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The function of facilitator in risk/chance management: action research in the stricken area of the Great East Japan Earthquake

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Abstract

The purpose of this study is to examine the function of the facilitator in extracting and coordinating the needs-seeds of both victims of the Great East Japan Earthquake and their supporters. The subject-matter of the research is a group of strawberry farmers of Watari-town who are victims of the earthquake. The town is situated in the damaged stricken area of that disaster. The author has been conducting participant observation and action research between April, 2011, and May, 2013, to promote the interaction of the needs-seeds with victims and supporters. The main needs of strawberry farmers were recovering the harvest to its former level, obtaining the alternative delivery channel, and letting many people know about the real condition of the stricken area. According to the needs and seeds of farmers, a Consumers' Co-operative Union Club has become a core supporter. A "Strawberry-stock model" has been suggested in which victims and supporters participate together; this model was put into practical use in October 2012. This case study describes how a researcher became a facilitator of contributing to "the better state" in a disaster-stricken area.

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Keywords: The Great East Japan Earthquake; victims; supporters; strawberry farmers; needs and seeds; participant observation; action research

1. Introduction: background and purpose of study

On 11 March 2011, a magnitude 9.0 undersea megathrust earthquake off the coast of Japan occurred with the epicenter approximately 70 km east of the Oshika Peninsula of Tohoku and the hypocenter at an underwater depth of

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approximately 30 km; this event is known as the Great East Japan Earthquake. An upthrust of 6 to 8 meters along a 180-km wide seabed at 60 km offshore from the east coast of Tohoku resulted in a major tsunami that brought destruction along the Pacific coastline of Japan's northern islands.

This disaster caused extensive damage to the agriculture in the Tohoku region. The Miyagi Prefecture was especially devastated by the massive tsunami that flooded 10% of its cultivated acreage. Large areas of farmland in the Sendai Plain, Japan, were inundated by tsunami and covered by a discontinuous sediment layer with a thickness ranging from 0.2 cm at some places and 30 cm at others. The layer consists of sand and mud and is generally thinning and fining toward the inland. After the tsunami, numerous fields and depressions remained ponded with brackish or saline water. Furthermore, rural communities themselves were as much damaged as was the land, and have yet to recover adequately.

Watari-town is located in the coastal place of Miyagi prefecture. Agriculture was one of its main industries; before the earthquake, 47.5% of its land was used for agricultural purposes. In particular, a large number of strawberries was cultivated, and the number of strawberry deliveries from Watari-town was the largest in the Tohoku district. The seismic intensity of the by 2011 Tohoku Earthquake, which was recorded in that town was a little less than six. Furthermore, 47% of areas of the town were flooded by the massive tsunami, and 95% of the vinyl greenhouses used for strawberries was swept away by the tsunami.

Many studies have been accomplished from various fields about the Great East Japan Earthquake. Focusing on agriculture, there are studies from the marco perspective about the damage and/or the challenge for recovering the farmland^{1, 2}, studies on the influence of the tsunami and the salt damage on the agriculture^{3, 4, 5}, studies on the reconstruction of agricultural facilities and farming^{6, 7} and so on.

There are many significant studies taking the perspective from outside of the disaster-stricken area. By contrast, the research reported here persisted in taking the position of within that area. The author got inside of a stricken area and committed herself to the problem that should be settled and collaborated about with victims, i.e., this was achieved by conducting action research in Watari-town. This study aims to clarify the potentiality of a facilitator to extract the needs-seeds of the disaster victims and the needs-seeds of the supporters, and to coordinate the strawberry-farming support of Watari-town in Miyagi Prefecture. The Needs mean the concrete demand and requirements of individuals, organizations, and communities. It is necessary to satisfy the needs to realize their better state. The seeds are techniques, abilities, talented persons, facilities and conditions that are necessary in promoting development and innovation. Both, needs and seeds, are required to find new methods for a solution. There are significant needs somewhere in the society. And there are significant seeds somewhere in the society. If they are not identified and matched, the innovation will not be born, therefore, it is required to match and coordinate them both.

2. Method

2.1. Significance of action research

The author carried out this study using participant observation and action research. The significance of action research is discussed below.

