

**PROCEEDINGS OF
2017 JAPAN-KOREA RURAL PLANNING SEMINAR**

Resilience and Sustainability of Rural Areas

Date: December 9, 2017

Venue: Kumamoto Prefectural Community Center Parea, Kumamoto, Japan

Edited by
Committee of International Affairs
Association of Rural Planning, Japan

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Edited by Committee of International Affairs, Association of Rural Planning, Japan

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ISBN 978-4-9907507-2-5 C3861

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Preface

Resilience and Sustainability of Rural Areas

Tomohiro Ichinose*

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There are many kinds of natural disaster in Japan due to its climate and geographical condition, namely earthquake, tsunami, flooding, typhoon, storm surge, landslide, avalanche, tornado, forest fire, eruption and so on. The Chuetsu earthquakes occurred in Niigata Prefecture on 23 October 2004 which mainly struck rural areas by shocks and landslides. Most of researchers and planners for rural area realized the difficulty of reconstruction in the situation of depopulation and aging status. The 2011 Tohoku earthquake and tsunami, and the accident of Fukushima Daiichi Power Plant damaged huge areas in the east part of Japan. Many municipalities affected by the tsunami and radiation lost their population by the disasters. Nobody can still return to most of three towns located close to the nuclear power plant, namely Namie, Futaba, and Okuma. Onagawa Town located in Miyagi Prefecture and few affected by radiation lost 37% of its population for four years because reconstruction in the rural areas took a long time and some people wanted to move from remote areas to more convenient ones. Most of the rural area had depopulation and aging problem before the 2011 disaster. It accelerated depopulation. In April 2016 two massive earthquakes caused in Kumamoto Prefecture and damaged rural areas again. 249 people died, and 8,674 buildings and houses were collapsed. Approximately 43 thousand people still live in temporally houses (statistics at the end of November 2017). On the other hand, Korea has less disaster compared with Japan. Despite the condition, there were some earthquakes in 2016 in Korea. Korea also faces depopulation and aging problem. Regarding not only disasters but also depopulation and aging, resilience and sustainability are one of the most important issues for rural areas in both of countries.

Japan-Korea Rural Planning Seminar has more than 15 years history. Every year we have the seminar in turns in Japan or Korea. After the earthquakes in Kumamoto the Committee of International Affairs, Association of Rural Planning, Japan decided the theme and location of the seminar through discussion with Korean association. Both presidents of the Japanese and Korean association will sign a memorandum of understanding during the seminar to keep exchange and collaboration. Also, we invite Chinese, Taiwanese, German and Austrian researchers as a guest. Kumamoto City, especially Institute of Policy Research, cooperates the seminar. Financial supports from Kumamoto City (convention grant), the Environment Research and Technology Development Fund (4-1505) of the Ministry of the Environment, Japan and Keio Research Institute at SFC are gratefully acknowledged.

Seminar Program

Morning session (10:00 to 12:00)

1. Opening

Prof. Tomohiro Ichinose, Keio University, Japan, Head of the Committee for International
Affair, Japanese Association of Rural Planning

Dr. Toshitaro Minomo, Director of Institute of Policy Research, Kumamoto City

2. Keynote presentation (40 minutes each, including discussions)

“Reconstruction of rural resilience and new direction of rural planning”

Prof. Satoshi Hoshino, Graduate School of Agriculture, Kyoto University, Japan, President
of Japanese Association of Rural Planning

“Disaster management status in rural areas of Korea and improvement plan”

Dr. Chang-su Lim, National Academy of Agricultural Science, RDA, Korea

3. General presentation (20 minutes each, including discussions)

“Resilience and sustainability of rural areas: A case study of the indigenous Laiji Village”

Prof. Shyh-Huei Hwang, Dean, Graduate School of Design, National Yunlin University of
Science and Technology, Taiwan

*“A brief introduction to the comprehensive planning of pastoral countryside in China: Taking
Suzhou as an example”*

Prof. WANG Lei, Soochow University

4. Poster session 1 (12:00 to 13:00)

Afternoon session (13:00 to 17:00)

1. General presentation (13:00 to 15:00) (20 minutes each, including discussions)

“The issue of restoration process of agricultural villages of the 2016 Kumamoto Earthquake”

Prof. Yu Shibata, Faculty of Environmental & Symbiotic Sciences, Kumamoto Prefectural
University, Japan

“The development of agricultural disaster assessment technology based on the image analysis”

Dr. Joon Gu Lee, Rural Research Institute Korean Rural Community and Cooperation,
Korea

“2011 Kii Peninsula Flood disaster with the viewpoint of rural municipal merger”

Prof. Kiyoko Kanki, Kyoto University, Japan

“Rural resources sustainability and water-food-energy nexus perspective”

Prof. Jin-Yong Choi, Seoul National University, Korea

“Planning in the Danube delta: Sfîștofca village in C. A. Rosetti municipality, Romania”

Dr. Meinhard Breiling, Coordinator, Vienna University of Technology, Austria

*“Aspects of social vulnerability as seen in three hamlets of northern Tōhoku and central
Kyūshū”*

Dr. Johannes Wilhelm, Associate Professor, Faculty of Policy Management, Keio
University, Japan

2. **Poster session 2 (15:30 to 16:00)**

3. **Comment session & closing (16:00 to 17:00)**

Coordinator

Prof. Eiji Yamaji, The University of Tokyo, Japan, Former president of Japanese Association of Rural Planning

Commentators

Prof. Jun-ichi Hirota, Faculty of Agriculture, Iwate University, Japan, Former president of Japanese Association of Rural Planning

Prof. Yoo-Jick Lee, Pusan National University, Korea, Senior Vice President of Korean Society of Rural Planning

Dr. Zhengxu Zhou, School of Architecture, Tsinghua University

Prof. Koji Itonaga, Nihon University

Wrap up & Closing

Prof. Eiji Yamaji, the University of Tokyo, Japan, Former president of Japanese Association of Rural Planning

Title and name of presenter for poster presentations

“Economic impact assessment from the potential introduction of Potato Spindle Tuber Viroid (PSTVd) in Korea”

Prof. Hong Sok (Brian) Kim, Seoul National University, Korea

“Town Organization, model, and case study”

Prof. Namsu Jung, Kongju National University, Korea

“The activation and sustainable development of Yunnan Traditional Rural Settlements”

Dr. Haifan Cheng, Kunming University of Science and Technology, China

“Movement of Japanese squirrel (Sciurus lis) in small forest patches: A case study of Morioka, Iwate Prefecture”

Mr. Takahiro Otake, Iwate University, Japan

“Contemporary trends of migration in rural Kumamoto: A case study from Aso district focused on local identity in migration context”

Ms. Antonia Miserka, Kumamoto University, Japan

“Application of UAV-mounted commercial multispectral sensor in a non-experimental rice farming practice”

Dr. Koji Harashina, Iwate University, Japan

“Actual condition of radioactive contamination in rural areas due to Fukushima nuclear power plant accident and decontamination limit: Through support research at Iitate village in Fukushima”

Prof. Koji Itonaga, Nihon University, Japan

“Land use change in 100 years and increased disaster risk: Flood Disaster in Joso city, on the Kinu River caused by Kanto-Tohoku heavy rainfall in September 2015”

Ms. Ikuko Imoto, Keio University, Japan

“Historical contexts of rural planning in Kumamoto Prefecture”

Dr. Kaoru Ichikawa, Institute of Policy Research, Kumamoto City, Japan

“Economic evaluation of Green Infrastructure at Higashiōmi city, Shiga prefecture”

Mr. Michiya Morisaki, Keio University, Japan

“A study of intention of migration based on the regional view assuming Nankai Mega-thrust Earthquakes: Focusing on the regional view about safety and resilience”

Dr. Ryohei Yamashita, Ishikawa Prefectural University, Japan

“Investigations on farmland and agricultural facilities damaged by the 2016 Kumamoto Earthquakes”

Dr. Mizuki Hira, Kagoshima University, Japan

“A Study on the Conditions and Disaster Responses of Schools in Iwaizumi Town During Typhoon 10 (2016)”

Dr. Yoshihiro Kikuchi, University of Hyogo, Japan

“Revival of Rural Traditional Event OYAMA- SANKEI (Holy Mountain Visit) of T Community Association”

Prof. Hiroyuki Fujisaki, Hirosaki University, Japan

“State and Improvement of Legal System of Rural Disaster in Korea”

Prof. Minh Baek, Kangwon National University, Korea

“Field Study and Development of a Water Harvesting System for Water Scarcity in Small Upland Farm”

Dr. Youngjin Kim, National Institute of Agricultural Sciences, RDA, Korea

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Reconstruction of Rural Resilience and New Direction of Rural Planning

Satoshi Hoshino*

1. Introduction

It was probably Great East Japan Earthquake (March 11, 2011) that triggered the diffusion of a rather new concept "resilience". To build up a disaster resilient nation, the National Resilience Plan was approved in the Cabinet meeting in June, 2014. This is a plan to strengthen the social infrastructure and the economic system against disasters at the national level. The local disaster prevention plan is a plan that focuses on making use of the soft power of the communities for disaster reduction at local level. Both plans at the different levels complimenting each other are expected to enhance resilience against the disasters. For these processes, resilience has become a popular term especially in the field of disaster prevention and reduction. The author would like to look back on changes in rural areas in Japan and to propose a new direction of rural planning based on the resilience concept.

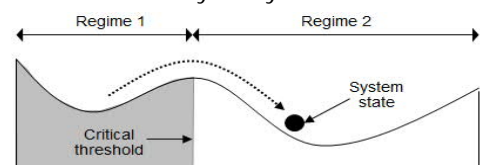
2. What is Resilience?

Originally the word "resilience" was a physical term, but used in psychology and ecology as a concept of "the strength to recover itself against an external shock flexibly" afterwards. It came to be used later in various fields such as disaster prevention, community development, global warming mitigation measures etc. Business companies also have interest in this word.

There are various definitions for "resilience" as it has been used in various fields. In the ecology, resilience is defined as "the ability of the system which deals with disturbance (flood, forest fire, human activities) without turning to a qualitatively-different state". In psychology, it is defined as "the resilient system has a function to cope with a stressful situation or adverse circumstances, to maintain mental health and to recover by oneself". Resilience for disaster and the hazard prevention means "the power to be able to come back to the state before the suffering without individual, family, company, organization or local community being broken". In this paper, we define Resilience simply as a concept indicating "the strength to recover itself flexibly from the state being damaged by an external shock".

Some fundamental characteristics of resilience are as follows.

- 1) Resilience is not a characteristic of a single element but a characteristic of a system in which individual elements are organically connected. In the field of ecology, resilience is treated as a characteristic of the ecosystem, whereas in the field of psychology, resilience is treated as a personal characteristic. In this paper, we would like to employ the characteristics of the system. This argument is similar to the case of "social capital" that can be dually recognized as a characteristic of a person or a characteristic of an organization, community or group.
- 2) Resilience is secured by multilayered structure. Ability of resilience should be built by every social dimension and section of multilayered structure of nation, organization, community and individual. As an important part of it, local community is demanded to improve its ability.
- 3) When the system is displaced beyond the critical threshold, regime shift may happen. Then it moves to a different regime and does not return to the previous one. This phenomenon is often observed in ecosystem. When a certain characteristics changes more than the threshold, the whole behavior of the system changes nonlinearly. "Different regimes can be metaphorically represented by a ball-and-cup diagram. The ball represents the current system and the valleys or cups



<http://www.reaimeshifts.org/what-is-a-reaime-shift>

Fig. 1. Regime shift

represent different regimes in which the system can function and be structured. A regime shift requires the ball moves from one cup or valley to another.”

3. Transformation of rural Japan

We are going to overview the trends of rural planning in the globalization process in Japan after tracing changes in rural areas. The postwar rural Japan drastically changed by the following factors.

- A) Accommodation of Surplus Population: The rural areas temporarily accepted a large number of people during the wartime and after the war and fed them under the food shortage.
- B) Delivery of Food: By the food control system, the farmers provided rice to the city inhabitants at a low price (the food control system was abolished in 1981).
- C) Depopulation and Aging: After retransfer of the surplus population to the urban areas was over, young generations continued to leave. The rural population decreased and aging was accelerated.
- D) Labor Supply: In the high economic growth period and later, the rural areas continued to provide diligent and excellent labor force to non-agriculture sectors.
- E) Land Supply: In response to the demand for urban land use, the rural areas provided land resource.
- F) Rurbanization: Not to mention the suburb areas, even in remote areas, the number of non-farmhouses increased rapidly in most agricultural settlements.
- G) Globalization: Globalization came up as a new keyword from the late 1980s. Internationalization started at 1950s in Japan. Import liberalization of agricultural products has been promoted since 1960s and the basic unit of internationalization was a sovereign state but globalization regards "the world" as an integral system, and a sovereign state is not necessarily premise of globalization.
- H) Distinction of municipalities: Japanese society entered the era of population decline after 2007. One book titled "Extinction of Local Municipalities" (CHUOKORON-SHINSHA, 2014) gave a shock to the nation. The author of this book advocated that about half of local governments (896 city and district municipalities) were classified as "city at risk of disappearing" because of decreasing population. Low birthrate and rapid aging came to be recognized among the people widely.

Table 1. The factors affecting the rural areas in Japan

Up to 1980s				In the 1990s and later		
1945~	1960~	1970~	1980~	1990~	2000~	2010~
A) Accommodation of Surplus population	C) Depopulation and Aging			H) Distinction of municipalities		
B) Delivery of Food						
	D) Labor Supply					
	E) Land Supply					
	F) Rurbanization					
	(Internationalization)			G) Globalization		

When looking up the whole picture, the rural areas have greatly been transformed by the above-mentioned factors, but the local systems in the rural areas were still alive. In other words the rural areas in Japan were resilient enough. The following reasons are assumed. Firstly, the stable land use systems fitted well to the natural ecosystem have been existing. The Japanese agriculture is characterized by paddy field agriculture and is the sustainable land use system which can endure the repeated cultivation over several thousand years. Secondly, the characteristics of the paddy field agriculture is the elaborate irrigation facilities. These facilities must be managed and maintained carefully by collective works of rural communities. For this reason, the community members have been tightly bonded by territorial connection. Thirdly, the support systems for rural areas and agriculture worked well. Local government (prefectural and municipal government) as well as central government, agricultural cooperatives, land improvement districts etc. have supported rural areas by means of both hardware and software.

Globalization began in the latter half of 1980s. After the collapse of Soviet Union in 1991, globalization spread through the world, and border control policies on finance and trade became weak. On the other hand, the Japanese economy entered into the period of economic stagnation called "Lost 20 years". The postwar period simply can be divided into two periods, "Up to the 1980s" and "The 1990s & later". The globalization began in the 1990s so they correspond to "Before" and "After" of the globalization respectively.

I overviewed topics in the field of rural planning and chose three keywords (key concepts) that represent the trend of rural planning after 1990. They are "Rural Revitalization", "Rural Sustainability" and "Resilience

Building”.

- 1) Rural Revitalization (1990-) is one of the keywords that represented to rural planning in 1990s. Because mobility of local resources for agriculture such as land and human resources is extremely low, it is rather difficult to take effective countermeasures against globalization. For the need that the rural areas should cope with these impacts by themselves, rural revitalization entered the stage as a new policy concept.
- 2) Rural Sustainability (2000-) is a concept derived from sustainable development in the report “Our Common Future” published by Brundtland Committee in 1987. Local communities depending on the natural resources are tracing the way to weakening more and more while the globalization of the market economy progresses. Since 2000s, rural sustainability drew attentions of the people in such discussion . Marginal community problem is one of the typical problems of rural sustainability.
- 3) Resilience Building (2010-) comes recently. We have experienced a number of disasters. Above all, the East Japan Great Earthquake disaster (2011) brought extremely serious damages into the extensively large area. How to recover from the earthquake damage became a crucial research question. In such situation, resilience came to attract attention. Local Resilience is a concept device to rebuild bond of solidarity and communication ability that are accumulated inside of the community area and to strengthen problem solving ability. Local Resilience has been discussed mainly in the context of recovery and reconstruction from the damages by hazard events (earthquake, typhoon, flood etc.). It is also desired that this concept device should be applied to the ordinary rural planning.

4. Rural Planning for Rural Resilience

Though various policy measures have been executed in the rural areas, the situations are not so improved. We can find some successful cases, but in general, rural problems are still there, population decline cannot be stopped yet and personal behaviors of rural people are gradually but absolutely changing by alternation of generations. Keeping the beautiful rural landscape was prides of the rural people. Indeed, the beautiful landscape has concealed the impending crisis of the rural areas. However, it is apparently lost in many rural areas in recent years. Disorder in the rural landscape suggests that “the continuation of the local system” almost reaches the limit. Thus, I mentioned that the basis of the local systems was still alive against globalization but it is doubtful whether this system will work in near future.

(1) Individualization and Risk Society

Since rapid economic growth, the rural communities have become heterogeneous by depopulation and urbanization. In addition, individualistic sense of values gradually has spread among the rural people. Family structure also has drastically changed. Average number of family members goes down and share of nuclear family increases even in the rural areas. Individualization and the risk socialization driven by globalization have been reaching to the rural areas with a delay in time. Unlike the simple modernization process such as urbanization and industrialization, they are not visible process and creeping up to the rural areas. We may fail to find out the essential changes in the rural areas. Individualization means that everything such as job selection, lifestyle, social relations or the consumption style can be a target of the personal choice without depending on existing criteria such as the norm and rules of the community, religious principles etc. Risk society is “a society increasingly preoccupied with the future (and also with safety), which generates the notion of risk” (by Anthony Giddens). In a risk society, risk is falling directly onto individuals passing through walls such as family, social organization, nation, stable occupation system etc. which support human life. Here is one example showing the fact that we already have been rolled up in the risk society. Fukushima nuclear plant accident happened in 2011. A Shiitake mushroom producer in Miyazaki Prefecture, more than 1,000 km far from Fukushima, thought “amount of Shiitake production in Fukushima would decrease” when he heard the news. However, the demand for shiitake quickly dropped nationwide, and the price also slumped as soon as the media reported that “Cesium is easy to accumulate in mushroom-kinds most.” The big consumers of the Shiitake are school meal services and they are quite sensitive to food security. They quickly stopped using shiitake as ingredient. Many Shiitake producers in Miyazaki had to close down their shiitake production.

(2) Regime Shift and Rural Planning

Fig. 2 consists of three ranges. The upper range shows the trends in rural planning. These keywords can be considered as concept devices for countermeasures of the rural areas to cope with globalization. However, in fact, there are not necessarily many successful cases against globalization. The middle range corresponds to the regime

shift same as Fig. 1. Here, the small circle indicates state of the local system. The arrows with dotted line show resilience vectors that make the local system move to the desirable or home position. The lower range shows frameworks of rural planning under the different regimes. The divergence of the local system from the home position becomes large by individualization and risk socialization in addition to depopulation. As a result, the divergence may exceed the critical threshold then local system enters a new regime. What we need to note is these shifts do not occur simultaneously. It may happen that some local systems already shifted to the new regime but others don't. Probably the both types coexist for a long time. Rural planning under the current regime, especially community planning greatly depends on the community-based autonomous organization. The local vision as a planned goal is set assuming existence of strong community. In the planning process, we greatly depend on the management functions of the community such as interest adjustment among the member households and consensus building in the community. In implementation process, we depend on the execution function of the community to mobilize necessary resources. Unit of community is a household but types of household have changed by depopulation and urbanization. Risk socialization and individualization have infiltrated into the community members. Social relations and network in the community are also affected as shown in the lower range of Fig. 2.

