were installed at consumers' coops and stores in Fukushima Prefecture. They can feel greater peace of mind by measuring on their own, and the data is accumulated to supplement the public inspection. The radiation meters were donated by consumers' coops nationwide, indicating that a network of aid is spread across the country. Next, concerning (3), they measure a mix of the whole breakfast, lunch, dinner, dessert and drinks, respectively, with a blender as a testing sample, which is called a duplicate diet method. Moreover, regarding (4), they conduct activities to measure internal exposure of the bodies exposed actually that is called whole-body counter. By combining (3) and (4), they can grasp the state of internal exposure at the personal level in more detail. This is how they obtain more assured security through measuring the conditions of contamination by themselves at every stage from the soil to the dining table.

In addition to the rigorous inspection system and spontaneous learning activities of coop members that undoubtedly provided the FSP subscribers a sense of reassurance, the presence of the system and activities alone cannot account for their purchase behavior, and I believe that we must consider “trust” that was cultivated over time among FSP members as a crucial factor. Since its launch in 1998, the FSP has poured a considerable amount of efforts into the exchange of ideas, experiences and emotions among farmers, food manufacturers and consumers, rather than simply facilitating monetary transactions among them. As consumers, many members of consumers' coops took the trouble of visiting farmers' fields and manufacturers' factories, to learn their challenges and feel their passion. Producers also made efforts to improve the quality of their products to meet the expectations of FSP subscribers who supported them through eating. The FSP also regularly organized events such as “School of the Field” in which members of consumers' coops had opportunities to sow, harvest and make *miso* with their children. In 2007 when farmers suffered from an unusually chilly summer, the coop members supported farmers by actively buying irregularly-sized, bruised soybeans low in quality with the label of “ouen” (sup-

portive) *natto*".

Farmers, food manufacturers and consumers have fostered trusting relationship and social capital through such collaboration among cooperatives over the years, which continue to exist even after the nuclear disaster. Despite some obvious setbacks of the project by the disaster, the resilience of the local food system is worth highlighting. The resilience was observed in the system's response to the raw material shortages and to the consumer anxieties over radioactive contamination of food.

On the other hand, there are two future challenges. First is to resume activities of exchange between producers and consumers such as "School of the Field" even partially. The greatest characteristic of local food systems is close distances between producers and consumers in terms of geography as well as social relations. Although "School of the Field" in which parents and children can participate together is the most fascinating opportunity of exchanges, it has not been resumed yet out of consideration for children, which can be inevitable. However, even for reaffirming a future direction of the soybean project now, when marks the fifth year since the nuclear disaster, has the time come to conduct activities of exchange between producers and consumers vigorously, hasn't it?

The second challenge is to set a future direction of development of the project. As mentioned, the subscribers to the project were not reduced by the disaster. The sales plateaus at 200 million yen (US\$ 1,666,000). It is certainly surprising, but it would require them to discuss on a future direction of the project amid it marks the fifth year since the disaster. They should aim for both an expansion in volume and deepening in quality. For the expansion in volume, a growth of subscribers would be essential. Currently, the number of subscribers who continuously purchase the soy foods of the project is 22,000, which only accounts for 12% of 182,000 members of Coop Fukushima as a whole, and there is still a room for expansion. Meanwhile, it is important for the subscribers not merely to participate in the project as a one-sided consumer but to foster a sense of membership among every one of them that they are the members who are involved in solidarity of food and agriculture. For that purpose, positive laying out of plans of exchange and learning programs such as aforementioned "School of the Field" would be required. It might also be a good idea to consider to broaden the variety of goods. A diversity of agriculture including rice, fruits, vegetables, dairy and livestock is developed in Fukushima. The possibilities for local production and consumption are boundless. In fact, *konyaku* or konjac foods were added to a new line a few years ago. A direction of development as fostering local production and consumption on a number of items in the project can be anticipated, without being bound by the name of the Soybean Project.