The problem of what researchers who deals with people and their society should do when they face a large number of victims and in huge damage-stricken areas. Would such researchers as intruders from an outside world who encounter victims who need immediate helps, be able to record something that is useful for a disaster in another place in the future? Here, an unavoidable soliloquy must occur, which the researcher should think about in the disaster study. As one of the possibilities to tackle the problem, the long-term action research in the target area that is based on the one-community formed by victims and outsiders would become significant^{8, 9}. It is enabled by accumulation of cooperative work between researchers and the victims who aimed at restoration, the revival of life.

It is enabled by building one community and collaboration between researchers and victims who aimed to generalize “the better state” of something. In many cases, action research - the cooperative practice is not completed by the one-shot activity (e.g., the experiment in the laboratory and the interview to the person concerned); it rather becomes an activity over a longer period of time.

2.2. Framework of research

The author entered into the local area of the field study as researcher on 16th April, 2011, and formed rapport with the victims by repeated communication and promoted research. A substantial part of the methodology was based on Hosaka¹⁰ concerning action research and Atsumi¹¹ concerning participant observation. The flow of the concrete study is shown in Fig. 1.

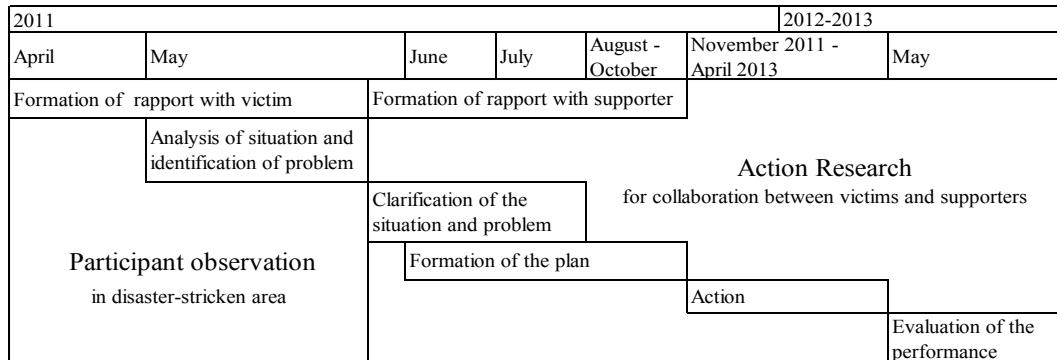


Fig. 1. Flow of the research.

The main data have been obtained from field work including the interviews of stakeholders. The main interviewees were as follows. Victims: nineteen strawberry-farmers including the former and current presidents of the Watari (Yoshida) Strawberry Union. Supporters: five members of the Club Consumers' Co-operative Union including the executive director of the Seikatsu-Club Tokyo. The conversation was recorded after having taken the permission beforehand and analyzed.

The field work was conducted approximately 24 months from 16th April, 2011 to 31st May, 2013. The progress of the action was observed and the outcome was evaluated afterwards.

3. Results and discussions (1) Participant observation

Based on participant observation, an analysis of the situation and identification of the problem have been carried out.

Watari-town is located in the Pacific coast of South Miyagi, the river mouth of Abukuma River. It consists of four areas- Arahama, Okuma, Watari and Yoshida with an area of 73.21 square kilometers. The fruit cultivation and floriculture flourished in the relatively warm climate of the Tohoku district. Strawberries in particular were a special product. There were about 250 strawberry farmhouse families. Watari's harvest yield in 2010 was the highest in the Tohoku district; the amount was 2,210 tons (2,047,900,000 yen)¹².

The influence by the Great East Japan Earthquake has been as follows. In Watari-town, 47% of areas of the town were flooded by the tsunami, and the village of the coast including the Arahama, Ohata Beach, Yoshidahama, Nagatoro Beach suffered crushing damage. The dead persons and the missing persons of the townsmen caused by this earthquake were 305 people in total. In addition, among the houses more than 5,600 were collapsed completely or partially. The industrial total damage amounted to more than 335,300 million yen. By the tsunami disaster, 232 strawberry farmhouse families lost their own dwelling-houses and/or strawberry greenhouses. More than 95% of the vinyl greenhouses for strawberry cultivation were lost in Watari-town.