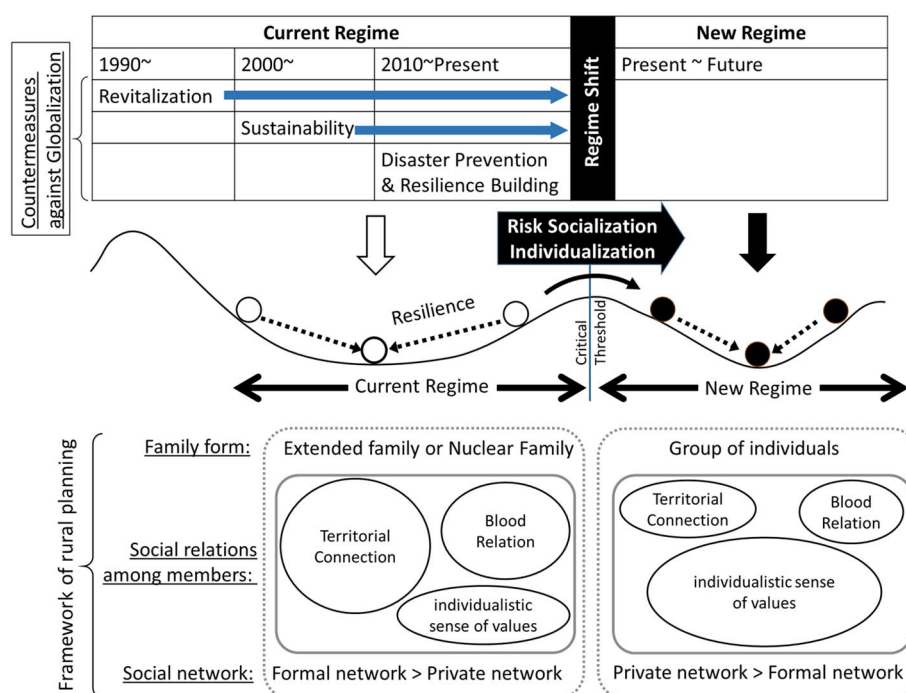


Fig. 2. Regime shift by globalization and a new framework of rural planning

5. Concluding Remarks

Though rural areas in Japan have been affected by various impacts, it is inferred that they had basically been resilient up to 1980s. The major keywords in rural planning (revitalization, sustainability and resilience) can be concept devices as countermeasures for the rural areas to take against globalization. However, the rural areas necessarily have not been successful to overcome the influence of the globalization. It is inferred that regime shift is happening in some rural areas by globalization. The current planning system is not functioned well under the new regime, hence, it is demanded to establish a new rural planning under the new regime.

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Disaster Management Status in Rural Areas of Korea and Improvement Plan

Chang -su LIM* ,Seung-Chul LEE* ,Eun-Ja KIM* ,MI-Jung PARK* ,Ki-Sung KIM**

1. Background and Purpose

There is a need for a systematic national-level response to the global trend of concentrated natural disasters, enlarging disaster size, and complex of various disasters. Although disasters in rural areas, which occur every year, mostly cause damage to humans and property, the preparation for this and support system are lacking. Rural areas have poor infrastructure for damage reduction when disasters occur, and more vulnerable people, such as senior citizens and multicultural families. Therefore, there is a need for a disaster management system that reflects these characteristics of rural areas and development of related technologies. While the ratio of people vulnerable to disaster to the total population is 22~26% in seven special city/metropolitan cities of South Korea as of 2015, that of si/gun in rural areas is 33~47%, which is high. There is a need to examine the overall disaster management status in rural areas, analyze problems through investigation of the establishment status of facilities for disaster prevention and other disaster-related facilities and analysis of conditions by local governments, and finally suggest an improvement plan. Therefore, the purpose of this study is to examine the overall disaster prevention environment in rural areas, find problems through condition analysis, suggest an improvement plan, and thus provide the baseline data needed for the establishment of a disaster response policy in rural areas in the future.

2. Methods and Scope

Scopes of rural area are ‘Eup/Myeon’ areas. Among other areas, the areas which the Minister of Agriculture, Food and Rural Affairs has notified considering agriculture, agriculture-related industry, agricultural population and living conditions (Framework Act on Agriculture and Fisheries, Rural Community, and Food Industry, Article 3) In rural areas that have been severely damaged, storm and flood damage, which has most affected the reasons for hot-spot damage, is considered the disaster scope. Figure1 is methods of study that disaster management status in Korea’s rural areas and improvement plan.

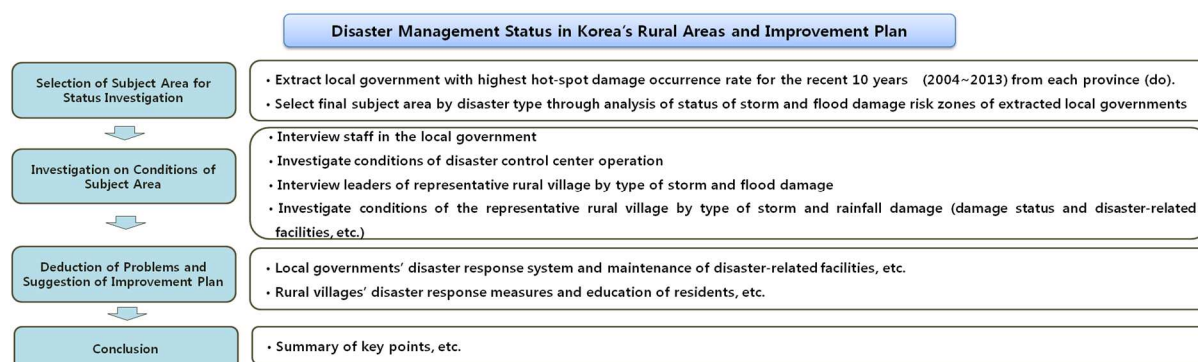


Figure 1. Disaster Management Status in Korea’s Rural Areas and Improvement Plan

3. Results

The areas with highest occurrence rate and damage amount were selected based on the occurrence rate of hot-spot damage by ‘Si/Gun’ for the recent 10 years (2004~2013) in the Annual Report on Disasters (2013, Ministry of Public Safety and Security)(Table 1)

A comprehensive plan for the reduction of storm and flood damage of extracted local governments was obtained and the number of places by type of storm and flood damage risk zones, which were investigated and analyzed in the report, was identified. The region with the highest number was selected.

*National Academy of Agricultural Science, RDA, **Kangwon National University.

For rural areas, a legal 'ri', where the relevant disaster has occurred the most, was selected from the selected local governments (Table 2)

Table 1. Local government by province with highest occurrence rate and damage amount of hot-spot damage

Classification	Si/gun	Number of occurrences	Damage Amount (KRW 1,000)	Average Damage Amount (KRW 1,000)
Gyeonggi-do	YP-gun	7	32,148,525	4,592,646
Gangwon-do	S-si	8	39,156,688	4,894,586
Chungcheongbuk-do	G-gun	6	55,773,723	9,295,621
Chungcheongnam-do	SC-gun	10	46,837,444	4,683,744
Jeollabuk-do	WJ-gun	9	58,690,919	5,521,213
Jeollanam-do	W-gun	9	111,308,332	12,367,592
Gyeongsangbuk-do	YD-gun	6	27,965,824	4,660,971
Gyeongsangnam-do	H-gun	7	68,531,884	9,790,269

Table 2. Number of places by type of storm and flood damage risk zones among selected local government

Disaster Type	H-gun	W-gun	YD-gun	WJ-gun	G-gun	SC-gun	YP-gun	S-si
River Disaster	68	43	65	115	344	41	72	243
Inland Flood Disaster	14	29	10	29	3	8	7	7
Slope Disaster	255	26	38	55	61	9	26	104
Sediment Disaster	29	17	101	34	55	13	8	195
Seashore Disaster	11	225	22	-	-	8	-	15
Wind Disaster	6	4	25	40	5	15	9	-
Other Disasters	12	12	-	28	16	8	2	-

It is through interview staff in the local government, investigate conditions of disaster control center operation, interview leader of representative rural village by type of storm and flood damage, investigate conditions of the representative rural village by type of storm and rainfall damage to derive investigation on conditions of subject area. (Table 3,4)

Table 3. Contents of interview questionnaire for person in charge of disaster in local governments

Classification		Contents
General Matters		Name of department, assigned task, years working in the department
Disaster Prevention Environment		History of major disasters, difficulty in organizing disaster response, disaster-related projects, topography and characteristics of disaster-vulnerable areas
Disaster-related Facilities	Disaster Prevention Facilities	The presence or absence of disaster prevention facilities in vulnerable areas, maintenance of disaster prevention facilities
	Temporary Residential Facility for Victims	Information on temporary residential facility status for designated victims, maintenance of temporary residential facility for victims
	Disaster Control Center	Use and status of disaster control center

Table 4. Investigation of status of disaster-related facilities in rural area and standard of judgment on facilities state

Judgment Classification (Grade)	Conditions	Methods	Likert scale
A	Currently no problem, but regular inspection is needed	Safety facilities	5
B	Good state with slight damage	Simple repair is needed	4
C	Mediocre state with damage in secondary members of frameworks	Prompt reinforcement or replacement of partial facilities is needed	3
D	Advanced deterioration in major members of frameworks or state of structural defect	Urgent repair, reinforcement and judging on use limit is needed	2
E	Advanced deterioration in major members of frameworks, sectional loss or state with safety risk	Prohibition on use and reconstruction are needed	1

It is through local governments' disaster response system and maintenance of disaster-related facilities, rural village's disaster response measures and education of residents to derive deduction of problems and suggestion of improvement plan. The following is deduction of problems and suggestion of improvement plan.

1) Establishment of disaster response department work system

ⓐ Problem : There is a need for improvement of the professionalism of officials who are responsible for disaster and disaster prevention. Some local governments need maintenance-carrying manpower and supplementation of disaster prevention policy.

ⓑ Improvement suggestion : Disaster prevention officials should be arranged by taking the special characteristics of disaster prevention work into consideration to maintain consistency in the plan and maintenance. There is a need for an organic work system between disaster-related facilities departments and control departments to identify the regular conditions of disaster prevention facilities in disaster-vulnerable areas.

- 2) Improvement of disaster damage reporting system reflecting regional characteristics
- ① Problem : When a disaster occurs, a damage status investigation should be reported within 7 days. Based on this, the subject of national subsidy is judged. However, it is difficult to report damage investigations for facilities in coastal areas or on islands within the designated period because even access to the damaged sites is difficult due to wind and waves.
 - ② Improvement suggestion : There is a need for the introduction of a new damage investigation system where special regional conditions and situations are considered.
- 3) Standardization of organization name for efficient disaster response
- ① Problem : Each local government has its own operational organization for disaster response. When related organizations conduct cooperative response activities, a unified organization name is needed for smooth communication.
 - ② Improvement suggestion : Each local government encourages the use of a common name for the disaster command and control system and standardized related common terms should be provided to unify functions and units of organizations.
- 4) Need for improvement of facilities in disaster control centers
- ① Problem : Although a disaster control center is usually used as an alarm post and disaster situation meeting room when a disaster occurs, some local governments have a poor environment where there is not even a screen meeting room. Disaster-related systems are poorly established and in some centers, even when a system has been established, it is not operated or is under maintenance. Improvement is needed.
 - ② Improvement suggestion : A checklist should be made for regular management of the responsible departments and maintenance is needed for the smooth operation of facilities. There is a need for the installation of basic disaster-related facilities and improvement of existing facilities for local governments' disaster control centers with support from the Ministry of Public Safety and Security
- 5) Introduction of new form of maintenance /management system for disaster-related facilities
- ① Problem : Deterioration is severe due to the absence of a task force for the maintenance of disaster-related facilities. Repair/reinforcements are needed. In the result of investigation of conditions, some facilities were maintained by specialized companies, while most of the facilities were neglected.
 - ② Improvement suggestion : Manpower should be supplemented in disaster prevention departments with a priority. And a maintenance plan should be established with the total inspection of disaster-related facilities. The active participation of relevant village residents or private organizations should be encouraged and a new form of maintenance system is needed.
- 6) Improvement of safety awareness through spread of village safety map
- ① Problem : As the status of disaster-related facilities and their locations are not shared by village residents, training and education for this are needed for villages that are vulnerable to direct damage from disasters.
 - ② Improvement suggestion : Rural villages should spread the creation of village safety maps in order for residents to recognize disaster risks and participate in autonomous disaster prevention. In addition, disaster risk factors should be reduced through administrative cooperative measures and maintenance of risk zones.
- 7) Cultivation of private organization and leaders in village through disaster training
- ① Problem : Disaster training is not only needed for experts and disaster-related working staff. Village leaders and residents need to improve their awareness of disasters because they can be the first reporters for disasters and damage occurrence in the process of establishment of a recovery plan.
 - ② Improvement suggestion : 'Si/gun' and local governments should manage to have private groups receive training by composing disaster training programs and assigning the mission to them. It is considered that there is a need for the cooperation of trained private organizations for damage investigation and response measures for the establishment of recovery plans by local governments.
- 8) Changes in designation of temporary residential facilities for victims and their management
- ① Problem : The temporary residential facilities designated for victims are mostly limited to schools, village halls and senior citizen centers. It was found that most of the temporary residential facilities for victims had low accessibility and low use, and the status of facilities was deteriorated.
 - ② Improvement suggestion : Newly established public facilities such as experience hall or multipurpose center created by zone project are induced to be used as temporary residential facility for victims. There is a need to designate temporary residential facility for victims in the place which is adequate for site situation considering

moving distance between villages in disaster-vulnerable zone and temporary residential facility for victims and has high accessibility, unlike existing designated facilities.

9) Inducement of participation of village residents and utilization of education programs for enhancement of disaster prevention awareness

⓪ Problem : Recently, residents in villages have been creating relationships among the residents and perform activities as well as physical improvement of the village environment. They also actively share in activities to resolve problems in the living environment. The participation of residents has an influence not only on the lives of residents in rural areas, but also on planning various development projects, establishment of purpose and direction, selection of alternatives, implementation of plan, and assessment of influence of project to maintain or improve social/economical/physical conditions. However, a connection of residents' participation in disaster response is lacking.

⓫ Improvement suggestion : The Ministry of Agriculture, Food and Rural Affairs introduced the Rural Field Forum, a community activity program where village residents excavate tangible and intangible resources in their village and establish a village development plan to make their village a better place to live in. There is a need to induce the participation of residents in making safe villages by adding various disaster preparedness programs to the forum. Out of five types of rural field forum activities currently ongoing (making a clean village field forum, village future design field forum, village business plan field forum, village's pending issue resolution forum, and community decoration field forum), a village development plan with residents participating that can prepare against various disasters can be grafted onto the village future design field forum.

In the results of identifying the disaster management status of rural areas in South Korea preparing for the trend of intensifying global natural disasters, some problems were found, and improvement and support for those problems are needed as follows.

- Establishment of work system of disaster response department
- Improvement of disaster damage reporting system reflecting regional characteristics
- Standardization of organization name for efficient disaster response
- Need for improvement of facilities in disaster control centers
- Introduction of new form of maintenance / management system for disaster-related facilities
- Improvement of safety awareness through spread of creation of village safety map
- Cultivation of private organizations and leaders in villages through disaster training
- Changes in designation of temporary residential facilities for victims and their management
- Inducement of participation of village residents and utilization of education programs for enhancement of disaster prevention awareness

Accordingly role division and cooperation by organizations with the characteristics of an agent who pushes forward the improvements taken into consideration are as Figure 2.

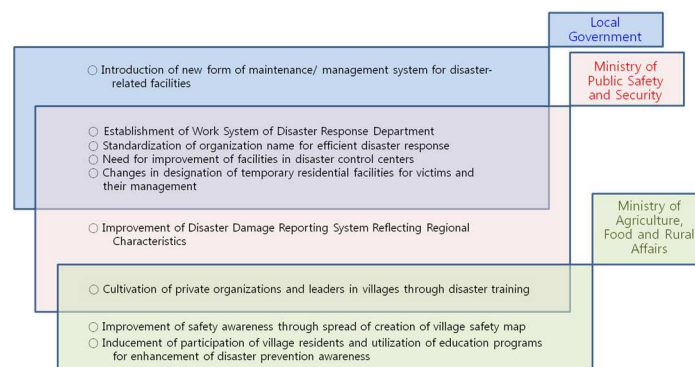


Figure 2. Role division and cooperation by organizations with the characteristics of an agent

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Resilience and Sustainability of Rural Areas

A Case Study of the Indigenous Laiji Village

Shyh-Huei HWANG*

1. Introduction to Laiji Village

Laiji Village is located in Alishan Township, Chiayi County, Taiwan. It is a relatively independent mountainous village, as it is far away from other villages. The inhabitants here are the Tsou indigenous. By clan relation and participating in the ritual of parent altar, they still maintain the tradition social structure. In earlier times, the residents had to walk for one and a half hour to arrive at Alishan Forest Railway so as to go to cities. The traffic was extremely inconvenient till roads were constructed to reach the village in the 1980s.

Laiji people made a living by hunting and farming in early times. Thanks to its beautiful scenery, Laiji had slightly developed its tourism. After the 921 Earthquake in 1999, the government and non-governmental organizations (NGOs) have introduced the concept of community innovation in order to recover the industry and drive the handicrafts of Laiji. Currently, there are approximately 350 residents living in Laiji, most of whom are engaged in planting tea, bamboo shoots, and beans. Recently, Laiji residents have planted more and more coffee, so their coffee gains recognition. In recent years, Laiji has vigorously promoted industrial transformation. With the efforts of the residents and the support of the government, handicrafts and homestay in the cultural industry become flourishing, pushing the development of eco-tourism. Visitors are welcomed with diversified cultural services like DIY (do it yourself) of handicrafts and agricultural products, as well as parties and dances.

When Laiji Village's traffic was inconvenient, priests would come to the village to preach and assist in improving their lives. Today, Laiji has a Christian church and a Catholic church. Some senior residents who are about 50-60 years old had received the support from churches to study when they were young. Hence, many tribal people are devout believers.

2. Severe Damage Caused by Windstorm Disaster, Relocation, and Post-disaster Reconstruction

On August 8, 2008, Typhoon Morakot hit Taiwan seriously. Laiji was also severely damaged. Some soil and houses had been swept away by debris flow. Additionally, due to road collapse, for nearly one month, the residents had to go out on foot to claim for supplies. In the face of post-disaster reconstruction, the government forced all the villagers to relocate for the reason of "The disaster area was unsafe".

But, nearly half of the residents gave up the permanent houses, as they are unwilling to leave their home. The following paragraphs describe the reasons why the villagers are unwilling to relocate.

2.1 Reasons of unwillingness to leave Laiji

2.1.1 Consideration of livelihood: As the places of relocation cannot provide farmland for them, it becomes a question of how to make a living. And they are also concerned about the increase in expenditure.

2.1.2 Impact by the traditional culture: The tradition of the Tsou people stresses unity rather than separation. If they relocate, they have to separate from their relatives and neighbors.

2.1.3 Living habits: Living in Laiji Village, They can grow vegetables outside their houses and have a fireplace in front of their houses. Enjoying chit chat during barbecue. Moreover, they are used to go to the churches in the village. They many not adapt to the climates in the new places. And they have to develop neighborhood relation and the circle of living anew. Affected by all these factors, they are unwilling to relocate.