5. Conclusions

Fukushima Prefecture is now about to enter the stage of far-sighted regional development or industrial development after undergoing the stage of restoration. What is called into question for Fukushima Prefecture, the nation's leading agricultural area, is how to strengthen connections with food industry and related sectors, on the axis of regeneration and development of agriculture. Certainly, local food systems in Fukushima were largely damaged by the nuclear disaster. Nevertheless, they did not collapse. Producers and consumers currently make efforts to regain their connections cooperating with each other. There are challenges in various locations that are region-wide, or in a collaboration among agriculture, industry and commerce. How should these efforts do to develop continuously without ending up with a temporal boom or event? Even for thinking about this, Fukushima soybean project, the focus in this paper, must provide many clues.

Lastly, I present a future direction of local food systems in Fukushima with recapitulating insights from analyses of the FSP.

The greatest characteristic of the FSP is a collaboration between the cooperatives. Agricultural cooperatives, as a producers' union, and consumers' cooperatives, as a consumers' union, joined hand in hand with each other to form a substantive organization through supplying soy foods, which enabled sharing of philosophies and continuous development. Meanwhile, the efforts would not have continued only with sharing of philosophies of cooperation. Another characteristic of the FSP is building a business model of support buying. Whereas supporting producers with the addition of a premium of 3,000 yen per 60 kg of raw soybeans, the consumers' coops secured over ten thousands of subscribers so as to supply as cheap as possible that brought about a large-scale and steady demand. Furthermore, a private food manufacturer valuing connections with its local region has also a prominent presence. To establish a business model of support buying with the use of the mechanism of cooperatives along with private companies – it can be said to lie in the heart of development of the FSP. Taking the opportunity of International Year of Co-operatives in 2012, cooperatives seek collaborations around Japan. However, many cases ended up with a collaboration at the stage of theory of movement, holding joint symposiums and sharing slogans and a sense of value. The case of the FSP indicates that although it is important to share thoughts, in order to widely bring and radicate them among coop members, a collaboration as a concrete business model is indispensable.

There are a number of cooperatives in Fukushima : not only agricultural cooperatives and consumers' coops, but also fisheries cooperatives, forestry cooperatives and so on. It is important to promote further collaboration between cooperatives. There are many other local food manufacturers which have corporate philosophies of contribution to regional development. It is not only manufacturers. It is important to broaden a network of collaboration to supermarkets, restaurants, even hospitals, schools, etc. which deal with a large volume of local foods (Figure 1). What is difficult is a business model of win-win relationship between each actor. For this, mechanisms of fair trade that are seen in cases of international commodities such as coffee and banana would be helpful. There are attempts like Tsujimura (2013) to explore a business model of support buying by introducing frameworks of fair trade to domestic trade within Japan. There are more and more studies on continuous contract deals for agricultural produces and foods. There is a call for not only practice on the site, but also contribution of us researchers.

There are a lot to learn from challenges of Fukushima Soybean Project that confronts the nuclear disaster : collaboration between the disaster-affected agricultural cooperatives seen at the stage of production in the raw material shortage problem confronted after the disaster ; and relations of trust or social capital that prevented pullbacks in consumer purchase that were concerned the most — these facts boldly show that local food systems in Fukushima can be regenerated by that people care for and connect with each other.

Lastly, I would like to mention academic contributions of this paper and list future research issues. Local food systems, which have drawn attention from the Western and East Asian countries including Japan, came into existence out of countermoves against the problems caused by globalization that “gradually erode regional society”. The FSP was established for just that purpose in the late 90s, and developed later on, but this paper found out from the reality of the situation after the earthquake and nuclear disaster that local food systems exert an effect even on “rapid and intense exogenous shock” including huge disasters. By focusing on local food systems as a mechanism that has “resilience” to various “crises” such as natural disaster and economic crisis, the theory of local food systems could integrate with

the study of “resilience”, and brighten the new theoretical prospects. It remains a future important research issue to be deepened from now.

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J : written in Japanese

JE : written in Japanese with an English abstract