The general problem of the strawberry farmhouses was the rebuilding of the strawberry production. The author interviewed strawberry farmers about their situation and concerns. The interview transcripts have been categorized using KJ method (Table 1). The interviewees and interview periods were as follows: one farmer (in his 60s, the former president of Watari-Yoshida strawberry union) at the coast of Yosidahama (30 minutes on 16th April, 2011),

five farmers (in their 30s and 40s, young successors) at a restaurant in Okuma (for two hours on 10th May 2011), two farmers (in their 50s) at their house and farmland in Nagatoro (for one hour on 23rd May 2011), one famer (in their 30s, young successors) at their house in Nagatoro (for one hour on 23rd May 2011).

Table 1. Categories and content of interviews with victims.

category	content of interview
disaster-damage	<ul style="list-style-type: none"> - I lost my dwelling-house and strawberry-greenhouses. - The earthquake caused the subsidence at coastal places. - All the drainage facilities for agriculture have failed. - Tsunami caused serious salt-damage.
characteristic of the strawberry cultivation in Watari-town	<ul style="list-style-type: none"> - A coastal place is a sandy area, which is suitable for strawberry cultivation. - Strawberry grown in Watari-town is sweet and delicious. The original strawberry kind "Mouikko" is famous. - The strawberry farming in Watari-town was highly profitable. Even a full-time farmer could make a living, therefore children stayed in this area to be successors.
difficulty of revival	<ul style="list-style-type: none"> - The coastal place will be limited for land use by regulation. It will be difficult to rebuild on the original land. - I can hardly recover as individual. I need public support. - The drainage facilities are broken, and reduction in the salt damage is not in sight. - Because of the salt damage, the soil cultivation is not possible anymore. - The prospect of securing funds is not in sight.
concerns over the future	<ul style="list-style-type: none"> - As for the person who lost both the dwelling house and the greenhouse, making strawberry is impossible this year. - The young farmers change the jobs and/or moved out of town for making a living. - An elderly strawberry farming family does not have the will to rebuild a field and getting into new debt. - The young successors have problems of their own living and family support. They hesitate to assume a big debt. - As long as the current situation continues, the strawberry industry of Watari will decline. - It entails a vast cost for the rebuilding of the greenhouse. In addition, the plant cultivation has a small yield. I cannot make a living when I sell strawberries at the same price as before.
possibility of revival	<ul style="list-style-type: none"> - There are some farmers whose damage is relatively small. They can be the initiators of reviving the strawberry cultivation in Watari-town. - I have no choice but to try my best. - If we adopt the methods of plant cultivation, it will be possible to cultivate strawberries without being affected by salt damage. In that case, however, the yield decreases to one-third of the soil cultivation. - Strawberry seedlings are left. I suppose that I can harvest strawberries for Christmas if I can rebuild the strawberry greenhouse by August (2011). I think that I can harvest it surely in April (2012).
demands	<ul style="list-style-type: none"> - I want JA (Japan Agricultural Cooperatives), town, prefecture and nation to help with funding. - I'd like to grasp the figure of the salinity not only of my farmland but also of the entire town. - I'd like to let many people know about the real condition of the stricken area, and to support us. - I'd like to reclaim the different distribution channels and to sell strawberries at a price as high as possible. - I want the strawberry industry of Watari-town to succeed in the next generation.

The interviews focused on six factors related to the situation of the interviewees. The first factor was disaster-damage. The big tsunami had crushed most of the farmland, vinyl greenhouses, agricultural equipment and dwelling houses.

The second factor was the characteristic of the strawberry cultivation in Watari-town. The high quality and profitability of the strawberry farming were talked about.

The third factor was the difficulties of rebuilding. The main factors that made the rebuilding efforts difficult were financial problems and salt-damage problems. Strawberries are crops which are vulnerable to salt.

The fourth factor was the uneasiness about the future. This included concern about the delay in restoring agriculture and anxieties that young successors would leave the town in order to obtain new jobs. Indeed it began to become apparent that young people got new jobs and/or moved to other areas. Furthermore, 70% of farmers of Watari-town were 55 - 60 years old at that time¹³. So it was no wonder that quite a number of them give up farming if it would take more than five years before the recovery of the agriculture.