2.1.4 Confidence in the natural environment

2.2 From self-help to help by others

2.2.1. From reconstruction on their own efforts to overcoming difficulties step by step.

2.2.2 Laiji with diversified development today

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- a. Efforts to develop sightseeing and craftsmanship.
- b. Laiji vigorously seeks for governmental resources to supplement its software and hardware
- c. Signs of youth return

3. Conclusion and Reflection

3.1. Conclusion: Disasters are inevitable. Laiji has suffered two severe natural disasters. However, most of the tribal people still choose to stay in Laiji where their ancestors had lived. Laiji's reconstruction after disasters demonstrate the resilience of Taiwanese which is described in detail below:

a. Never abandon homeland easily: Laiji's traditional culture includes many lessons from natural disasters. Their ecological resources are the outcomes of the nature and the wisdom of the tribe. Laiji people attach great importance to land ethics. Their familiarity and cherish of natural resources is closely related to their livelihood. Hence, despite disasters, they still choose to reconstruction rather than relocation.

b. Adaptability to the nature: The villagers are used to assume multiple posts and leverage on local materials. In the face of uncertainty of the environment, they still can be self-sufficient and help each other. Therefore, after the windstorm disaster, they take advantage of the resources in the mountain and reconstruct their village by mutual help.

c. Attention to unity: Their love for their hometown dwarfs the convince of experts and the government. The traditional custom of the Tsou people requests the tribal people to take care of each other. Relocation means that they have to separate, so they can no longer take care of each other. If they listen to the government, the tribal people can no longer stay together. Thus, they reject relocation and choose to reconstruct.

d. With devout religious beliefs, they believe that God has his own arrangement. They remain gratitude. The churches entered Laiji very early and provided much support to the village. After the windstorm disaster, even if the outside were unwilling to help the tribal people, the churches still provided funds, though not many, to them to help them stand up again.

e. Laiji people integrate old and new social and organizational structures and develop industry. Traditional systems like the clan chief are designated to maintain social stability. Churches aim to appease the soul. New organizations, like Community Development Association, help the tribe to develop the cultural industry. Leverage on tourism, the homestay industry provides services. They seek for new models to balance between cultural heritage and business benefits.

3.2 Reflection

a. Is relocation the only option? The government considers the safety of residents and the cost of disaster relief (from the point of view of management). Perhaps, the tribal people still face uncertainty caused by extreme climate. Nevertheless, mountains and forests are their home. If they relocate, they face many problems in terms of livelihood, living habits, changes in social organization, and loss traditional cultural value. And most importantly, a village with diversified culture will disappear from the map. For the long run, the cost of relocation may be high.

b. The Aboriginal people living in mountains (the aborigines) can also be guardians of mountains. Doesn't helping them learn how to pursue good fortune and avoid disaster have stronger positive significance than relocation? Residents living in mountains are most familiar with mountainous environment. For instance, Forestry Bureau employs Laiji villagers to patrol mountains because of their keen knowledge and experience of mountains. Therefore, from the viewpoint of maintenance of tribal cultural and natural environment rather than from the viewpoint of saving of management cost, the government shall help them learn the possibility of disasters, establish disaster prevention systems, protect forests, and improve the observation ability of natural environment by learning from the elderly. Relocation is by no means the only choice!

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A Brief Introduction to the Comprehensive Planning of Pastoral Countryside in China – Taking Suzhou as an example

Lei WANG*

1. Summary of pastoral and rural comprehensive planning

The Comprehensive Planning of Characteristic Pastoral Countryside (Pastoral Complex)—No. 1 Document of the Central Committee of the Communist Party of China (CPC) in 2017 proposed to build a number of characteristic villages and towns characterized by “Three in One” (integrated development of agriculture, culture and tourism), “Three Synchronization” (synchronized improvement of production, life and ecology), “Three Industry Convergence” (in-depth convergence of the primary, secondary and tertiary industries) around the well-grounded, characteristic and potential industries.

1.1 Policy orientations-Innovation development strategy to solve the “Three Rural Issues”

(1) Effectively improve the effect of financial support for agriculture.

In recent years, China’s strong support for beautiful countryside construction is carried out separately by different departments, reaching an adequate combined effect. An organic combination is made of the existing agricultural park construction project and the new rural construction project, and funds are collected together to promote the pastoral complex construction with village or town as a unit so that two kinds of policies have complementary advantages, which can yield twice the result with half the effort.

(2) A new format to solve the “Three Rural Issues” in an all-round way

The Comprehensive Planning of Characteristic Pastoral Countryside with rural areas as the carrier, farmers as the main body, and agriculture as the leading industry adheres to the in-depth convergence and development of the primary, secondary, and tertiary industries, carries out the pastoral complex construction, extends the industrial chain, expands the new functions of agricultural products, and enriches the new formats of rural development according to the line of thought that the primary industry lays a solid foundation, the secondary industry increases wealth, and the tertiary industry adds new formats, and moreover, bringing a lot of rural construction land back into active use and timely introducing new business entities and social capital to increase rural entrepreneurship income based on the development of the pastoral complex.

1.2 Planning principles

(1) Establish the bottom-line thinking of “protect grain security”.

The pastoral complex construction shall not be a simple tourism development or a disguised real estate development both of which deviate from the main line of agriculture, and must make an organic combination of grain production capacity construction and pastoral landscape beautification.

(2) Establish the bottom-line thinking of “protect the ultimate guarantee of farmers”.

The pastoral complex must regard farmers as the main body of construction and benefits, must not squeeze the farmers out of agriculture, rural areas and land in terms of the introduction of social capital into the pastoral complex construction, and should plan the benefit allocation mechanism according to local conditions, optimize the allocation of land resources, and allow the rural land to participate in the industrial development.

2. Implementation Mode

2.1 Focus on the integration of funds and projects

The funds of all departments are integrated, and social capital and bank capital are leveraged for centralized investment with county-level governments as the platform and special funds as the lever. The road of comprehensive treatment is taken for mountain, water, forest, field, road, and village. In the past, all administrative departments conducted disorderly development and multi-point project approval, which, on one hand, was easy to cause repeated project approval, and on the other hand, affected the department planning and reduced the overall effect.

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2.2 Give full play to the role of the market

Project management shall highlight the leading role of the project approval of new business entities, and regard the financial fund as the role of encouragement and subsidy to better enable the market to optimize the allocation of funds, and then actively support the characteristic economic development to take the road of differentiation.

3. Case Interpretation

According to the data of December 2016, there were 14253 villages in Suzhou, including 3358 reserved villages (key villages, featured villages) and 10895 ordinary villages. So far, the village planning of 1268 key villages and 295 featured villages has been completed. 100 beautiful village demonstration spots, 690 three-star comfortable housing villages, and 1065 agricultural leisure bases (spots) have been built. There are 51 modern agricultural parks, covering a total area of 75000 ha, and accounting for 33.9 percent of the total arable land.

Kaihsienkung Village is located in the southwest of Suzhou, near the Taihu Lake, and 47 km away from urban area in Suzhou¹⁾. The total area of the village is 4.5 km², the total number of householders 773, the population is 3005 including 2848 farmers. The total area of farmland is 197.7 ha, including 194.7 ha aquaculture farm and 3 ha mulberry field. Because of the book *Peasant Life In China: A Field Study Of Country Life In The Yangtze Valley* written by the rural social scholar Hsiao-T'Ung Fei, Kaihsienkung Village is often referred to as "Yangtze village"²⁾.

3.1 Village industry's characteristics:

(1) The primary industries are leading - Before 1980, rice cultivation, mulberry planting and other traditional agricultural production were leading industries of the rural industries in a sporadic layout.

(2) The primary and secondary industries are in parallel - Township enterprises of "South Jiangsu model" started and developed in the 1980s and 1990s.

(3) The secondary industries are leading - After the mid-1990s, silk enterprises declined, cocoon farming gradually disappeared, and agriculture began to scale. All the paddy fields were converted to the shrimp and crab farming industry.

(4) After 2000, primary and secondary industrial development stagnated, "South Jiangsu model" characterized by local government's super-intervention on the rural industrial layout faced transition, and the original function of the village returned to find a new path of development.

3.2 Environmental problems of life and production

(1) The power supply, water supply, external transport and other infrastructure construction of the village have been consistent in good evaluation by the villagers. But the overall infrastructure faces the aging of the facilities, and villagers put forward higher expectations on the livable environment.

(2) For the use of water resources, the current large-scale development of shrimp and crab farming industry in the village which is a certain risk of pollution for the river is urgent major industrial and environmental problems to be addressed for rural planning.

3.3 Planning contents

(1) Building a complete characteristic industrial system: fully explore the unique cultural heritage and reputation of Kaihsienkung village which is a window for researching Chinese villages; Balancing the functions of agricultural landscape and experience to promote the deep industry convergence of agriculture, tourism, scientific research, education, culture and recuperation; Guiding the transformation of rural industries, promoting the development of rural e-commerce & logistics service industry, and building a stable sixth industry system..

(2) Creating an ecological system: optimize the allocation of pastoral landscape resources, deeply exploring the ecological value of agriculture, cooperate with the overall protection & the comprehensive management on the village, water, farmland and forest in the neighborhood of Taihu Lake, adhere to the clean agricultural production, and effectively manage the unexpected problems of non-point source pollution of agricultural environment.

(3) Optimizing the rural planning and construction system. In accordance with the development path of farmland idyllization, industrial integration, urban and rural integration, the overall region shall balance its development, comprehensively improving the public facilities and other infrastructure such as rural education, medical services, and sewage treatment.

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The Issue of Restoration Process of Agricultural Villages of the 2016 Kumamoto Earthquake

Yu SHIBATA*

I. Introduction

Big and serious damages occurred in the very wide area by the Kumamoto earthquake, 2016. The damage concentrated areas are width of several kilometers and length of 60 kilometers along Futagawa and Hinagu fault zones. Most of those are agricultural areas and there are various situations of the damaged agricultural villages. The damaged areas show patchy patterns which are characteristic of this earthquake. So, it is necessary to reconstruct according to the characteristics of each agricultural villages.

In this paper, overview the damage states of agricultural villages and also we aim to clarify the detail of some village's restoration process and to propose some viewpoints toward reconstruction of agricultural villages

II. Characteristics of the 2016 Kumamoto earthquake

About the 2016 Kumamoto Earthquake, it is considered "unlike any other earthquake previously occurred" by Japan Meteorological Agency and earthquake experts. Started from a "foreshock" of magnitude (M) 6.5 quake on April 14 at night, followed by the even stronger M7.3 "Main shock" on early April 16 which occurred 28 hours after the foreshock. And it was followed by 2 times of maximum seismic intensity 6 upper and 3 times of 6 lower aftershocks, and reaching 4,288 times of seismic intensity of greater than 1 were observed by April 7, 2017. It exceeds the number of aftershocks previously occurred inland earthquakes.

Also the areas severely damaged by the earthquake was hit by a record-breaking rain from June 19, to June 21, 2016 which recorded hourly precipitation of rainfall more than 100mm and total amount of rainfall more than 300mm caused by stationary Baiu front. And it was followed by slope failures, landslides, and corruption of ridges between rice fields in agricultural areas in the mountain areas all over the areas which caused damage extension to the lesser damaged areas directly from the earthquake. It became exactly a situation called complex disaster.



Fig.1. The damages of fine wooden farmhouses.

III. Outline of damages in agricultural areas

The first thing noticed in the agricultural area is housing damages. Almost all of fine wooden farmhouses are all or partially destroyed regardless of their ages (Fig.1.). Regarding building damages, not only main houses but also barns are largely damaged (Fig.2.). Due barns are normally built more simple way than main houses, the percentages of all or partially damages are higher. Furthermore, from mini trucks and tractors to rice-planting machines, combine harvesters, dryers, washing machines for sweet potatoes, and all other agricultural equipment and tools are placed in those barns. The damages that those tools are broken or unable to take out from barns are also huge for the farmers.



Fig.2. The damages of barns.

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Also damages of residential lands and retaining walls are extensive as well as building damages. Many lands are covered by all or partially broken main houses or barns and it blocks roads in the villages (Fig.3.).

For other damages includes buildings of public halls, fire brigade’s warehouses, shrines and temples, small shrines, ossuaries, graveyards, agricultural lands, agricultural facilities like waterways. It can be said almost everything in the village are damaged. Especially many cases were seen like those collapsed public halls couldn’t be used as temporary evacuation shelters or even one fire engine couldn’t drive out from the fire brigade’s warehouses.

IV. Situations of restoration of damaged buildings after a year

Fig.4. shows the rate of restoration of damaged buildings after a year of some typical villages. Examining the proportions of the vacant lot and derelict, it is 51.8 at Tateno area, Minamiaso village, 70.7 at Shimo-Futa area, Nishihara village, 37.3 Kami-Futa area, Nishihara village, 67.9 at Sugido area, Mashiki Town. Shimo-Futa area and Sugido area, here were many vacant lots reflected the situations of building damage. On the other hand, the proportions of the no damage, rebuilt and repaired, it is 35.8 at Tateno, 21.2 at Shimo-Futa area, 56.5 Kami-Futa area, 23.5 at Sugido area. It means to widen gap in daily life of disaster victims.

V. Outline of the district community planning associations for Post-earthquake reconstruction

Half year after the earth quake occurred, post-earthquake reconstructions by district communities are also started to be discussed. Mainly for example, in Mashiki town 17 areas established district community planning associations, and in Nishihara village by 6 areas, in Minami Aso by 6 areas. Each have different names but they are established by its residents to discuss village reconstruction plans. Due different areas have different damage situations, the progress of discussion or themes are also varies. However the current common theme for discussion is widening roads.

VI. Case study in Kusijima area, Mashiki town

The district community planning associations for Post-earthquake reconstruction was also formed in Kusijima area, Mashiki town. The population of Kushijima is 194, which is made up of 62 households, and the percentage of the population over 65 is 40.7%.

Examining the proportions of the buildings completely destroyed, it is 23.0% for main buildings. The combined rate of total and partial destruction was 62.4, amounting to extensive damage. As compared to the situation of restoration of damaged buildings after a year, not only the total and half destruction but also the partial destruction buildings were demolished and removed.

From June 2017, the discussion was started about the view of post-earthquake reconstruction by the residents of Kushijima. The meeting of the district community planning associations were held once per 2 weeks. The widening of roads, the park improvement project and public housings were of strong interest to residents.

VII. Issue of restoration process of agricultural villages

It is not possible to rebuilt houses without widen roads in many areas, so it is certainly an important task. However the landscapes of the village as a result of widen roads or how to maintain community system in the village while the population is decreasing are not fully discussed yet. Therefore the challenges for the future is how we will support such discussions to use many knowledge and experiences of past seismic disasters.



Fig.3. The serious damages of retaining walls.

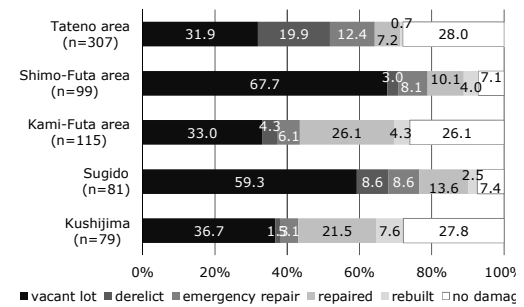


Fig.4. Restoration of damaged buildings after a year.



Fig.5. Atmosphere of Kushijima’s district community planning associations for Post-earthquake reconstruction

The Development of Agricultural Disaster Assessment Technology based on the Image Analysis

Lee, Joon-Gu*, Jang, Jung-Seok**, Park, Jong-Wha***, Yoo, Seong-Joon****

1. Introduction

The technologies that can reduce the damage of agriculture sector from meteorological disasters due to abnormal weather that is getting worse and worse over the world have been developed. It will be a somewhat vague idea of how the natural disaster mitigation technology and the image analysis technology are combined in the agricultural field, but after hearing the explanation of it, you will find that there is a myriad of applications. The purpose of this study was to develop the disaster assessment technology and its pilot application for agricultural infrastructures, rice as a main crop and apple & pear as main fruits. Reservoir collapse, downstream flooding, rice being flattened and fruit fallen caused by typhoon and heavy rainfall and rice damaged by drought, finally, secondary damage caused by preserving the sites of fallen fruits in orchard until insurance appraiser visiting, all of these are the subjects ought to be solved at this research. The purpose of this study is to establish a rapid response system to various agricultural disasters due to climate change and to reduce the cost of agricultural accident insurance management with efficient management based on quick and objective agricultural accident assessment techniques and also to decrease the loss of property of farmers and to ensure their stable income.

2. Main Subject

2.1 Development of Damage Assessment Technology for Agricultural Infrastructure Based on Drones

A. Establishment of recovery plan using drones

- As people is not able to access to the disaster site, it might be possible to do virtual surveys through the orthomosaic and DSM (Digital Surface Model) obtained by using the drones, which may make establishment of rapid disaster recovery plan possible and decision maker decide the level of recovery support budget by watching the drone images.

B. Development of a drone image database for agricultural infrastructure and a program for calculating restoration cost

- In the management of agricultural infrastructures, it is possible to trace disaster history and establish a permanent recovery plan by managing the image of the disaster site with DB together with GIS.
- It will be possible to quickly calculate the required restoration cost by multiplying the unit cost that comes from the database of disaster recovery cost for each type of work and the dimensions which the virtual survey tool gives, such as volume, area, length, etc. from damage facility.

2.2 Development of drone based rice damage evaluation technology

A. Extraction of damaged area through image analysis

- In the images taken by the drone, the most distinguished color wavelength can be found by comparing the normal growth part with the drought damage part, leafhopper or bacterial blight damage part.
- The wavelengths that best reflect the growth of rice plants from drought damage are blue and red wavelengths.
- The wavelength that best represents the growth condition of rice in response to the damage caused by blight and harmful insects is the green wavelength

B. Development of automatic calculation program for damage area on images acquired by drone

- In order to automatically calculate the damage area on the orthophoto that has the damage status of rice paddy, cadastral data and NH Property and Casualty Insurance subscription information are fused with image information.
- Paddy boundary extraction, image pattern analysis of rice, rice damage classification, damaged area calculation, damaged area and lot number of damaged paddy display can be performed at this program.

2.3 Development of assessment method of fruit damage based on image analysis

- Images of apples fallen by typhoon are photographed on a mobile device, and the number of fallen fruits and their area might be calculated by auto-counting application. The damage ratio can be calculated by dividing the number with ROI area on the app.(Figure 1).

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- By applying the dropout rate to the area of the whole orchard, objective damage assessment is carried out quickly.
- The Application was extended to mobile phone app. for use by on-site assessors.