The fifth is about the possibilities of rebuilding (positive elements). It was pointed out there were seedling left as well as the methods of plant cultivation. Besides, there were even a few farmers who could begin cultivation somehow that year. The motivation was shown that they could only do their best, and were willing to cultivate strawberries again.

The sixth category is about demands. The introduction of public funds, support from the outside of the stricken area, and new distribution channels were demanded. Furthermore, they hoped to succeed in continuing the strawberry industry of Watari-town in the next generation.

4. Results and discussions (2) Action research

4.1. Clarification of the situation and the problem

Based on the identified problems, this study was carried out by focusing on the probability of revival and demand. The aim was to generalize a model of a new structure involving outside supporters who collaborate with farmers who could start the rebuilding effort. This model must be really founded in practice, and it is important that farmers and supporters are concerned with process itself to create the model. Forming and implementing such kind of structure is expected to prevent a blank period of inactivity in strawberry farming in Watari-town.

The author extracted and coordinated the needs and the seeds which are associated with supporters and farmers. The large frames of farmers' needs and seeds had been already obtained by participant observation and interviews. But it was expected that the supporters also had certain needs and seeds. Many people conducted volunteer activities after that disaster. In addition, people's consciousness of ethical-consumption increased in those days in Japan. The movement to purchase food produced in Tohoku in order to support victims was prospering. The company also conducted supporting activities to address their social responsibility^{14, 15, 16}.

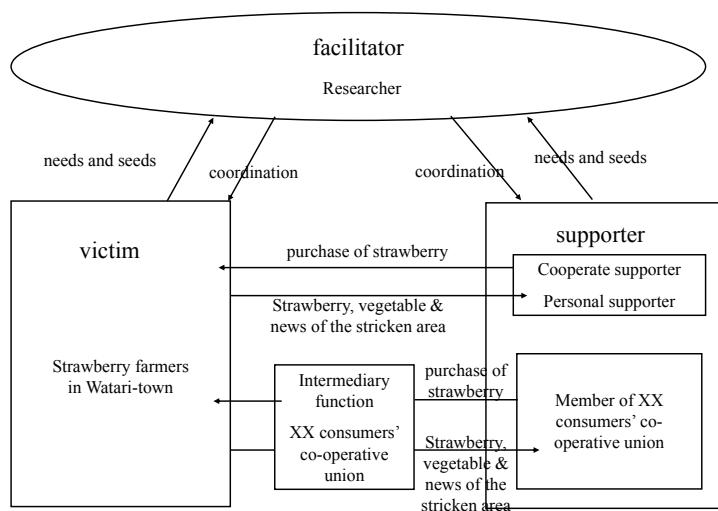


Fig. 2. Original version (ver.1) of collaborative model.

Based on the above situation and its problems, an original version of a collaborative model has been suggested that a strawberry farmhouse and “supporters” participated in (Fig. 2). Several potential supporters were considered who could join in this model; it was found that the Consumers’ Co-operative Union Club had needs and seeds to match this model.

4.2. Formation of the plan and action

On 7th June 2011, the author visited the headquarter office of the Seikatsu-Club Tokyo, Consumers’ Co-operative Union Club to ask to participate in the collaborative model as a supporter. The needs and seeds of strawberry farmers and the model of Version1 were shown and opinions were exchanged with two permanent directors of the Seikatsu-Club Tokyo. The author asked the Consumers’ Co-operative Union Club for support and cooperation to identify the market and the club members who contributed funds.

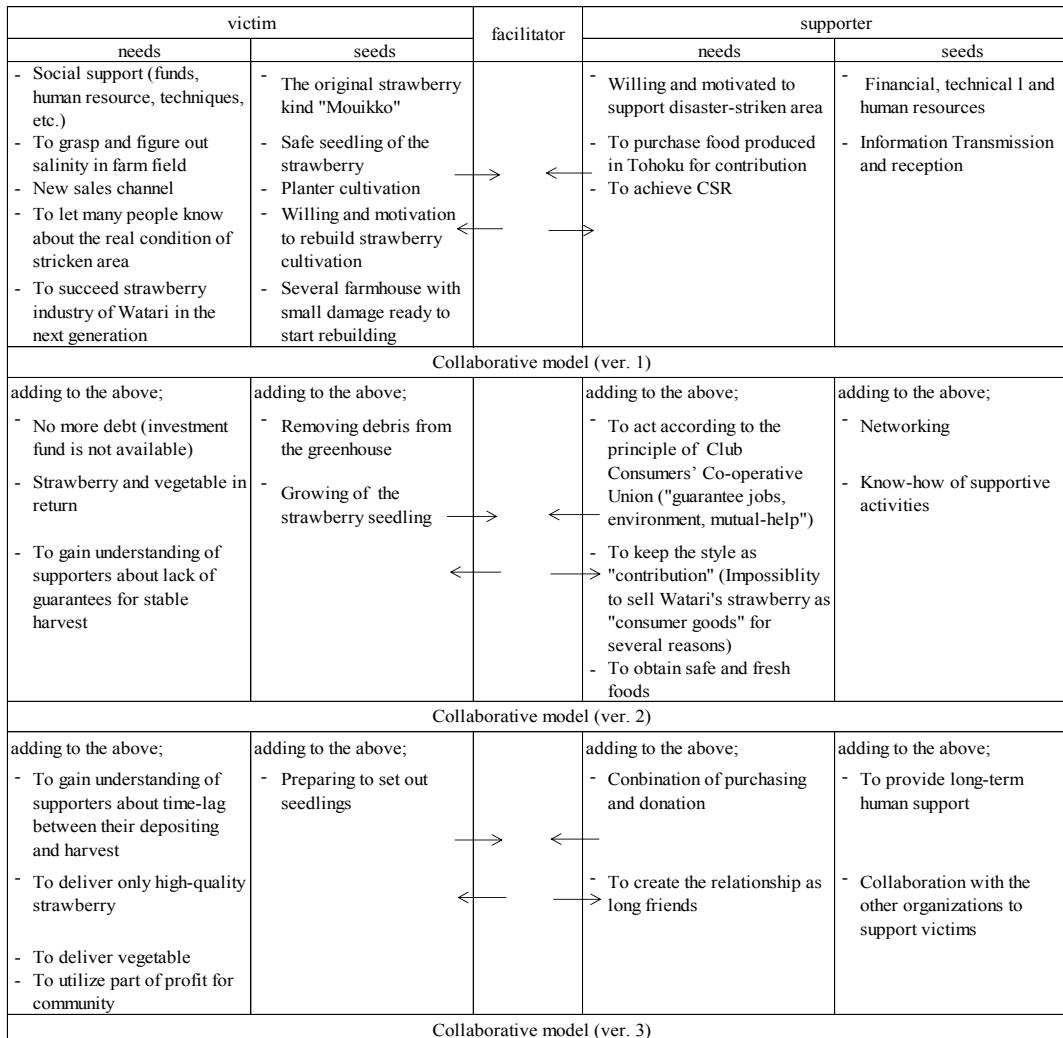


Fig. 3. The interactive process between victims, supporters and facilitator.

Through communication by meetings, telephone and emails, needs and seeds of the Consumers' Co-operative Union Club were extracted afterwards; they are shown in Fig. 3. In addition, by asking opinions about model version 1 in the strawberry farmhouse, new needs and seeds such as those given in Fig. 3 were extracted. They were put into the next version of the model.

On November 10, 2011, strawberry farmers, members of the Consumers' Co-operative Union Club and the author gathered in the stricken area of Nagatoro in Watari-town and exchanged each other's opinions based on the model Version 2. The farmhouse and the supporters met for the first time, this was the start of their collaboration.

Victims (strawberry farmer), supporters (Consumers' Co-operative Union Club) and the facilitator (researcher) collaborated to form a model that was more suitable and effective for both groups. The final version (Version 3) of the "Strawberry-stock model" was formed (Fig. 4). In this model, the supporters buy strawberry-stock (Ichigo-kabuken) with 3,000 yen. The farmers send strawberry and vegetables from a hometown for 2,000 yen to the person who bought the stock. The remaining amount of money (around 1,000 yen) is contributed to local promotion and support of the person who engages in strawberry agriculture newly.