Table 1 Performance of self-shadow + MCT (near distance) vs. ROI + Self-shadow + MCT + Post (Far Distance)

Number of images	Self-shadow + MCT		ROI + Self-shadow + MCT + Post	
	Detection Rate (%)	Accuracy (%)	Detection Rate (%)	Accuracy (%)
10	81.7	73	86.7	94.2

* MCT(Modified Census Transform), ROI(Region Of Interest, Detection Rate: Percentage of total fallen fruits (actual number) to ones judged to be real fallen (positive detection), Accuracy: Percentage of those which are judged to be fallen fruits (total of box) to ones to be real fallen fruits (positive detection)

2.4 Field Trial Application and Damage Assessment System Improvement

A. Field assessment Mobile app. Development for Property and Casualty Insurance

- Inquiry of assigned inspection list, confirmation of contractor information, confirmation of my inspection list, inspecting target orchard location map service, input of assessed results(the number of fallen fruits counted with app. or by manually), online signature of investigator and insured person, storage and transmission of damaged fruits photographs

B. Development of GIS platform for rice damage orthophotos

- GIS Electronic map (or aerial photograph) showing insured farmland, contract information popup with click on the farmland.
- Provides the function of checking and inquiring weather information about disaster area and designated area

3. Research Results

A. Development of Damage Assessment Technology for Agricultural Infrastructure Using Drones

- Establishment of DB of Damaged Images by Drones for Agricultural Infrastructures
- Development of a small tool on GIS to calculate the restoration cost by using the recovery cost database

B. Development of Damaged Rice Evaluation Technology Using Images by Drones

- Development of Software for Calculating Damaged Area on Image for Rice Disaster
- Verification of damaged area by field verification and image verification

C. Development of Assessment Method for Fallen Fruit Using Image Analysis Technologies

- Accuracy of detection: Red apples (90%), green apples (85%), pears (90%)
- Implementation of auto-counting app. for fallen fruits in small, low-cost mobile environment

D. Field Survey Mobile App Development and Its Application

- Development of on-site mobile app for crop damage assessment and demonstration

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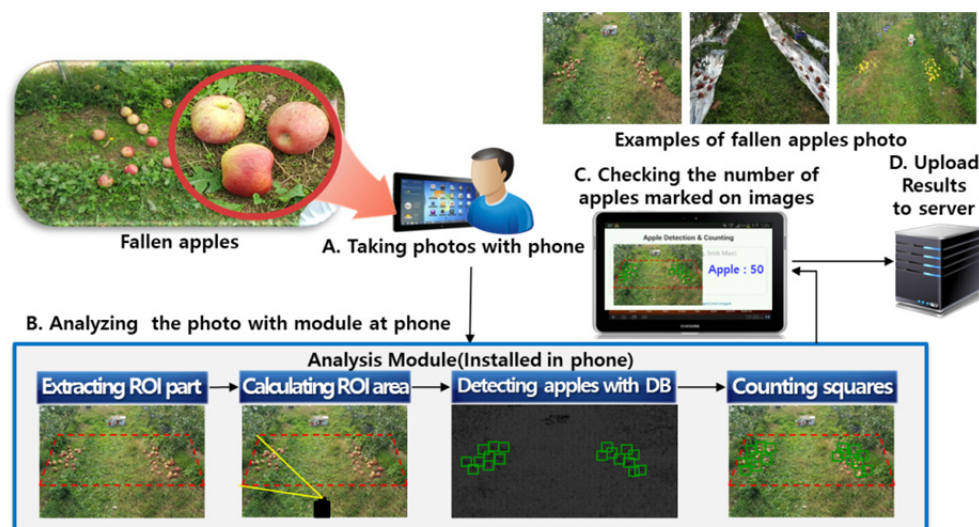


Figure 1 Mobile phone app applying scenario

2011 Kii Peninsula Flood disaster with the viewpoint of Rural Municipal Merger

Kiyoko KANKI*

1. 2011 Kii Peninsula Flood disaster

Typhoon Talas hit the southern part of Kii Peninsula, parts of Wakayama, Nara, and Mie Prefecture, with continuous heavy rain between 1st and 5th of September, 2011. This caused lots of serious flood and landslide disasters in the mountainous areas as well as in the coastal areas. This was one of the biggest typhoon disasters in this 100 years in Kii Peninsula. There exist many reports mainly about the physical damage in this moment, but this presentation is focusing on the social situations during the emergent condition. Kii Peninsula is rural with small, decreasing and aged population with the mountainous topography, as well as known as the historic environment that is partly designated world heritage of cultural landscape, named "Sacred Sites and Pilgrimage Routes in Kii Mountain Range". This character is linked to several facts, those are: large-scaled municipal mergers had been implemented shortly before the flood disaster / several main river water systems are covering the peninsula and main road traffic systems are crossing the river systems / World Heritage pilgrimage routes formed in the medieval era, called as Kumano Kodo (ancient road) in the southern areas, are also crossing the river systems, as well as, main roads in the modern era until 1970's are. Under these characters, local communities faced several difficulties and also utilized their ability to meet the difficulties. To discuss about the resilience, such local experience can be informative to realize the capacitation of rural, mountainous village areas.

2. Tanabe City – 6 years after large municipal merger

Tanabe City is the largest city in Kii Peninsula now. In 2005, 1 city and 4 towns were merged to be present Tanabe City. The flood disaster came to this city 6 years later after the merger. After the merger in 2005, former city and town officers were restructured from 5 offices into 1 united office, which has one central office in the western part and 5 small branch offices according to each location of the former city's and towns' central offices. This means that not small parts of each office members were not very familiar with their areas. In one side the restructuring had the good influence to promote, empower, manage the local activities, at the other side the less-familiarity during several years after the merger was disadvantage for them (Fig.1).

Geographically, Tanabe City area covers several main river systems. The upper part of Hidakagawa river is directly connected to other city at the lower part of the same river, but the administrative system is different. This situation is the same with Kumanogawa river and Hikigawa river. This is the important point with the less-familiarity. Before the merger, municipal areas were small and some group of municipalities could cover the one river system, and all of the officers of small municipality could be very familiar with the area.

At the Typhoon Talas, every river systems had the dangerous situations. Among them, Kumanogawa had the severe flood, and along every river systems, landslides and the destruction of main road systems had taken place almost everywhere in the Peninsula. The earlier-happened Kumanogawa flood were very far from the city's central office. The main road crossing the different river systems was broken and stopped. The substitution of the break of main road system was the surviving main roads in the modern era. The substitution was narrow-wide and rather steep and winding roads, close to the cliff-like topography from place to place. Local people familiar with their area had known such topographic features, so the less-familiarity was disadvantage. Indeed, there occurred frequent traffic jams with few number of less-traffic skills. Traffic jams was very stressed matter to the people under the emergent situation. Several interviews show this was very problematic specially to the community-to-

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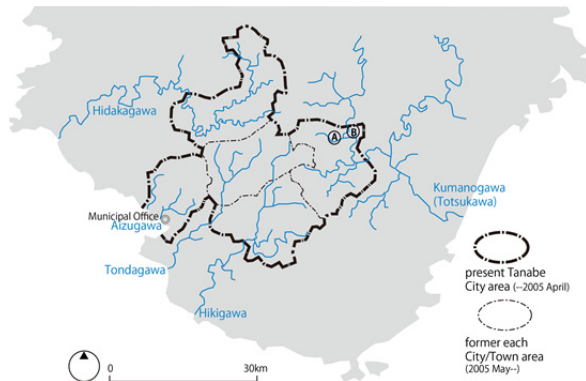


Fig.1 Tanabe City area and the municipality merger

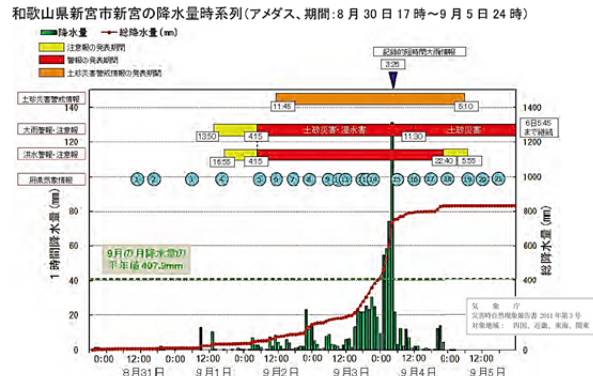


Fig.2 Typhoon Talas's heavy rain alert (JMA)

community cooperation as well as keeping the safety of elementary school pupils' commute.

Fig.2 shows the rain and heavy rain alert at the lowest part of Kumanogawa (Shingu City) by Japan Meteorological Agency. This shows the heaviest rain and the beginning of the disaster was the mid-night time. In the east part of Tanabe City, local communities faced the flood, high-water partly more than 2nd floor level, at the mid-night. Many of local communities are related to the forestry, which had capacitated the people to be able to walk and run in the forest hills, fortunately, safely escaped from the flood just rushing out from their beds. This emergent situation was difficult to be realized soon after from the remote location. The different city, which facing with the same Kumanogawa, had the similar situation. The after-disaster management such as the discussion with the dam-manager company was not near-matter from the remote center, in comparison with the neighbouring Shingu City.

3. Influence and resilience related to World Heritage cultural landscapes

Kumano Kodo and its surrounding cultural landscape was affected by the flood disaster. A in Fig.1 was the only break point of the heritage pilgrim route with large landslide(Fig.3). This part is the ruin of the small village 'Michinokawa' with around 10 households which left to the town center in 1973. We had made the ruin area survey in 2005 for the conservation study of world heritage, and noticed that the landslide location is located nearby the former under water spring. This is not well known fact. We need the influence of the former village systems.

B in Fig.1 was the very severe landslide and river disaster location. With only one night, the small hill topography disappeared and the most of the agricultural land of the very small village 'Okuban' (Fig.4). After the disaster, the people of Okuban decided to leave the village. After around 1 year of the leaving, one elder lady returned to the village ruin in her own house to live in. In this mountainous area, elder people are highly capacitated to live in the even isolated situation indeed. Kumano Kodo formed in medieval era, was very narrow pedestrian route, but the capacity is more sustainable. Several villages became isolated but they are rather isolated daily so to be ready for living by their stocks for a few days. Some people could walk to the other village by crossing the ridge of the mountains by foot, and to share the traffic with the villagers to reach to the town. The skills related to the forestry which is essential to conserve the cultural landscape were highly utilized by the local communities.



Fig.3 Landslide at Kumano Kodo Fig.4 Landslide in Okuban

These kinds of specific characters are not frequently discussed compared with the physical damage analysis.

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Rural Resources Sustainability and Water-Food-Energy Nexus Perspective

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As demand grows, there is increasing competition for resources between water, energy, agriculture, fisheries, livestock, forestry, mining, transport and other sectors with unpredictable impacts for livelihoods and the environment (FAO 2011). Water, food and energy are the essential resources to support human sustainability while the resources are limited due to the global trends including population growth and climate change, so that the Water-Food-Energy Nexus was proposed as a concept for understanding relationships among resources in terms of trade-off. The nexus presents a conceptual approach to better understand and systematically analyze the interactions between the natural environment and human activities, and to work towards a more coordinated management and use of natural resources across sectors and scales. Rural areas represent a green region in which water, food and energy resources are located while sustainability has to be evaluated in terms of population change, water pollutions and energy consumption. The study would review the nexus approach as a tool for rural sustainability evaluation in reflection of resources availability of rural area and propose the nexus perspective applicability.

After the nexus approaches were suggested by Hoff (2011) in Stockholm Environmental Institute during the 2011 World Economic Forum, its concept has been adapted to evaluate and understand the relationships among the water, food and energy and utilized as a basic approach to develop the platforms for resources sustainability evaluation.

Biggs et al. (2015) reviewed nexus perspective in terms of sustainable livelihoods and limitations of the several nexus platforms were analyzed as shown in table 1.

In this study, the nexus perspective was suggested to evaluate the green region 'rural area' sustainability analysis with itemizing the resources related with water, food and energy and impact factors like population, land use change, etc. The sustainability will evaluate with a ranking system in nexus platform consisting of factors interacting among the resources and impacts.

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Table 1 A critical review of the principal nexus frameworks used by governments and multilaterals; identifying the potential linkages and limitations of these frameworks from a ‘sustainable livelihoods’ perspective. (Biggs et al. 2015)

Nexus framework	Potential linkages to “sustainable livelihoods	Limitations from a ‘sustainable livelihoods’ perspective
The water, energy, food security nexus Stockholm Environment Institute: Hoff (2011)	<ul style="list-style-type: none"> ● Acknowledges inequitable outcomes of benefits gained from natural resource use ● Advocates a pro-poor nexus approach to natural resource use reducing the vulnerability of the poorest and safeguarding human rights to food-water-energy security ● Recognizes the threat of foreign direct investment to the livelihoods of the poor ● Awareness of macro-level drivers of vulnerability (e.g. urbanization, climate change, globalization) ● Acknowledges need for adaptation in current institutions, governance structures and policies ● Recognizes the need to account for externalities in policy and management to ensure sustainability and equity for all people and ecosystems ● Recognizes the importance of ecosystem functioning and services to human well-being, and strong links between ecosystems and the livelihoods of poorest 	<ul style="list-style-type: none"> ● Recognition of the need for alterations to governance structures and institutions are abstract and focussed on resource use/extraction ● Factors mediating access to and utilisation of resources such as societal and cultural structures and norms, which are key determinants of ‘security’, are given less consideration ● Nexus approach to manage complexity and multi-scalar issues, but discussion focuses on macro-drivers and omits complexity at the livelihoods (local – individual) scale (e.g. gendered access to food, agency and choice) ● In the section ‘Knowledge gaps in the nexus’ livelihoods related issues, or dynamics of resource use which may enhance livelihoods, are not considered
The Water-Energy-Food Nexus FAO (2014)	<ul style="list-style-type: none"> ● Situates a nexus approach to natural resource use within the context of social needs and economic development, specifically in the context of reducing poverty, sustainable agriculture and ecosystems and food security ● Highlights that taking a nexus approach can engage a range of stakeholders 	<ul style="list-style-type: none"> ● Proposed stakeholder dialogue does not explicitly engage poorest and most vulnerable ● Outlines monitoring and evaluation of a nexus assessment approach which only addresses outcomes on resource use and productivity as opposed to human wellbeing
Multi-Scale Integrated Analysis of Societal and Ecosystem Metabolism (MuSIASEM) Giampietro et al. (2013)	<ul style="list-style-type: none"> ● Allows for context-specific flexibility in constructing multilevel socio-economic structures which can in part, constrain or enable livelihoods 	<ul style="list-style-type: none"> ● Modelling focus on distribution, flows and use of resources across various socio-economic sectors does not address other factors which determine the capabilities of the societal sectors to enhance livelihoods or well-being ● Does not address factors which determine equitable or inequitable sharing of resources within sectors ● Explores the sustainability of resource use at a society-level and within society, but not how sustainable resource use can lead to enhancing livelihoods C
Climate, land-use, energy and water strategies (CLEWS) Howells et al. (2013)	<ul style="list-style-type: none"> ● Acknowledges that resource use is linked to development challenges (in introductory section) 	<ul style="list-style-type: none"> ● Modelling framework explores feedbacks between resource productivity policy/management decisions in energy, water and land-use sectors under different climate scenarios. Does not address mechanisms for how changes in resource use can enhance livelihoods ● Does not explore how changes in resource use can enhance the range of choices people have or how changes in resource use can make livelihoods more resilient to shocks and stresses

Planning in the Danube Delta

Sfiștofca village in C. A. Rosetti municipality, Romania

Meinhard BREILING*

Sfiștofca is a remote village in the Romanian Danube Delta. It is reported to be established around 1800 by Russian fishermen from Vilkovo (Vylkove in Ukraine and Valcov in Romanian language) in the Ukrainian Danube Delta less than 15km away from Sfiștofca. The establishment of the wooden church in 1827 can be taken as an official founding date of the village. That time favourable situated at the mouth of the Kylia arm of the Danube Delta the village generated prosperity for up to 1000 people in 1900 (History of Dobrodgea, 1904). The peripheral position was a consequence of the land locking of the place by the sediments of the Danube River. The water based traffic had to be substituted by land based traffic. During the 1950ies and early 60ies, the Sfiștofca (also named magistral) channel was built by political prisoners from Periprava with the aim to better access the reed and fish resources of the Danube Delta.

A relative high number of inhabitants of several hundreds of inhabitants can be found until the 1970ies. According to local sources, the major retreat from Sfiștofca started after a flooding during the 1970ies. Then the population of Sfiștofca gradually decreased due to the utmost peripheral position of the village in the Danube Delta. The better valorisation of fish and agricultural resources was aimed during the 70ies and 80ies and particularly targeted in the 6th (1976–80) to 8th (1981–85, 1986 to 1990). national five year central economic plan for Romania. The communist leader Nicolae Ceausescu had visited Netherlands and the Rhine Delta and wanted to stimulate a similar development and prospering in the Danube Delta as well. The wetlands should be turned into agricultural land and with increased profitability other economic sectors should manifest here. The increased level of state investment counter acted the trend of outmigration of the Danube Delta. However, while in many other locations of the Danube Delta the population increased due to better economic possibilities the population of Sfiștofca declined. The prime economic asset of the village, the access to the Black Sea and the mouth of the Kylia arm as a habitat for sturgeons got lost at the beginning of the 20th century by large quantities of transported sand.

The fall of the communist system in 1989 brought a new environmentally minded regime during the 90ies. The Danube Delta was declared a UNESCO world biosphere heritage site. A governor for the Danube Delta Biosphere Reserve Administration DDBRA was put in place and a set of ecological benign measures was established with the aim to ecologically restore the delta. The DDBRA is a state agency under the rule of the Ministry of Environment and Climate Change. More than 80% of the land is under its rule. But the 20% economically most attractive lands are owned by the provincial government of Tulcea and the 10 municipalities of the Danube Delta. The ecological regime as proposed by the government was often opposed by the local planning authorities. They need income to run their administration. The most profitable assets in possession of local authorities were licenced to rich strangers that got access to aquaculture ponds and the most productive reed harvesting areas. Despite the devotion as ecological restructuring areas the outtake of natural resources during the 1990ies was over proportional. The huge differences of interests between rich outside investors and poor local inhabitants led to severe tensions. While few locals could profit from this situation most other people lost their - mainly informal - rights like fishing or harvesting reed for family use which they had during communism. Due to lacking perspectives, many villagers, in particular the well educated ones, left the Danube Delta to economically more prospering places.

The remaining poor local population had high expectations when Romania entered the EU in 2007. In particular all kinds of eco-tourism were targeted as a means to develop. The two primary goals of the Danube Delta Regional Development Plan were poverty elimination and economic growth could not be reached (Nichersu 2015). The economic situation is worse within the Danube Delta than within the adjacent regions of Tulcea County. In Tulcea County the economic situation is again worse than in the rest of Romania and Romania is far behind the average

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GDP of the European Union (Worldbank 2014). The economic problems even aggravated during the first period of the European Union from 2007 to 2013 and most localities did not receive any project support from programs of the European Union Cohesion Fund or within the Territorial Cooperation programs (Danner et al. 2014, pp. 43, 44). The non inclusion or insufficient inclusion of locals was observed (van Asche et al., 2011). This is in line that two thirds of the allocated money of these funds in Romania was not called for projects. However, the ministers of the EU reconfirmed that a territorial cohesion of EU member states is a common goal and all of them signed the "Territorial Agenda of the European Union 2020". This led to a new instrument for the program period 2014 to 2020, a so called Integrated Territorial Investment Program, ITI. The Danube Delta is thereby a selected case study (EC 2015). ITI aims the joint implementation of several EU programs and a combined investment of one billion Euro is foreseen in the Danube Delta. However, Sfiștofca village as well as the larger unit of C.A. Rosetti municipality do not qualify for EU funding as the minimum population is not reached.

While in principle we have a lot of money available, local people in remote villages and municipalities remain poor. The scale of programs and projects do not fit to practical circumstances or informal procedures at the place. There is money for large scale projects and initiatives but no money for small scale local improvement projects. Private investors can get almost every investment back if they follow the EU project guidance. But control and reimbursement procedures can stretch over many years, so that it remains still unattractive to invest. In addition many projects a business plan for the profitability of projects.

In case of Sfiștofca , the village was even considered too remote to be visited by a fact finding team of the World Bank. No one from the village or the larger municipality was involved into a broadly managed public participation process with regard to the Danube Delta Strategy. The travel to another village is considered as a high cost when the average yearly income per household is € 1.500.- with many persons far beyond this amount. Public transport worsened or does not exist any longer due to fewer people that still remained. The only remaining small store in the village closed in 2015 when the woman in charge became ill. The elementary school closed already many years before indicating that the village is slowly dying.

While all descriptions so far point to a neglect and a desperate situation Sfiștofca has several particularities that few other places have. It belongs to the religious minority of Russian Old believers - a group of believers scattered around the world - which has plans to make Sfiștofca a holy place of pilgrimage even if the remaining population should have left the village. Another hopeful initiative came from artists living in Tulcea, Bucharest and abroad, forming the Sfiștofca Art Association. They discovered the remoteness of the place as a source of inspiration and use the place for workshops. During the last 10 years art films and photos or documentations were produced and brought the place some fame in insider circles (Gheorghiu 2014). Annual workshops that involve the local population of the municipality are held in Sfiștofca . Yet another initiative is university cooperation to support the local population by student projects. Several universities, such as Ion Mincu University of Architecture and Urban Planning Bucharest, the National University of Arts Bucharest, Ovidius University Constanta, Technische Universität Wien started a fruitful cooperation since 2009. Occasionally this network is supported by members of other universities from outside Europe, under them Keio or Kobe universities from Japan. The direct relation of students, locals and local decision makers is fruitful for all parts. The student projects are freely chosen by students and inspired by the locals in need for it. Under them a small scale freshwater supply in response to the observed salinization process with a ground water pump; plans to marketize medical plants, horticultural products, honey from the Danube Delta; plans for youth camp and nature outdoor learning exercises; design proposals for nature near designs of tourist shelters and fishermen cottages (Voica et al. 2015).

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Aspects of social vulnerability as seen in three hamlets of northern Tōhoku and central Kyūshū

Johannes WILHELM*

1. Introduction

While Japan is known as a "disaster prone country" the demographic change – that has been discussed at the 2015 Japan-Korea Rural Planning Seminar in Ishikawa – represents another factor that needs attention when talking about vulnerability, that is the degree to which a system, subsystem, or system component is likely to experience harm due to exposure to a hazard, either a perturbation or stress/stressor. (Turner et al. 2003:8074) Thus I refer to "social vulnerability" by meaning a setting (structure, process etc.) that makes a social system likely to experience harm due to exposure to stressors. The latter stressors can be natural disasters, but also demographic or ecological factors due to socioeconomic change are possible. It should be noted that vulnerability represents a dynamic concept and depends largely on the embedding of a given society and the complex processes occurring therein and its frameworks, such as the structural differences of social, cultural or institutional resources available. Because of this processuality, there are always shifting states of vulnerability. Resilience, on the other hand, refers to the ability of an individual or a group to overcome a vulnerable state. It arises from the (individual and collective) ability to mobilize resources to address more or less possible or imminent threats or calamity in order to compensate for (possible) damage and to restore lost functionality or adaptively respond to emerging conditions. This, for instance, can be adaptive institutional actions such as an affirmative adaption to expected situations as we will see later.

In my paper I will look at three case sites in two regions, Oshika peninsula in Miyagi prefecture and Aso in Kumamoto prefecture, to show some adaptive strategies undertaken by residents – both individually and as a community – to overcome a present or expected state of social vulnerability. I will also ask, if institutional adaption to challenge vulnerabilities is a top-down (administration driven) or rather a bottom-up process.

2. Cases

2.1 Case 1: Oshika peninsula

I start with the case from Oshika peninsula, a region severely hit by the 2011 tsunami (3.11), that I've been studying long before disaster. (Wilhelm 2005, 2009, 2013, 2016, Wilhelm & Delaney 2013) Although I could go very much into detail, however, as time is short, I have to be cursory. The Oshika peninsula represents the southern end of the Sanriku coast at the Pacific Eastern side of Tōhoku with her myriads of ria bays which provide excellent conditions for marine aquaculture such as oyster, scallop or sea-squirts, i.e. ascidian. Today, the coastal fishery sector in Sanriku is characterized by many small-scale operators – most often family-run and thus with a relatively high share of female and/or seasonally employed labor – which are organized within the local Fisheries Cooperative Association (FCA) branch. The impact of destruction after the quakes on 3.11 hit the Sanriku region severely. Virtually all fishing vessels and fishery facilities (ports, rafts for cultivation, etc.) had been destroyed by multiple tsunamis and most gear and facilities were lost. Further, the entire coastline subsided up to 1.2 meters (in Ayukawa at the tip of Oshika Peninsula) that is why wharfs had to be lifted to enable fishing and landing operations. In addition, the debris drifting in coastal waters as well had enforced a long-term interruption of fisheries operations.

My main focus will be laid on two coastal communities of Oshika Peninsula (Miyagi Prefecture), Yoriiso and Momonoura, respectively. Yoriiso, because I've studied this hamlet for more than 15 years, and Momonoura, because it is the only place where the so called Fisheries Special Zones (suisan tokku), a different fishery rights allocation that opens the local fisheries management for outside investors have been installed after disaster. We will see why the introduction of the Tokku seemed inevitable for Momonoura when looking at demographic details and different settings after disaster of the two hamlets.

Yoriiso has had a rather stable and balanced population before disaster whereas in Momonoura an out-migration of younger generations was observable. The latter might be owed to the relative vicinity of the urban area of Ishinomaki. The damage caused by disaster also differed considerably. Momonoura was virtually completely spilled by the waves, while in Yoriiso only the area at the harbor was affected. In 2013, however, we see a drop in overall fisheries population in both hamlets, but, in Momonoura the 'productive ages' are missing. When looking at the migration pattern observable on the regional meso-level we see that many residents within

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Ishinomaki moved from the remote coastal areas to the urban centers around Kanan and Kōhoku, especially from the Ogatsu and Oshika areas. This trend is also observable in Yoriiso, yet, not as intense.

Fisheries in both, Yoriiso and Momonoura, is mainly aquaculture, oyster in the latter and ascidian (sea-squirt) in the former. Whereas oyster cultivation could be resumed within a year after disaster, ascidian needs more than two years to grow. The producers of ascidian in Yoriiso thus carefully kept an eye on business partners (wholesalers) in the ascidian industry until summer of 2013, when the first products were ready for delivery. In 2010, seven of ten ascidians had been sold to South Korea, yet, in September 2013 the South Korean government imposed an import ban on marine products from Fukushima, Miyagi and Iwate prefectures. Since this the ascidian industry suffers from overproduction, and since 2016 about 10.000 tonnes of ascidian are being scrapped in Miyagi prefecture only to maintain prices. A case of a shifted state of vulnerability. On the other hand, it is interesting that the out-migration led to an increased share of accessible cultivation waters for the remaining shareholders, and many aged fishermen (in locally influential positions) have refrained to reconstruct their fishery activities since disaster, hence disaster led to an overall rejuvenation at least in Yoriiso. This is perhaps one factor why residents from Yoriiso refused to move out.

2.2 Nishiteno, Aso (Kumamoto)

I am conducting studies on social vulnerability in Aso since early 2016, thus before the earthquake. At that time I was member of the Institute for Japanese Studies at the University of Vienna (Austria) where village studies had been conducted in the Aso area in 1968/69. Based on household surveys on the family structure collected in the hamlet of Nishiteno half a century ago, I started to trace the residential changes since then. to find out more on spatial changes in kumi neighborhood mutual help organizations and changes in social life. Nishiteno was hit by several severe, yet, spatially isolated earthquakes in 1975, and was severely hit by two typhoons in the first half of the 1990ies. The spatial dissolution of the kumi groups had more to do with these physical events rather than by weakening social ties as far as I could observe during several stays since then. However, an institutional document (community rules) for members of the village revealed an interesting aspect in a combined view with statistics from the World Agricultural Census.

In the mid of the 1980ies a relative increase of the aged population was expected. Simultaneously, the community ruled were changed in 1986 in which stated, that male high-school students are to become full members of the community with all rights and responsibilities. Obviously, this institutional change represents an adaption to an expected vulnerable state, i.e. an ageing local population that is feared to loose its ability to conduct mutual help (in street construction, emergency etc.).

3. Conclusion

To conclude, local residents are able to cope with changed local situations due to natural hazards or socioeconomic factors. However, as we have seen in the case of post-disaster ascidian aquaculture, the local setting is embedded in a global web of relations, which, in turn, is difficult or virtually impossible to challenge by local actors. Furthermore, disaster does not unconditionally mean the breakdown of local society, but, rather needs to be seen in larger contexts at least beyond the physical level of construction. Disaster or external factors such as economic/social/technological etc. development can trigger further vulnerabilities or even lead to a de facto loss of local autonomy if a social system loses its basic functions.

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Economic Impact Assessment from the Potential Introduction of Potato Spindle Tuber Viroid (PSTVd) in Korea

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1. Introduction

In Korea, the risks of invasion from foreign pests and diseases have increased because of recent transnational agreements made through the Doha Development Agenda (DDA) and Free Trade Agreements (FTA). The damage and loss instigated by these invasive species in crop yields are severe; such adverse consequences significantly and negatively influence agricultural production. Therefore, the continuation of global trade agreements and sustenance of domestic crop production requires comprehensive investigation; the nature of foreign species and diseases, including their effects on domestic agricultural production and the national economy.

Among the invasive plant pests, potato spindle tuber viroid (PSTVd) is a small and circular RNA molecule that infects a variety of species within the Solanaceae (Singh, 1973¹⁾; Singh 2014²⁾). Its introduction to local crops has caused problems in many countries. Initiatives that aim to protect crops from viroid infection are among the action targets of the Sanitary and Phytosanitary Standard (SPS) of WTO (WTO SPS Agreement). ‘PSTVd is listed as regulated pest by European Union (EU) quarantine organism, because of its potential risk on potato production and economic impact for EU countries.’ (Soliman et al., 2012³⁾). The Korean government also designated the PSTVd as a restricted pest and limited the regions that permit potato importation. PSTVd is a highly infectious agent that can severely damage crops; PSTVd infection can significantly reduce the yield and quality of products (Cui et al., 1992⁴⁾; Singh et al., 1971⁵⁾).

It is essential to elucidate the economic consequences of a possible PSTVd spread. This study explores the economic impact of the possible introduction and spread of PSTVd in Korea.

2. Materials and methods

Partial budget modeling (PBM) is a suitable tool to explore the potential damage in production and cost/benefit structure from an introduction of PSTVd at potato farms in Korea. PBM is designed to evaluate the economic consequences of the changes in the management practices as a result of the introduction of a specific species (Macleod et al., 2004⁶⁾; Soliman et al., 2010⁷⁾). PBM is a method based on the principle that compares the changes in costs and revenues with the subsequent estimation of net economic effect. The net economic effect of a change is the sum of the positive effects minus the sum of the negative effects.

The economic impact in this study is based on previous expectations and is evaluated through hypothetical scenarios. The assumption is that the introduction and spread of PSTVd originated from the private sector, where relatively poor disease control management and possible importation practice of the infected seed potatoes.

3. Results and discussion

On this basis of the previously mentioned scenarios, expected damage quantity of the potato yield is about 5,439 tons, 27,193 tons, 54,386 tons, and 108,772 tons for 1%, 5%, 10%, and 20% of land area affected, respectively. This will result negative impact to the producers by the amount of total costs (protection costs and yield losses) that are involved for approximately 9.3 billion KRW (US\$ 8.5 million), 46.3 billion KRW (US\$ 42.1 million), 92.6 billion KRW (US\$ 84.2 million), and 185.1 billion KRW (US\$ 168.3 million) for 1%, 5%, 10%, and 20% of land area affected,

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respectively. These direct economic consequences correspond to the net profit change to the producers without any additional revenues and reduced costs. The net profit values are compared with the gross root and tuber crop product (GRTCP) of Korea in 2012, which was approximately 774 billion KRW (US\$ 703.6 million), and their shares on GRTCP for each scenario are approximately 1.2%, 5.98%, 11.96% and 23.92%, respectively.

The results indicate that damage costs significantly increase as the distribution rates of PSTVd infected seed potatoes increase. Consequently, the introduction and spread of PSTVd can cause a considerable economic impact on potato producers and related industries in Korea. This observation suggests the importance of the systematic implementation of control measures (e.g. quarantine and preventive systems) to detect PSTVd in the early (breeding) stages of seed potato cultivation; thus, consequences affecting the producers and the national economy are minimized.

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Town Organization, model, and case study

Namsu JUNG*

I. Background

The village project is implemented to overcome the declining population and aging of the rural area, and to restore the village function so that it can carry out public functions of agriculture and rural areas. This restoration process also increases the social capital such as social trust and community norms when the people are led by the community movement based on the identity of the village rather than the surgical form, so that it can be operated and maintained smoothly.

If social capital is expanded, what the village organization should be is not really important. Lee(2015) set up village conflict, network, and leadership as indicators of social vulnerability in "Social Vulnerability Research based on Residents' Conflict Analysis", but did not include village organization (structure). However, in the process of consulting the villages with poor business or evaluating villages in excellent villages, it is very important that "villages are forming an organization in order to minimize the conflicts and maximize the effects of the projects".

Especially in modern rural villages, village leaders are required to play various roles such as managers, innovators, change facilitators, communicators and inspectors.

However, it is difficult for some of the village leaders to perform all these roles, and it is considered efficient that the members of the village community should organize and organize appropriate organizations. Therefore, this article will examine the types of organizations that can be formed in villages based on the contents of the standard textbooks of towns and villages colored with agriculture products, and compare them with the cases of excellent villages that I have visited.

II. Various organizations can be adapted by town

1. Village-centered operation model in which all villagers participate

This model is a model that can be resilient to carry out the business centering on the village head and the chairperson. It may be possible to incorporate a business steering committee, but most of them are directly under the jurisdiction of the resident's organization in the neighborhood. It is of great significance to include the development committee, aged society, women's society, youth society, small group, individual pension,

In the village, you can directly manage the processing, sale, and experience of agricultural products that may generate profits, support publicity and marketing of your home, and receive a portion of your proceeds in the form of development funds or dues. The proceeds can be used for environmental management of the village or for the management of the facilities, or can be supported for village welfare activities. With this structure, village members will be able to participate in a certain role.

It should be noted that the development fund or dues that are borne by individual operators (such as private homes, pensions, restaurants, etc.) in the village should not be discussed or enforced as equivalent to the administrative expenses supported by the administration. In such a case, the village meeting is likely to enter the process of negotiating the value of the goods in the market. The way that individual operators pay or the amount of money they can afford to pay for the village.

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2. An operation model centered around the town office

The second model is centered around the town office. Individual members in the village raise income through experience, accommodation, and sales of agricultural products through a responsible management system, and pay a certain commission to the village. If income-related facilities and activities continue to increase in the village, it would be rather inefficient for each individual to proceed.

Consumers also prefer to have card spending, standard pricing, and a refund system. For this reason, a certain organization (secretariat) in the village carries out the reception of customers, sales of agricultural products, refunds, etc., and the individual members directly deal with consumers such as experience, lodging, and agricultural products in accordance with their own circumstances. In this model, it is also possible for the town secretariat to find new revenue models, such as running a grocery store or providing group meals, in addition to the usual tasks.

3. Responsible management operation model that entrusts management operation to the corporation in the village

The third model separates traditional village activities and corporate activities that promote income. Property rights are left in the township in order to prevent disgusting operation and moral hazard of various facilities supported by administrative business. Instead, they form a working group or corporation for efficient operation and commission the operation. The villagers establish a relationship with the corporation by selling agricultural products or providing jobs.

It is a model that can be selected when there are many residents who have not participated in the early stage of the project. It can be judged in an advanced way in terms of separating ownership and operation of community facilities. However, if the transparency of corporate operations is assumed and earnings do not arise, misunderstandings or conflicts can exist. This is a model that can be maintained if the head of the village takes charge of the corporation's ex-ante audit and the amount of return of the corporate income to the village (joint management fee) is appropriate. However, it is a model that does not encourage people to formalize village councils, and individuals or corporations can manage village projects.

4. Establishment and operation model of joint-stock corporation

Joint-stock corporation model is a model that collects funds from the farm association corporation in the neighborhood association and receives the dividend according to the investment fund through the operation of the facility. Agriculture corporations or cooperatives are possible but they are encouraged to farm corporations because they are investment-oriented models and because they focus on internal farmers rather than outsiders. The remaining items are an example. It can be applied when the size of villagers is not large and community confidence is strong. It can also be considered when the village project develops to expand the responsibility management system of the income business. It is a basic development model of experiential resort village.

This model is characterized by strong responsibility and business propulsion. But when the business is in crisis, you have to take risks jointly. On the other hand, if the corporation's profitability is high and it is difficult to enter the new business, there may be a limit to the recruitment of new professionals. There is also a risk that corporate management and village communities can be shaken by a small number of outside parties when new inflows are easy.

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The Activation and Sustainable Development of Yunnan Traditional Rural Settlements

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1. Yun¹nan traditional rural settlements and its human settlement environment

Yunnan, where has a unique geographical environment, mild climate, altitude difference (The elevation between 6740 meters and 76.4 meters). Undulating terrain, 94% is the mountain, flats are few. The formation of the settlement affected and restricted by the natural ecological environment, to form a rich settlement types. There are about 13,431 administrative villages and 124,206 natural villages . Ethnic minorities lived here for generations, and the proportion of ethnic minorities accounted for 46% of the country. On the whole, it shows the characteristics of large mixed living and small habitation. For example, the traditional settlements' form of Yi, Dai, Hani, Wa, Lisu, Nu minorities etc. are different, and the living room culture and the living environment all have their own systems. Settlement adapted climate environment fully , and created a diverse architectural form and culture wisdom. For example, the Dai Stilt House adapted to the tropical rain forest hot climate.

The site selection and layout are well located. For example,the traditional villages of Lijiang skillfully use the plateau landscape, creating a harmonious life realm of man and nature. UNESCO evaluated the ancient city of Lijiang as a combination of economic strategy and rugged terrain. In the last century, British author James Hilton created the lost horizon in the magical land of Northwest Yunnan, and regarded Zhongdian as a paradise -- "Shangri-La" [1].

Secondary disasters caused by earthquakes and torrential flood frequently, and some traditional rural settlements located in disaster areas. In order to resist natural disasters, also the subject of ecological migration is put forward, and the relocation of traditional rural settlements is a hot topic. The planning and construction speed is fast, and the achievements are large, but the research on characteristics of traditional villages are few. Due to the lack of villagers' participation, the villagers do not understand planning, lacking of planning identity and Interaction.

2.The development of contemporary traditional rural settlements

China's rapid urbanization has been concerned process of urbanization. In recent years, China attach importance to rural issues gradually, to increase efforts to move into the rural construction. Large-scale development and construction led to the disappearance of traditional settlements amazing, if not strengthen the protection.

Some traditional villages living conditions are not suited to the needs of modern life. Driven by the top-down macro policy, the rise of large-scale beautiful home construction, many traditional houses were demolished. Community residents as the master of the traditional settlement, they have strong desire for a better life and the pursuit of huge construction. Due to the lack of rural planning construction personnel and villages management, leading to management out of control, the village extension along the main road and the scenic.

Facing such an era, the protection of traditional villages has become an important task. From 2012, the Ministry of Housing and Urban Construction, the Ministry of Culture and other departments jointly carried out the Chinese traditional village action plan, total registered four groups of 4153 traditional villages . There are 615 in Yunnan, accounting for about 1/6 of the whole country.

3.Discussion on the sustainable development of traditional rural settlement activation

Traditional rural settlements carry a rich historical and cultural value. As the carrier of historical and cultural heritage, once destroyed, where is culture ? Thus, traditional rural settlements as a cultural heritage, need the protection of simple beliefs and sustainable development concept, the protection of cultural space and cultural heritage, requires government, society and planners to work together.

Residents' cognition often has some limitations between personal interests and village protection, who is

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concerned with specific personal interests. This should to support self-organization to form Cooperatives, to guide the formation of public values, to solve the settlement of the "public pond" problem [2], without to rely entirely on the government. Through the Cooperative set up a bridge of communication, to achieve community between social interaction, bottom-up and top-down interaction etc..

The activation of traditional villages requires public participation. Planners should be fully involved in the traditional village renewal. That's from focus on field investigation to collaboration, from material space to community development, from plan to the implementation, from maverick to multi-collaboration. Tourism development is an important way to promote village renewal. The current development of traditional villages is mostly guided by foreign investment, and it is necessary to avoid over-commercialization. To avoid the low participation of villagers resulted in the phenomenon of "gentleness" and "outsiders communities". To avoid excessive tourism development impacted on sustainable development of settlements. The regulations of tourism activities need community autonomy, which can be organized through autonomous management, then to promote the tourism order and sustainable development.

4.Activation practice of Azheke in Yuanyang Heritage Area

The settlements which located in the heritage site Honghe Hani Terraced Fields as the world cultural heritage, is a model of sustainability for thousands of years. It created a unique cultural landscape of agriculture, and it is a living system of paddy field farming culture. The World Heritage Organization gave Honghe Hani Terraced Fields a high evaluation. Heritage area of 166 square kilometers, a total of 82 villages located in which about 54,000 people. Azheke is one of the five key World Heritage Villages. The traditional residential mushroom house occupies 80%. There are 67 households and 389 people, all Hani nationality.