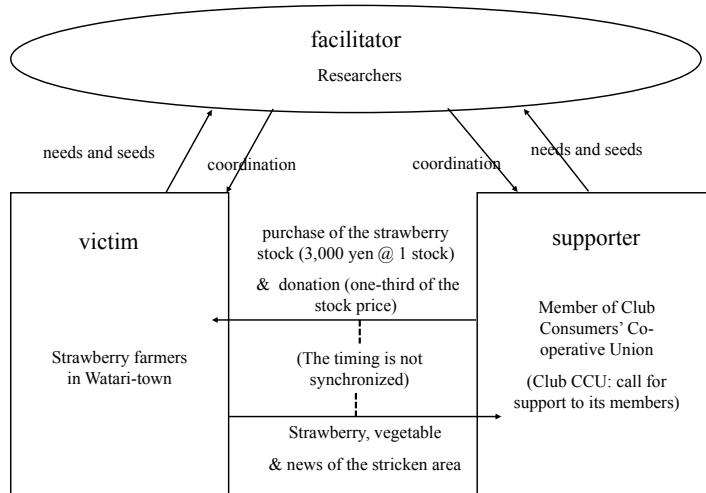


Fig. 4. Final version (ver.3) of the collaborative model—"Strawberry-stock model".

The following effects of this model were expected. For supporters: They can directly realize the effect of the support in the form of fresh and reliable farm products that are provided. They can understand the present conditions of the stricken area. For a consumers' cooperative: By the contribution to society that "stricken area support" is realized at the same time when the products come "direct from the field." The corporate value improves beyond the current state. For stricken area farmers: A part of the financial funds for the agricultural rebuilding is provided. They can find new consumers for their strawberries. They have many people who know the present conditions of the stricken area. They can prevent the blank period of inactivity for strawberry production of Watari-town.

This model was actually in use and referred to as "Torinoumi, symbiosis strawberry-stock activity". "Torinoumi" means the sea of birds, is a local famous place where this activity is mainly conducted.

4.3. Evaluation of the performance

The outcome and the impact of this action are as follows. The group of strawberry farming families of Watari published 3,562 shares of strawberry stock certificates in October, 2012. A consumers' cooperative appealed to members of an association to purchase stock certificates, and all purchased them. The income was 10,686,000 yen;

the surplus fund was 3,580,365 yen. The surplus fund of the "Torinoumi, symbiosis strawberry-stock activity" was used 1) to support activity equipment of the community production, to repair traditional cultural assets and assume its encouragement to live together, 2) to support "the agricultural training expense" of the person who sets to work in agriculture including starting newly in Watari and to support the creation of work places, 3) to support the current strawberry farmers who struggle for agriculture revival in the area around "Torinoumi" creating a spring of agriculture revival.

The support of the Consumers' Co-operative Union Club has been developing by including other agricultural products. A large greenhouses complex for strawberries with approximately 23ha and for seedlings with 7ha was built with a "revival grant" that has been made available by the nation (This was completed in September 2013). However, due to the high maintenance cost, it would not be easy for farmers to continue cultivation in the strawberry greenhouse complex. Furthermore, there are farmers who left strawberry farming. It therefore becomes a problem in Watari-town to create jobs for such farmers and local people. The Consumers' Co-operative Union has focused on tomato that is tolerable to salt, and has promoted the support of local people in cultivating tomatoes. They planted the seedlings in an area of 6ha and harvested tomatoes of 130t. With this tomato as raw materials, they manufacture ketchup and the juice of the local brand and sell it for the members of the Consumers' Co-operative Union Club, a consumers' cooperative.

5. Conclusions

This study has tried to clarify the potentiality of a facilitator to extract the needs-seeds of the disaster victims and the needs-seeds of the supporters, and to coordinate them with respect to strawberry farmhouse support of Watari-town in Miyagi Prefecture. This is one of the stricken areas of the Great East Japan Earthquake that occurred in March, 2011. The author has been conducting participant observation and action research from April, 2011 to promote the interaction of the needs-seeds with victims and supporters.