At the beginning of completed the protection and development planning of Azheke Village in 2014, the wishes of the villagers were to remove the mushroom house, then built a new one. After a recent sample survey, the traditional mushroom houses have been reduced by more than 1,000 buildings to less than 500 buildings from the inscription up to now. The traditional mushroom houses generally have the problems of poor living environment, where people are living together with livestock, lacking Living space and light, the grass of roof also needing be replaced periodically etc. In order to reuse mushroom houses, to avoid removal, the planner pushed the protective remould of a mushroom house. For the 1st floor, it had been dug down 0.4 meters partially, reasonable using of the underlying space into a bar and ancillary space. The 2nd floor had been divided into the spaces for exhibition and living. The 3rd floor been adapted into a simple living space. Throughout the remould, local construction materials and building technology had been reused, in order to play a universal demonstration role, and change the demolition and reconstruction thought of local villagers. The mushroom house of remould experiment in Azheke, had won the first prize of the Outstanding Examples of Pastoral Buildings, which awarded by the Ministry of Housing and Urban-Rural Development.The village had been displayed in the Ministry of Housing and Urban-Rural Development and the 26th UIA Conference[3]. Planner also introduce the association of students and other activities. Inviting the city people to the villagers houses, where ate and lived together. Through the interaction between urban and rural communication, enhance the villagers to participate in tourism awareness, to renovate their houses improving the quality of living environment.

The most lack of the development of traditional villages is intellectual support and financial support currently. Faced with fragile rural systems, there is an urgent need for social, financial or other related work involved, and introduction of social capital. The traditional settlements should be set up rural planners and rural cadres institutionally. Traditional villages environmental remediation is a highly technical project, including infrastructure, historical and cultural environment restoration, fire, natural ecological environment, architectural style etc.. That need to integrate design and implementation. Public affairs of traditional villages require public management, which need organize and coordinate villagers' intentions, construct together with Cooperative too.(National Science Fund subsidized project : Sponsored by National Natural Science Fund of China 51608240.)

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**Movement of Japanese squirrel (*Sciurus lis*) in small forest patches:
a case study of Morioka, Iwate Prefecture**

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1. Introduction.

Japanese squirrel (*Sciurus lis*) is an endemic species of Japanese islands, which is distributed in Honshu, Shikoku, and Kyushu. This species is arboreal, and thus vulnerable to fragmentation of forest habitats¹⁾. The population of this species is very limited and fragile in urban areas where generally forests are heavily fragmented. It is reported that the preference to Japanese squirrel by urban residents is the highest among urban/suburban dwelling wild mammals according to results of questionnaire survey²⁾. For these reasons, Japanese squirrel would be a good conservation target species in urban areas, and is a good indicator species for assessing habitat fragmentation and ecological network formation.

Previous studies in the Kanto-Chubu district reported that home range size of Japanese squirrel is about 20 to 30 ha for males and about 10 ha for females³⁾, and it is difficult for them to disperse moving across arterial roads or dense residential areas⁴⁾. On the other hand, very small home range size is reported in Tohoku district, 3.65 ha for males and 1.45 ha for females⁵⁾. In addition, habitat use by the squirrel in very small woodland is reported in Isawa area⁶⁾ (0.45 ha), and Morioka (0.3 ha) where the woodlands are highly fragmented by an arterial road or residential areas (Masaki, unpublished). These results suggest that even very small forest patch (<1 ha) may function as important habitat in Tohoku district particularly in urban landscape. However, it is not clear whether the squirrels inhabit just one habitat patch or they move around several patches fragmented by roads or residential areas.

The objective of this study is to clarify the actual situation of Japanese squirrels which inhabit urban small forests by radio-tracking focusing on movement between forest patches in fragmented landscape in order to provide basic information to establish urban ecological network.

2. Material and methods

2.1. Study area

This study was conducted in 7 forest patches and their surroundings located in northern urban fringe of Morioka about 2 km from central part of the city. The size of forest patches ranges 0.19 to 31.57 ha with an average of 6.43 ha. These patches are fragmented by arterial road (National Route 4) and residential areas. The preliminary survey detected the presence of the squirrels by feeding signs of walnuts in all 7 forest patches.

2.2. Radio-tracking

We captured squirrels from May to October 2016 using traps made by modifying commercial mousetrap. Captured squirrels were weighed, and radio-tagged only if their weight was over 200 g. Radio-tracking was conducted almost on a daily basis until the end of January 2017 in the manner so that we can evenly cover all period of time when squirrel are active. Location of the squirrel was compiled as GIS-data using ArcGIS 10.3.

2.3. Classification of movement types

Movement of the squirrel was defined as a line between two subsequent location points within 36 hours. Following Fey et. al.⁷⁾, the movement was classified into 3 categories based on their distance: (1) routine movement, (2) exploring movement, and (3) dispersal movement. Exploring movement included steps longer than twice the average movement distance and routine movement included all steps shorter than this. Dispersal movement was defined as one-way movement in the direction of the area defined as post-dispersal settlement area.

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3. Results and discussion

We captured 4 squirrels (2 males, 1 female, and 1 juvenile female) and tracked 3 squirrels (2 males and 1 female) during the survey period. One male (M1) was tracked for 8 months and another male (M2) for 3 months. One female (F1) was tracked for 7 months. We observed 11 movements between forest patches and 2 movements between forest patch and a single tree which is located outside the forest. Movements between forest patches included crossing an arterial road and residential areas. The movement across orchards and a cemetery by M2 was observed for 9 times, whereas that across an arterial road (F1) or residential areas (M2) was observed only once for each. This result suggests that the environment between forest patches is a major factor to determine the frequency of movements, and that squirrels can move more easily when forest patches are connected by orchards and cemetery.

The result of classification of movement types is shown in the Table 1. Routine movement distances were not significantly different in 3 individuals (Kruskal-Wallis test, $P > 0.05$). However, significant differences in exploring movement distances were found in all pairs of them (Steel-Dwass test, $P < 0.01$ for each). This may reflect the differences in sex/age of each individual, and environments inside and outside forests in which they stayed. The orchards and a cemetery adjacent to patch no.5 and no.7 (Figure 1) is likely to increase the moving distance of M2. In addition, home range size of male Japanese squirrel is generally larger than female^{3), 5)}, which may result in longer exploring movement distances of males (Table 1). However, routine movement distances were not significantly different between males and females. These results show that male squirrels do more exploratory behavior (i.e. moving longer distance) than females, but there is no difference between them in routine behavior. We observed movements across arterial road (F1) and residential areas (M2), which were classified as dispersal movements. These movements coincides with the dispersal periods of Japanese squirrel in July and August⁸⁾.

Our findings suggest low habitat connectivity of forest patches divided by arterial road or residential areas, and a potential of orchards to function as corridor. It is necessary to consider the spatial configuration of forest patches and their surroundings to establish urban ecological network.

Table 1. Classification of movement type

	routine	exploring	dispersal
The number of movement	255	35	-
M1 Average movement distance (m)	49.4	166.7	-
SD	37.0	33.3	-
The number of movement	68	11	1
M2 Average movement distance (m)	47.3	305.1	540.6
SD	38.3	120.2	-
The number of movement	209	22	1
F1 Average movement distance (m)	40.1	125.3	243.7
SD	26.7	31.9	-

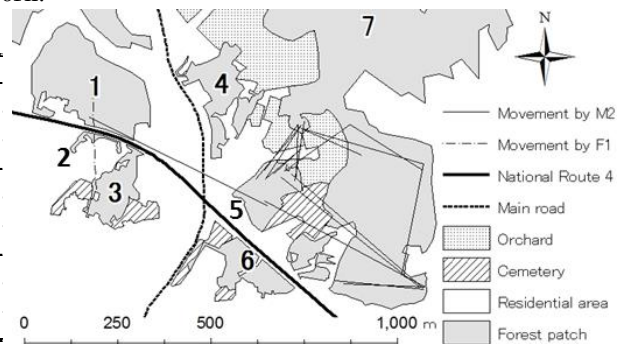


Figure 1. Movement of squirrels

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Contemporary trends of migration in rural Kumamoto

A case study from Aso district focused on local identity in migration context

Antonia MISERKA

1. Introduction

The depopulation of rural areas is a widely discussed topic in Japanese academic context. Suffering of both a low fertility rate (1.45 in 2015) and death rate (10.3 per 1,000 in 2015), Japans population is aging rapidly while the younger generation and their share on paying taxes decline. Difficulties upholding the social structure is a logical consequence of these demographic trends. In concrete numbers, in 2016 27.3 percent of the population were over 65 years old, while only 12.4 percent were beneath the age of 15. It is estimated that these trends will continue, with the Japanese population shrinking from about 126 Mio. in 2016 to about 101 Mio. in 2050 while at the same time the population aged 65 years and older will climb to numbers estimated 37.7 percent.

The above changes can be felt even more severely in rural areas, where in addition to natural population change (birth rate, death rate), migration is a central factor for population loss (social population change). From the 1950s onwards, Japan experienced a rapid urbanization, resulting in a highly concentrated population in a small number of major urban areas. As a result, in 2010 51 percent of the population lived in the three major metropolitan areas of Tokyo, Osaka and Nagoya (Statistics Bureau 2017).

2. Depopulation of rural areas

Continuous migration to major cities has left many rural regions suffering their loss of population. In recent years studies about such depopulated areas have been a focus of Japanese rural research. A number of scholars depict the current situation of rural municipalities and the problems which they face or will face in the future (Masuda 2014, Ohno 2009, Yamashita 2012). Municipalities facing declining population are usually divided into following concepts. Based on population age and the activities or cooperation within a community four states of rural municipalities can be classified. ①Sonzoku shūraku or persisting villages, ②jun-genkai shūraku or semi-depopulated villages, ③ genkai shūraku or depopulated villages and ④ shōmetu shūraku or extinct village (Ohno 2007). Considering the overall population decline, plus the steady out-migration from rural areas to the cities, for many villages a transition from persisting village to depopulated village is imminent. However, to prevent a further depopulation, many efforts for revitalization have been attempted on national, prefectural and municipal level (Tokuno 2007, Ohno 2009). Such initiatives have various approaches, including advertising of a region for new ventures or people from the cities, as well as strengthening existing structures and cooperation within the communities.

3. Migration to the countryside

In most cases population outflow to urban areas is higher than the number of people moving to a certain rural area. However, living in the countryside is not as unattractive as statistics make us presume. While economic limitations indeed push a lot of young people to urban areas, usually one of the children either remains in or returns to the countryside to succeed the family business. Furthermore, as environmental awareness increases, both young and elderly people increasingly move to rural areas to improve their living conditions and escape the stress associated with living in a city.

The two forms of migration being depicted in this paper are so-called U-turn as well as I-turn migration. U-turn migration describes the migration of an individual back to their hometown. Having grown up in the countryside, at some point the individual left their home to pursue further study or work in a metropolis, but returned to their hometown at some point and still live there. I-turn migration on the other hand defines migration to a certain rural village, either from another municipality or major city, without having lived there before.

4. Methodology

The aim of this study is to provide an insight into above mentioned forms of migration to rural areas and to examine the various reasons people have for either moving or returning to the countryside. Furthermore, this research looks at how these people view their environment and the community they moved into as well as how they position themselves within that community.

The area chosen as field for this research is Aso-City in Kumamoto prefecture. The author stayed in Miyaji, a part of Aso-City, for about three weeks in September 2017 and conducted guided interviews with residents within the city boundaries of Aso-City. To approach the participants an introduction by mutual acquaintances was used, after which new participants were introduced using the snowball principle. The main contents of the interviews were the migration history of the participants and their personal view of Aso-City as their place of living. Further, possible problems or misunderstandings with neighbors upon moving to Aso-City as well as the participants integration into the local community were inquired.

5. Preliminary findings and further approach

An overall of 20 people, nine women and eleven men, were interviewed for this study. The age range of the participants was from 28 to 74 years, the focus lying on people in their 30s (figure 1). Eight people moved back to become the family successor (U-turn), another eight people moved to Aso-City alone or with their families to start their own venture or enjoy retirement, and four people moved to Aso to be with their spouse (figure 2).

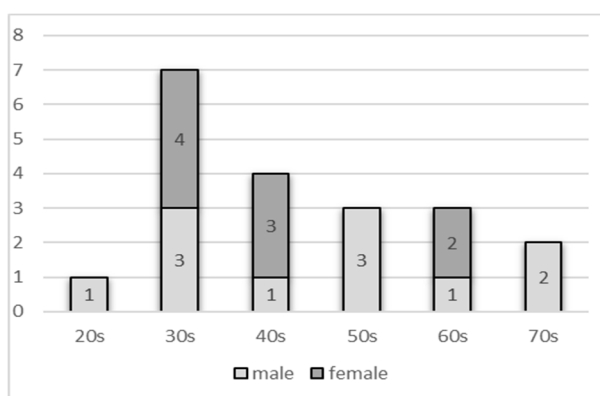


Figure 1 Age distribution

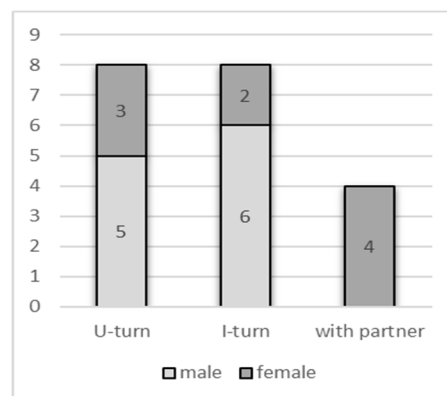


Figure 2 Form of migration

This study consists of three parts. First, an overview of the participants migration history is given, ending with their move to Aso-City. Then, their arrival and possible difficulties that may have gone along are described. Also, it is determined to what degree the participants themselves feel integrated into their community. Finally, their personal view of their current place of living as well as Aso as a region are discussed.

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Application of UAV-mounted commercial multispectral sensor in a non-experimental rice farming practice

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1. Introduction

There is a growing expectation for applying unmanned aerial vehicles (UAVs) in agriculture. Monitoring the growth of crops within a season is essential to decision making in precision agriculture¹⁾. Multispectral sensors mounted on UAVs enable us to capture imageries with higher spatial and temporal resolutions than satellite-based remote sensing, which is a great advantage for monitoring spatial variation of crop growth for individual farmers.

Some exploratory researches have been conducted to predict crop yield. Swain et al. (2010)²⁾ reported strong correlation between rice yield and NDVI at panicle initiation stage calculated from imageries captured by UAVs. Zhou et al. (2017)³⁾ successfully demonstrated strong correlations between rice yield and UAV-based multiple vegetation indices (VIs) calculated from multi-temporal imageries. These studies were conducted in an experimental-based rice production practices where fertilizer application rate or planting density are intentionally varied widely by experimental design, which results in a great deal of variation in rice yield. In conventional rice farming, however, a single farmer basically practices rice farming in a uniform manner (fertilizer application, planting densities, etc.) for each cultivar in their land. In this situation spatial variation of crop growth and resulting yield would be much less than these experimental studies. Recently, commercial multispectral sensors and UAVs become less costly and affordable for general users in actual farming practices. However, potential and applicability of UAVs remote sensing in non-experimental rice farming is not well discussed.

The goal of the study is to explore the effectiveness of a commercial multispectral sensor mounted on a UAV in a conventional rice production practice. Our specific objectives is to examine: (1) the capability to detect spatial variation of rice growth in multi-temporal growing stages, and (2) correlation between VIs calculated from multi-temporal imageries and rice yield obtained from small quadrat sampling.

2. Material and methods

The study was conducted at rice fields in Takizawa Farm of Field Science Center, Iwate University located in Takizawa City, Iwate Prefecture, Japan (39°46'44.8"N 141°07'39.3"E). The annual average temperature and precipitation of the study site are 9.9 °C and 1099 mm, respectively. Seven compartments of rice field with the size of 0.33-0.40 ha were taken as sample plots, where cultivar of Hitomebore (*Oryza sativa* Japonica Group cv. Hitomebore) is cultivated in a conventional manner in which application rate of N, P, K are 75 kg/ha, 66 kg/ha, and 55 kg/ha, respectively, and top-dressing is not applied. The planting interval of rice is 16 cm × 30 cm.

The UAV used in this study is 3DR Solo. The 4-band (G, R, RE, NIR) multispectral sensor, Parrot Sequoia, was mounted on this UAV. Imageries were captured at the height of 100 m (ground spatial resolution: 9.8 cm) in planting season of 2017 for each growing stage: transplanting (May 16), initial tillering (Jun 5), tillering (Jun 20, 21), jointing/panicle formation (Jul 5, 11), heading (Aug 11), filling (Aug 31, Sep 14). Ortho-mosaic images were produced by online image processing software Micasense ATLAS, and NDVI and NDRE⁴⁾ were calculated by ArcGIS 10.5.1. These indices were extracted and averaged for each quadrat set in the subsequent field sampling.

Manual quadrat sampling was conducted on September 25, 2017 to determine rice yield. The size of a quadrat was 0.9 m × 1.6 m containing 30 clumps of rice. A total of 41 quadrats were set to cover all compartment of rice field. Harvested rice was air-dried for 2 weeks and processed to determine the weight of gross brown rice, which was subsequently sorted to obtain net brown rice (>1.9 mm) weight and yield ratio (net/gross) was calculated.

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3. Results and discussion

The yield of gross and net brown rice was 7.13 ± 0.57 t/ha and 6.53 ± 0.52 t/ha, respectively (mean \pm sd). Significant difference of these values was not found in any pair of rice field compartment (Tukey HSD, $P > 0.05$ for all). The temporal change of VIs (NDVI and NDRE) at several growing stage is shown in Figure 1. Both indices increased as the rice grows in tillering stage and recoded maximum value at jointing and panicle formation stages in July, after which decreased at heading and filling stages. Spatial variation of both indices, indicated as standard deviation, was larger in initial growing stages (tillering stage) and decreased after jointing and panicle formation stages. Weak positive correlation was found between yield of gross brown rice and VIs after heading stage (Figure 2), where strongest correlation was found in late filling stage (Sep 14) for NDVI ($R = 0.32$, Figure 3) and heading stage (Aug 11) for NDRE ($R = 0.25$). Zhou et al. (2017)³ reported that booting stage is the optimal stage for grain yield prediction and NDRE showed the stronger correlation than NDVI. Unfortunately, we could not acquire imagery in booting stage (late July) for some technical reasons. On the other hand, Tanaka and Kondoh⁵) applied NDVI values in heading stages as an optimal predictor of rice yield. Though no correlation ($R < 0.2$) was found between VIs and net brown rice yield, we found negative correlation between VIs and yield ratio, where $R = -0.73$ for NDVI (Figure 4) in late filling stage, and $R = -0.59$ for NDRE in heading stage. This reflects insufficient ripening condition of rice in the period of quadrat sampling due to poor sunshine in August 2017. The positive correlation between gross rice yield and VIs may be offset by negative correlation between yield ratio and VIs.

Even weak correlation between rice yield and VIs, we could demonstrate a potential of UAVs remote sensing in non-experimental and conventional agricultural practices. Further discussion on methodology such as optimal flight height, capturing period, sampling design, etc. is needed to enhance the capability to assess the crop growth.

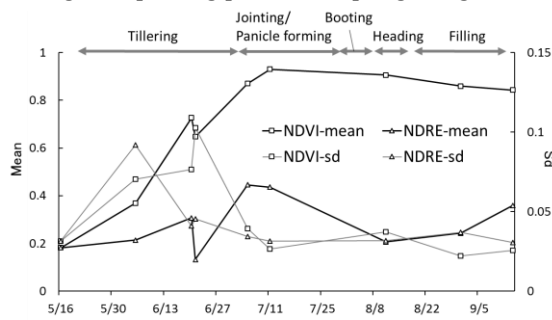


Figure 1. Temporal change of vegetation indices

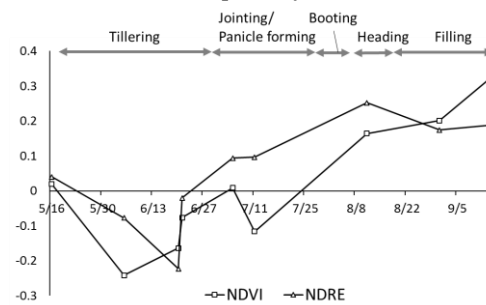


Figure 2. Correlation between yield of gross brown rice and VIs

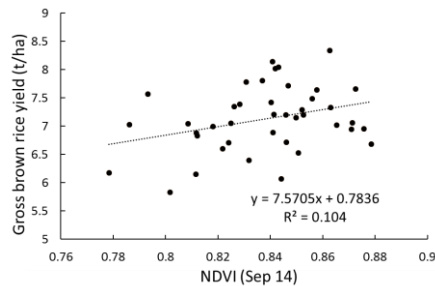


Figure 3. Correlation between gross brown rice yield and NDVI in filling stage

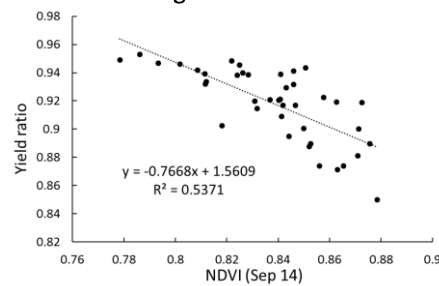


Figure 4. Correlation between yield ratio and NDVI in filling stage

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Actual condition of radioactive contamination in rural areas due to Fukushima nuclear power plant accident and decontamination limit

Through support research at Iitate village in Fukushima

Koji ITOANAGA

1. Introduction

Iitate is the beautiful villages in Japan. Its landscapes of forested mountains and gently rolling farmland were home to about 6,100 people. The people of Iitate were planning their community around the theme of a “Madei life,” using a word that in the local dialect means “respectfully and carefully.” That all changed on March 11, 2011. Iitate is no longer a pastoral village living in harmony with its natural surroundings. The 2011 accident at the Tokyo Electric Power Company (TEPCO) Fukushima Daiichi Nuclear Power Station spread radioactive contamination to a number of surrounding villages, including Iitate—centered approximately 40 kilometers to the northwest. On the evening of March 15, 2011, rain and snow fell on Iitate and contaminated the village with radioactive material from the nuclear accident. With no evacuation instructions from the government, villagers who lived 30 kilometers or more from the nuclear facility continued to be exposed to radioactivity. Evacuation orders for Iitate finally came on April 22, but by then villagers had already received some of the highest exposures.

I had worked to support the village administration from 1993. I was able to form the Iitate Village Support Team only five days after the disaster. Since then, we have worked with local government and villagers to provide refuge and recovery advice to the village, carry out radioactivity and public opinion surveys, and develop a long-term plan for coping with the disaster. Approximately two months after the accident, the cooperative relationship with the administration has disappeared from the viewpoint of the difference in the risk assessment against the radioactive disaster and information disclosure. Since that time, we have established a cooperative relationship with the villagers and have been carrying out various support research activities to date.

April 23, 2011 Designated as an evacuation area, the evacuation life of all the villagers continued until March 2017. Recklessly, the evacuation direction was canceled except on a part of the village on March 31, 2017. The village office is functioning, but in November 2017, the villager who returned home was about 10%. In November 2017, more than half of all the households in the village acquired new houses outside the village.

I report the actual condition of housing pollution in 6 years and the effect and limit of decontamination.

2. Radioactive contamination situation immediately after the disaster

On the evening of March 15, 2011, after the air radiation dose in front of the village office was measured at 44.7 μ Sv/h, we urged Iitate’s mayor to hasten the evacuation of children and pregnant women. Some villagers were evacuated, but by the end of March they had returned—after a team of radioactivity experts commissioned by the village authorities and led by Syunichi Yamashita, vice president of Nagasaki University, advised that it was safe to do so. Our Iitate support team cooperated with Tetsuji Imanaka of Kyoto University, a nuclear energy researcher, to conduct an aerial dose rate investigation and soil analysis across the whole village area on March 28 and 29, 2011. In the southern part of the village, closest to the nuclear power plant, the survey found radioactivity values of 30 μ Sv/h (Imanaka et al. 2012). The team presented these unsettling findings to the village authorities, but the mayor refused to make them public, so our support team also published them.

3. Changes in radioactive contamination inside and outside the housing, limit of decontamination

1) Measurement of air dose rate in 2013 before decontamination (5 houses in Iitate village)

The outline of the five measurement results is as follows. ① The second floor is relatively higher than the first

*Nihon University

floor. ② It is high in order of ceiling > floor 1 m > floor. ③ Mostly $0.6 \mu\text{Sv/h}$ or more of radiation control area standard. ④ In the average value [second floor ceiling $2.0 \mu\text{Sv/h}$ > second floor 1m $1.6 \mu\text{Sv/h}$ > first floor ceiling $1.5 \mu\text{Sv/h}$ > second floor $1.2 \mu\text{Sv/h}$ > first floor 1m $1.1 \mu\text{Sv/h}$ > first floor $0.7 \mu\text{Sv/h}$], the second floor tends to be high and the ceiling tends to be higher is there.

2) Measurement in 2014 including decontamination houses (Iitate Village et al., 14 cases)

The air dose rate inside and outside the house is correlated. $3.4 \mu\text{Sv/h}$ outside the housing, $2.1 \mu\text{Sv/h}$ in the housing is the highest value at the dose rate. The dose rate of all non-decontaminated houses exceeds $0.6 \mu\text{Sv/h}$ of the radiation control area criteria. This indicates that residence is difficult. The air dose rate inside and outside the housing of decontaminated houses is reduced to $0.9 \mu\text{Sv/h}$ outside and $0.4 \mu\text{Sv/h}$ or less in the room. There is an effect of decontamination. However, they exceed the standard of radiation control area. The shielding effect of the building is about 50%, the interior nearside the outer wall, especially the interior of the mountain is higher. Like as 2013, the second floor is higher than the first floor, and at the first floor the space dose tends to be higher at floors <1 m above floor <ceiling.

3) Measurement of all decontaminated houses in 2017 (Iitate Village et al., 10 cases)

All houses investigated were decontaminated. Due to the natural reduction of radioactive cesium and the decontamination effect, the air dose rate in residential houses has been reduced to 30 to 40% compared to 2014. In residential land it decreased to 20%. However, there were some residential lots in the soil where radioactive cesium remained about thousands Bq / kg. About 90% of cesium adhered to the surface layer in the event of a disaster, but after decontamination it is around 40% in the surface layer. Cesium remains in the ground due to stirring by wild boar, stirring by decontamination work, etc. There are many strict parts to utilize as a farmland for a self-made vegetable garden. In the life in the village, the additional exposure dose is 4.5 mSv a year. It is about 4.5 times the value acceptable to the people. The half-life of radioactive cesium 137 is 30 years, and the additional radiation dose will be 1 mSv per year in about 50 years. There is no situation where evacuation can be canceled.

4. Satoyama, forest pollution and decontamination limit

There is a mountain behind the house in Iitate village. The mountain is radioactively contaminated, decontamination is only in the range of 20 m from the residential land. The way of decontamination only removes contaminated fallen leaves and does not remove contaminated soil. The distribution map of the air dose rate in the mountain behind decontamination shows only the surroundings of the decontaminated housing low, and the mountain of the back shows the situation with high air dose rate. Furthermore, the air dose rate at the side of the road is high. Only decontaminated residential land is only a cool spot of radioactive contamination.

5. Radioactive contamination of wood

The content of radioactive cesium of pine at a position with an air dose rate of $1.3 \mu\text{Sv/h}$ at 1 m above the ground was analyzed in 2015. The bark was 3243 Bq / kg, the sapwood material was 126 Bq / kg, the core material was 53 Bq / kg, and the leaf was 245 Bq / kg. The cesium content of the bark is high. Government firewood regulation value is 40 Bq / kg, and it is impossible to sell this material as firewood. Cedars of $2.0 \mu\text{Sv/h}$ in the soil surface were cut and measured. Radioactive cesium is as high as 26500 Bq / kg in the soil 5 cm layer. Radioactive cesium is 13900 Bq / kg in bark, 120 Bq / kg in sapwood, 400 Bq / kg in core material. The degree of radioactive contamination of cedar heartwood is higher than other tree species. Nevertheless, the government has not enacted the regulation value of timber for building. This is a big contradiction.

6. Conclusion

The regeneration and revival of the traditional rural life culture that sustainably utilized the forest is the future of more than 100 years. Not only the villagers lost their homes, but also the people of the future lose their culture of living together with precious forests. This situation is strongly recognized by the state, prefecture, village authorities and the people, and relief to the victims of radioactive contamination (pollution victims of radioactive pollution) is an urgent matter.

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Land use change in 100 years and increased disaster risk.

Flood Disaster in Joso city, on the Kinu River caused by Kanto-Tohoku heavy rainfall in September 2015.

Ikuko IMOTO*, Tomohiro ICHINOSE**, Satoru ITAGAWA***, Yumi YAMADA*

1. Introduction

In September 2015, Kanto-Joso area by the Kinu River had experienced a widespread flood inundation, caused by overflow and levee breach, after a severe rainstorm in northern Kanto area, nearly 650mm from Sep 7th to 11th. By that flood of the Kinu River, claimed the life of 2 persons and caused about 4,400 houses to have floor level inundation, and also 6,600 houses under floor inundation.

Joso area, placed about 30 to 50 km from Tokyo, was a flat agricultural region with paddy rice fields, before 1960th. Historically, the Kinu River flooded many times, so that villages and roads were placed on the natural levees and river bank dunes. However, in late 20th, after reinforcement of the river control and development of Tsukuba New Town in the adjacent area, this area has become a suburb of Tokyo and Tsukuba city. We examined the change of the land use and the estimated amount of damage by the natural disaster.

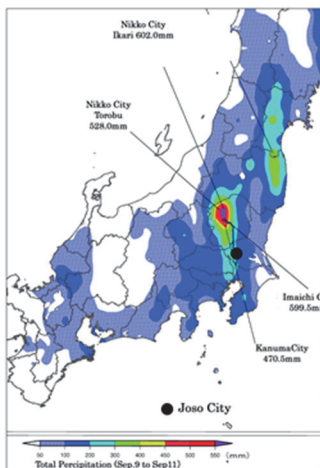


Fig.1 Total rain fall amount, from 9th to 11th Sep. Heavy rain fall at Upper basin or the Kinu river . (The Meteorological Agency^①)



Fig.2 Flooded area at 6pm. 10th Sep. (Traced from the flooded area map by Geospatial Information Authority of Japan ²⁾)

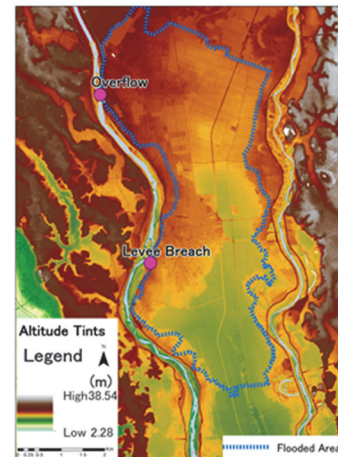


Fig. 3 Landform of the area, (Made from 5m DEM data by Geospatial Information Authority of Japan)

2.Methods

We analyzed land use changes in the flooded area of Joso City from 1907 to 2015 using old topographical maps and vegetation maps. The publication year of the topographical map is 1907 and 1953, the oldest one and the one just after the World War II. For recent land use change, we used the vegetation map published by Ministry of the Environment, since 1973. There are two vegetation maps in the area, namely the old one drawn on a scale of 1:50,000 in 1981 and the new one on a scale of 1:25,000 in 2000. We classified nine land use types from these maps. As for estimation of the disaster-affected area, we used the flooded area of Sep.10th 6 pm, to know the direct influence of the breach and overflow, while the inundated area of Joso City changed within 3 to 4 days according to elevation and drainage of the area.

3.Results and Conclusion

Fig-4 showed that urban land use of the area had not increased much from 1907 to 1953. Also, in those days, the Kinu river was an essential element for ship transportation. Therefore, the towns and villages were placed near the river and on natural dikes or sand hills. Paddy rice field placed at low elevation flat in those time. The dry fields of the area were for many kinds of crops, wheat, barley, mulberry, and upland rice⁴⁾.

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After the high economic growth periods of 1960's, urban land use of the area increased and spread widely to the dry fields. Moreover, rice field also spread into the dry field area following the improvement of the cultivation and the irrigation system of rice field.

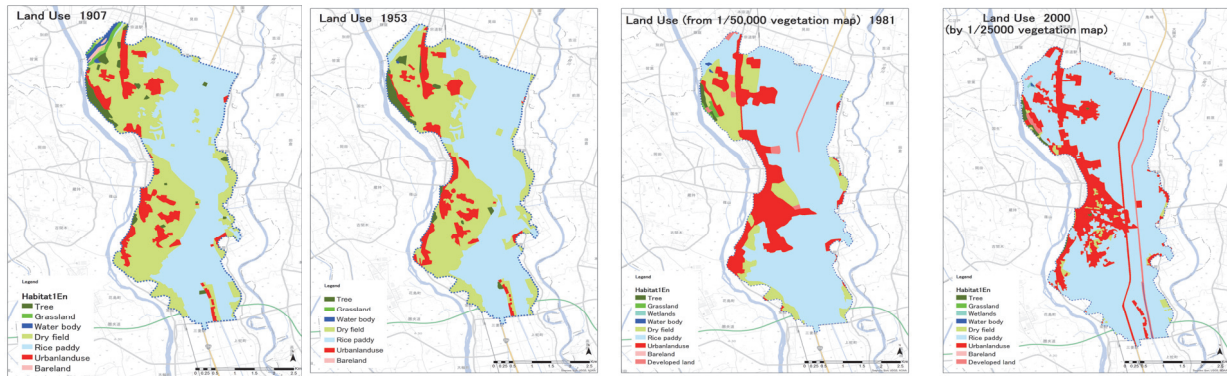


Fig.4 Land use transition from 1907 to 2000

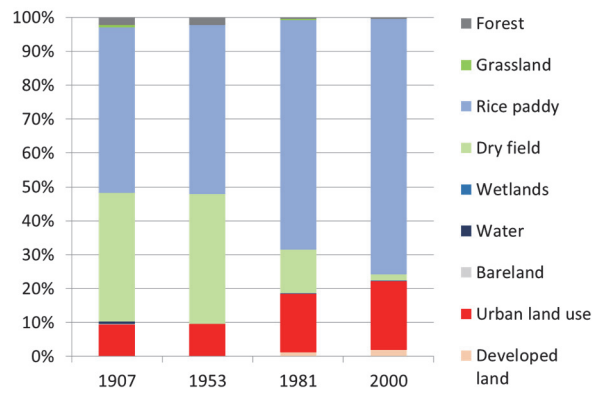


Fig.5 Land use ratio from 1907 to 2000

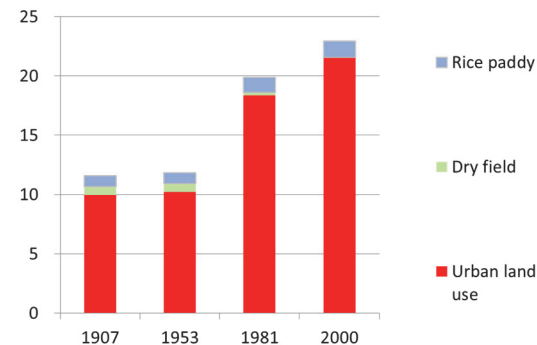


Fig.6 Disaster damage, estimated from land use of the flooded area, in 2015

We estimated the economic loss of the disaster from the flooded area in 2015 and the land use of each year. Fig. 5 shows the land use ratio of the four years. Urban land use was only 9%, 10%, 17%, and 20% in 1907, 1953, 1981, and 2000, respectively. Conversely, agricultural use (rice paddy and dry field) decreased after 1953. Then the estimated total disaster damage increased from about 11.6 billion yen in 1907 to 22.9 billion yen in 2000 (Fig.6).

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Historical contexts of rural planning in Kumamoto Prefecture

Kaoru ICHIKAWA* and Toshitaro MINOMO*

1. Introduction

Today's Kumamoto Prefecture primarily consists of three areas from the Edo feudal period (1603–1868), namely Hosokawa Domain, Sagara Domain, and Amakusa area. The former two were ruled by feudal lords, and the latter was directly ruled by the central (Edo) government through appointed governors. It can be assumed that this governance system, which uses local rulers, affected regional polices in ways that reflected the local conditions and social situations. These local differences can be observed by examining the disciplines of landscape architecture. Examples include “garden culture” of Mito and Maeda Domains and Nanko Park of Shirakawa Domain. Nanko Park was constructed by Lord Sadanobu Matsudaira for the enjoyment of people from all social classes and the Park's main component—the irrigation pond (Nanko)—was used for agricultural purposes. The central government did influence feudal lords through tax imposition and the system called “sankin-kotai,” under which the lords were required to spend every other year in Edo. However, the governance system was decentralized because the lords and governors ruled the territories with their own wisdom and ingenuity; thus, it was an age of localism. This study considers concepts and technological developments in rural planning by focusing on localism by examining these three different cases. By doing so, we aim to understand the major patterns of locally-oriented rural planning in Japan. We expect that this attempt will serve as material for further discussion and exploration to deepen the understanding of rural planning in monsoon Asia.

2. Three distinctive types of rural planning in Kumamoto Prefecture

We examined the historical epoch-making events of rural planning in the aforementioned three areas during the Edo era. Hosokawa Domain is characterized by extensive land reclamation from the Ariake and Yatsushiro Seas (Fig 1.). Land reclamation efforts in both of these seas demonstrate a type of rural planning to which knowledge of water supply and drainage systems in tidal flats are key for development. Therefore, in this area, we can find locally-oriented wisdom and ingenuity on these important issues.

For Sagara Domain, we noted that the area is characterized by Hitoyoshi Basin, formed by the Kuma River system, one of the three fastest rivers in Japan and the Kyushu Central Mountains. On the right bank of the river, agriculture is practiced on the narrow valley and small alluvial plains formed by Kuma River and its main tributary Kawabe. However, our focus is on the history of the development of the irrigation systems, called Hyakutaro-mizo and Kono-mizo, which can be observed on the left bank (Fig 2.). These irrigation systems enabled extensive rice cultivation fields by constructing a training wall and a diversion weir in upper stream of the Kuma River. After the construction of the irrigation systems, rice production massively increased in Sagara Domain from around 2,000 koku (1 koku = 180 liters) to up to 30,000 koku.

The Amakusa area is partly characterized by the culture of the hidden Christians with strong links to Nagasaki. As the area consisted of islands, livelihoods of people were self-sufficient and supported by both agriculture and fisheries. Rural planning in this area was characterized by a harmony with the landscape: the cultivation of the new land went up the hills because of limited flat land and the rough sea around the islands. This type of rural planning, characterized by the development of terraced fields, is unique to islands and effectively responded to an increasing population and food demand. An example of these terraced fields exist around the Oe Church in Amakusa (Fig 3.), one of the places described in a well-known travel writing titled, “Gosoku no Kutsu” (Five Pairs of Shoes), written by five poets who traveled the Kusyu island in 1907. Incidentally, there were also plans of land

reclamation for the development of new fields in the coastal areas, but these efforts were not successful in Amakusa.

3. Discussion

These three cases might provide insights for modern rural planning. These cases demonstrate that highly acclaimed rural planning is achieved only through a “combination of philosophy and action.” Soichiro Honda, a well-known Japanese industrialist, said, “Technology without philosophy is a lethal weapon,” and, relatedly, that “philosophy without action is worthless.” In societies experiencing population decline, innovation and redesign is important in different elements of rural planning including agriculture, farmland, rural areas and ways professionals work." In this context, it is worth examining the history of rural planning as a basis for current rural development.