"The better state" that the strawberry farming family expected to achieve was included not only to restore their production to the former level but also to obtain alternative distribution channels, and to let many people know about the real condition of the stricken area. In addition, it was an important element not to accumulate debts if possible. According to the needs of the victims, consumers' cooperatives have become the most important supporters. "The strawberry stock certificate model" has suggested that a strawberry farmhouse and the Consumers' Co-operative Union Club participate in it, and a model was put into practical use in October, 2012. This new model addressed the need to create "the support that can be seen on the face" of the consumers' cooperative members.

This case study describes how a researcher became a facilitator in a stricken area and was able to contribute to putting into practical use a new model for revival. The model served as a platform for the qualitative and quantitative data that were obtained from a variety of stakeholders. While this process advances, promoting the agricultural and local overall activation becomes part of the needs of the victims. The collaboration with farmers who have experienced the recovery from other serious disaster-damage in Japan, such as the Niigata-Tyutsu Earthquake, and/or the supporters of foreign countries is a problem for the future. It becomes a long-standing on-site activity.

References

1. Fuyuki, K. Agricultural Recovery Efforts in Tsunami-Damaged Areas: A Case Study of Miyagi Prefecture (Papers Readatthe Autumn Conference Symposium, 2011, Academic Tasks for the Reconstruction of Local Economies and Societies after the Tohoku-Pacific Ocean Earthquake and the Fukushima Nuclear Accident), *History and Economics*, 2012; **54(3)**, p.16-23.
2. Mori, Y. Damage Situation and Recovery of Farmland and Farm Facilities: Support for the Creative Reconstruction in the Stricken Area of 2011 Tohoku Earthquake, *Research Strategy: Research Report of National Agriculture and Food Research Organization*, 2011; **12**, p.3-31.
3. Arai, Y. & Kobayashi, S. Salt Damage on Paddy Rice, *Agriculture and Horticulture*, 2011; **86(7)**, p.737-742.
4. Kiri, H. Evaluation of the Effect of Tsunami Energy Dissipation of Disaster-prevention Farmland, *Journal of Agrarian Engineering*, 2012; **213**, p.279-286.
5. Uto, K. & Kosugi, Y. Hyperspectral Manipulation for the Water Stress Evaluation of Plants, Contemporary Materials: Solid State Matter, Biomaterials, Nanomaterials, *Water*, 2012; **3(1)**, p.18-25.
6. Hatakeyama, T. Strengthening Extension Organizations by Various Cooperation: From Extension Activities for Rebuilding after the Great East Japan Earthquake, *Agricultural Extension Research*, 2012; **17(1)**, p.21-24.

7. Hidaka, K., Tamaki, K. &Koshijima, I. C6 Fundamental Study on Education Project for Implementing Collaborative Business among Agriculture, Commerce and Industry, *Proceeding of the 2011 Spring Conference, International Association of Project and Program Management*, 2011, p.196-205.
8. Funabashi, K. On “Research” and “Recovery-plan” of Disaster, *MERA Journal*, 2011; **4(2)**, p. 43-48.
9. Yamori, K. *Action research: Human Science to Practice*, Tokyo: Shinyosya; 2010.
10. Hosaka, Y. Action Research, Muto, T. ed., *Word Map of Qualitative Psychology*, Tokyo: Shinyosya; 2004, p.175-181.
11. Atsumi, T. *Knowledge of Volunteers*, Osaka: Osaka University Publication Society; 2001.
12. Kahoku Newspaper; 3rd October 2011.
13. Mori, H. *Bring Back Strawberry Field: Trace of the Revival from 3.11 Tohoku Disaster*, Tokyo: Ushioshuppansha; 2014.
14. Miyagi, Y. Increasing of Consciousness to Ethical Consumption after the Great East Japan Earthquake, *Life Design Report*, 2011; Autumn 2011, p.10.
15. NTT Resonant. *Investigation on Support for the Stricken Area and Change of the Values after the 3.11 Tohoku Earthquake*; 2011.
16. Komatsu, M. Security Investment fund to Support Earthquake Recovery in Tohoku, Special Symposium: Earthquake Disaster Reconstruction and Local Reproduction, 2012; **34(1)**, p.54-58.