These three areas enhanced food production and stabilized their economies in different ways. Hosokawa Domain overcame river flooding and opened extensive new agricultural fields on tidal flats, whereas Sagara Domain addressed water scarcity in the alluvial fan by building large scale irrigation systems to transmit water from the Kuma River. In Amakusa, farmers created terraced fields on hills to enhance sweet potato production, which can grow in poor soils. People captured the unique limitations and potential of the local areas when overcoming development challenges.

Considering the current population decline in rural areas, however, it is evident that a similar type of rural development characterized by the enlargement of farmland is not suitable. Nevertheless, the outcomes of rural development, achieved through local ingenuity during the Edo era, strongly characterize each of the areas today. Furthermore, these outcomes are even more appreciated than those achieved in a latter period when rural planning became an object of science and supported by modern technology. Infrastructure like dikes and sluice gates shape the unique landscape together with the large flat rice fields in Ariake and Yatsushiro, and folksongs once sung by the farmers when engaging in the construction work have been passed down in the areas. The irrigation canals of Kono-mizo and Hyakutaro-mizo are important elements of the beautiful rural landscapes in the Hitoyoshi basin and people’s appreciation and awe of water are expressed during traditional events and by the offerings placed in the canals. In Amakusa, this understanding started to deepen in relation to Christian culture as well as the beautiful rural landscapes. It should be highlighted that these landscapes have been shaped, not only by the existence of the infrastructure, but also through their use, maintenance, and improvement. For example, the Kono-mizo Land Improvement District is still actively maintaining the irrigation facilities beyond the administrative boundaries. This means that these irrigation systems are gradually becoming valued as cultural heritage that characterizes the areas, rather than just facilities for agricultural production. They even valued nationally and internationally, as seen in the recent certification by the National Important Cultural Properties (Ariake and Yatsushiro), Important Cultural Landscapes (Amakusa), and the International Commission on Irrigation and Drainage (ICID) Heritage Irrigation Structure (Hyakutaro- and Kono-mizo). In the future, these locally-focused methods could play a role in promoting “green infrastructure,” including in the context of disaster prevention and mitigation in monsoon Asia in the era of climate change.

Reflecting on rural development in the early modern era and understanding its influence today could be beneficial for considering the future of locally-oriented rural planning. Japan’s agriculture developed around rice, and the reclamation and improvement of irrigation were major approaches to increasing production. In addition, terraced field was another major approach in areas with limited flat land, such as islands and mountainous areas. Thus, further examination of these three cases could inform future rural planning in Japan.

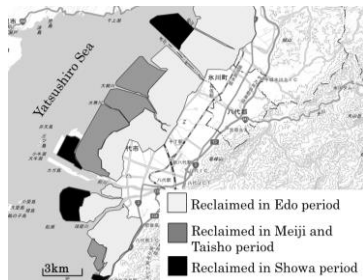


Fig. 1 Land reclamation in Hosokawa Domain (Created using GSI maps)

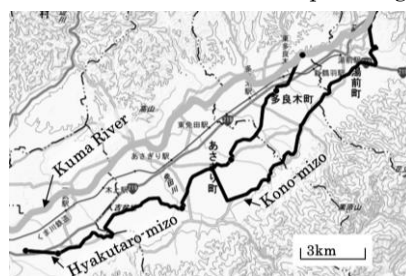


Fig 2. Irrigation canals in Sagara domain (Created using GSI maps)

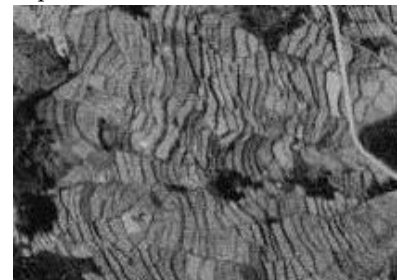


Fig 3. Terraced fields in Amakusa area in 1947 (Aerial photo by GSI)

Economic evaluation of Green Infrastructure at Higashiōmi city, Shiga prefecture.

Michiya Morisaki* ,Tomohiro Ichinose*

1. Introduction

In recent years, environmental concerns such as global warming and air pollution have been widely taken up worldwide and at the same time their interest is rising. In Japan, the concept of taking nature as capital and the concept of green infrastructure, which is multiplied by the growing interest, has attracted attention. In the first place, green infrastructure is a concept developed in the latter half of the 1990s in Europe and the United States. Although there are various definitions of it, "efforts or concepts of social capital development, land utilization and disaster prevention using nature's forces and mechanisms" is general. In Japan as well, it is used in "government planning plan" etc. in the government plan in 2015, and it is getting more general.

In addition, Eco-DRR, which is one of the functions of the green infrastructure, has also garnered worldwide attention. This is a generic term for functions that mitigate the risk of people and their property being put at risk by preventing disasters and acting as a buffer zone for the impact from disasters. In response to unprecedented natural disasters frequently occurring due to climate change, there is also pointed out that green infrastructure is superior to gray infrastructure such as embankment in terms of its disaster reduction function and maintenance and maintenance expenses. In Japan, with her declining population, various discussions are also being done on land use laws to minimize disaster damage.

From the background as described above, the green infrastructure has attracted attention. However, the economic evaluation of green infrastructure has not been done much in Japan yet.

In this research, we will focus on Higashiōmi City in Shiga prefecture where floods occur frequently. Based on the concept of Eco Disaster Risk Reduction (Eco-DRR), we calculate the reduction rate of the damage caused by disasters when developing the green infrastructure in affected areas. In addition, we evaluate the reduction rate of disaster damage when people living in a high-risk areas migrate to areas with less disaster risk.

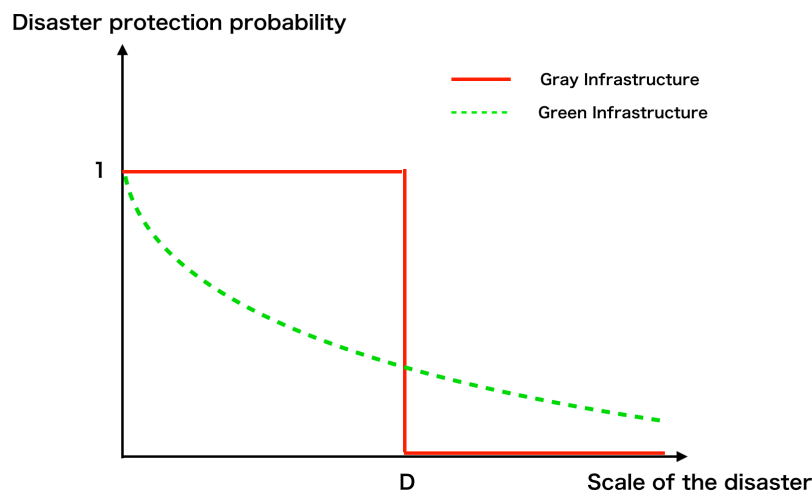


Fig.1 Assumption about disaster protection probability of both infrastructure

2. Methods

Regarding the survey method, we start from creating a habitat map, a hazard map, and a population forecast map on a mesh basis. First, we will prepare a Habitat Map (Land Use Map) for each age of Higashiōmi City based on an older topographic map and the vegetation map of the Ministry of the Environment to clarify the

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transition of its Habitat type (usage method). Also, for the Habitat in the hazard area, we will apply the same work using flood area and hazard map etc.

Then, we will combine them with figures of population estimation to infer the mesh where the hazard potential is high but the population is densely populated in the future. By doing so, we will know the mesh that will suffer damage in the future, so we will be able to create a Habitat map that can minimize the amount of disaster damage.

Also, in Shiga prefecture, since three kinds of maximum flooding depth data of flooding are indicated by probability for 10, 100 and 200 years, respectively, we can know changes types of hazard change by probability.

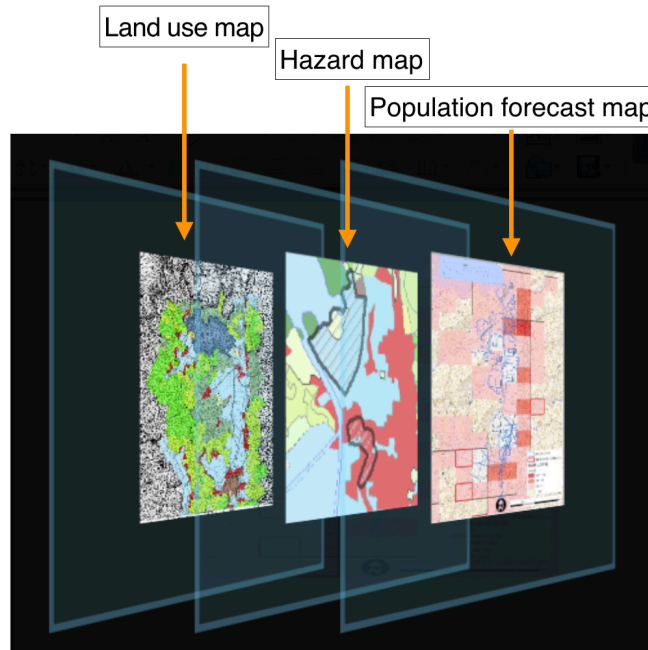


Fig.2 Research image

3. Expected results

Our hypothesis for this research is that the amount of disaster damage decreases in Higashiōmi City by introducing measures of green infrastructure instead of gray types. It is expected that this will be possible by setting the indicator of whether land use is appropriate based on the amount of disaster damage. Also, it is expected that comparison with gray infrastructure can be done on the basis of damage amount.

In addition, establishing this economic evaluation method increases the possibility that green infrastructure is actually used. If so, even if an unprecedented disaster occurs, the scope of its impact will be small.

Acknowledgements:

The authors gratefully acknowledge financial support from the Environment Research and Technology Development Fund (4-1505) of the Ministry of the Environment, Japan and Research Institute for Humanity and Nature (RIHN: a constituent member of NIHU) Project No. 14200103.

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A Study of Intention of Migration based on the Regional View

Assuming Nankai Mega-thrust Earthquakes

Focusing on the Regional View about Safety and Resilience

Ryohei YAMASHITA*

1. Background of study and data collection ¹⁾

In the process of restoration following the damage caused by the Great East Japan Earthquake, Kumamoto Earthquake and other disasters, a rapid population shift was observed. Consequently, in this study, the effect of the risk of Nankai mega-thrust earthquakes was investigated. These disasters related to population shift, with the Pacific coast area of Japan as a hypocenter, are expected to occur within every ten years. In particular, the effect of residents' recognition of an area, from the perspective of safety and resilience on their intention of migration based on the risk of earthquakes, was explored in this study. An online survey was conducted in October 2015 and 6,300 persons (approximately) living in areas located from Kochi to Kanagawa Prefectures responded (Fig. 1). The following basic information was included in the survey: age, gender, occupation, family composition, household income, and accommodation as well as details. This is presented in Table 1.

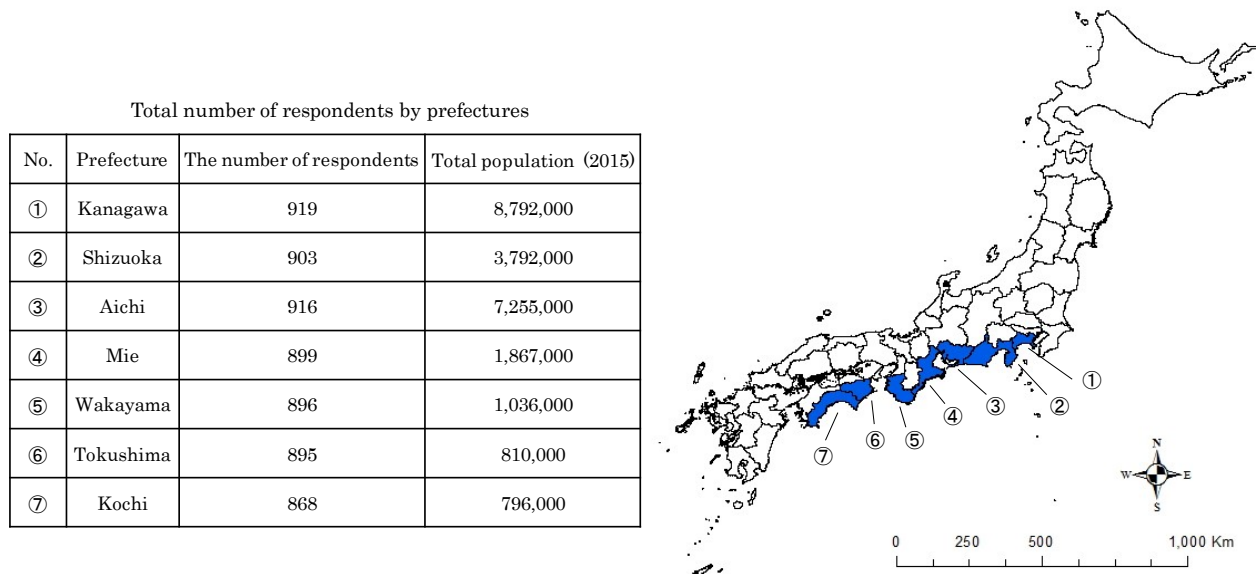


Fig. 1 Questionnaire survey form's distribution areas

2. Results and Discussion

Logistic regression analysis was conducted using the data obtained from the survey. Subsequently, the relationship between intention to migrate and the individual view was evaluated statistically. In Table 2, some of the attributes of the respondents are presented.

As to another data except in Table 2, personal attribute information such as household income and family composition, statistical data on the geographical characteristics of the place of residence were collected and used for analysis.

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Table 1 Analysis questions and options

No	Questions	Options
①	Do you think that a massive earthquake, which made the coast of the Pacific Ocean the hypocenter, will affect your future?	1: I certainly think so, 2: I do not understand, 3: I do not think so
②	When the massive earthquake occurs, did you think it will influence the area you live in and the environment where you live now?	1: It is serious ... I must take refuge, 2: There will be damage for a while, 3: the damage is not serious, and 4: I do not understand
③	Do you become a stranded commuter when disasters such as a massive earthquake occur?	1: There is a high probability I will become stranded, 2: I may become stranded, and 3: I definitely will not become stranded
④	In general, do you feel safer in a city or rural area when faced with the possibility of a massive earthquake?	1: City area, 2: Rural area, and 3: I do not understand
⑤	When damage caused by an earthquake causes confusion, do you think it is better to remain in a city or rural area until the affected area has been restored village area?	1: City area, 2: Rural area, and 3: I do not understand
⑥	Are you considering change of a place of residence for the purpose of keeping the safety and property of the body supposing the risk of a huge earthquake disaster?	1: I inquire concretely. (I already emigrated actually for the purpose of disaster prevention), 2: I examine a few. And, 3: I do not inquire at all.

The results are summarized as follows.

- ①: Elderly people tended to think that “urban areas are safer” when comparing urban areas and rural areas. On the contrary, the tendency not to consider urban areas safe was perceived by people who realized that there is a high probability that they would become home refugees when the disaster occurred. Most of the respondents resided in areas with a high population density and had relatively high household incomes.
- ②: The tendency to think that rural areas were safer was found in people living in areas with a relatively high population density. On the other hand, people who lived far away from the coastline, relatively older people and men tended to perceive that rural areas were not safe.
- ③: A comparison in this study between urban and rural areas could not determine that a tendency to think that urban areas were more resilient. The tendency not to think that urban areas were more resilient is seen in people who were aware that enormous damage would occur when a huge earthquake occurs.
- ④: The tendency to think that rural areas are more robust was found in people who lived in areas with a high population density or who had a clear view of accidents as a result of massive earthquakes. In contrast, there was a tendency for men to think that rural areas were not resilient.
- ⑤: In this study, it was confirmed statistically that these regional views to think that 1) urban areas are considered to be safe and 2) urban areas or rural areas are regarded as resilient, influence a consideration of emigration. And then, a regional view that rural mountainous areas were considered safe did not significantly affect the intention to migrate.

Note

- 1) This research was conducted with the support of JSPS KAKENHI (24248039, 15H05630). This report is being revised and is based on a paper (In Japanese) published in Rural Planning Society Journal Vol. 36, No. 3 issue.

Table 2 Age and gender distribution of respondents

Age/Sex	Male	Female
Under 29	193	737
30 ~ 39	496	1,072
40 ~ 49	791	874
50 ~ 59	758	503
Over 60	607	264

Investigations on farmland and agricultural facilities damaged by the 2016 Kumamoto Earthquakes

Mizuki HIRA *

1. Outlines of Kumamoto Earthquakes

Magnitude 6.5 earthquake occurred at the epicenter of Kumamoto district on April 14, 2016 at 21:26 p.m. And, more than M7.4 earthquake followed on April 16, 2016 at 1:25 a.m. There were registered more than 5 degrees on the Japanese scale in Kumamoto, Ohita, Fukuoka, Saga, Nagasaki and Miyazaki Prefecture. Though there were approximately 2,000 times aftershocks after that two big earthquakes by Meteorological Observatory, the refuge term from earthquakes took so long. The seismic epicenter (hypocenter) seemed to be moved Futagawa rift and Hinagu rift. The Administration in Japan admitted as a great loss disaster area by the Disaster Relief Act on April 25. Now, many supports for these disasters are continued by lots of people in Kumamoto Prefecture. The results are shown in the following section, which based on both the field investigations and reports by Agriculture, forestry and fishery department, Kumamoto Prefecture on April 23 and September 2.

2. Damages of Farmland and Agricultural facilities

The amount of damage are estimated approximately 148.7 billion yen on Agriculture, forestry and fishery relations. Maximum amount of damage was registered since the attack by Typhoon 18, 1999 (80 billions yen). The detail were shown that 104.8 billion yen on Agriculture, 40.6 billion yen on forestry and 3.3 billions yen on fishery. Numbers and the amount of damage of farmland and agricultural facilities are shown in Table 1. There were so many damages for facilities for livestock, apparatus for agriculture, and cooperative barns and so on in Aso district especially.

On farmland damage relations, it was shown in photos, liquefaction in paddy field (Photo 1), collapse of slopes, rifts and cracks of ground (Photos 2 and 3), fall-down of paddy wall (Photo 4), settlement and swell of ground, and grass in pasture. Besides, on agricultural facilities, collapses of embankments and cracks of reservoir (Photos 5 and

Table 1 Number of damages and the amount of damages (reference Kumamoto Pref.)

Kumamoto Earthquake (September.5 2016)		Number	billions yen	Remarks
Farmland	Paddy field	767.4	21.8	Collapse of slope, rifts Cracks, liquefaction pastures
	Upland field	349.8	5.4	
Subtotal		1,117.2	27.2	
Agricultural facilities (Number)	Agricultural	497.0	39.2	Reservoir, Irrigation conduits and drainages, Agricultural roads Drainage facility Embankments of cost line and slopes
	Facilities for life	0.3	0.3	
	Coast line	7.0	3.5	
Subtotal		504.3	43.0	
Farmland and Agricultural facilities Total		1,621.5	70.2	Estimated Amounts

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6), settlement of road (Kumamoto-shi and Mashiki-cho) cracks of road (Uki-shi), damages of Agricultural roads were reported in Mashiki-cho, Mifune-cho and Kousa-cho etc.

In Kumamoto Prefecture, as the countermeasure against the following disasters, the protection of collapsed embankment by blue sheets, discharge by temporary pumps and observation of danger places using the live camera continuously were executed. And urge to supports for restart and the continuation in agriculture were supported. In addition to that, there were the supports of their farmer's own activities and urgent procedure of agricultural water facility for rice crop, secure of alternative water resources, supports of crop conversion.

The constructions in farmland and agricultural facilities are planned to retrieve until 2018. In spite of the retrieves for the original state, it is very important to construct the ground as a large piece of land in the future for concentrating farmlands. Furthermore, the project should be executed under the mutual agreements of people's opinions for completion of objectives in these regions.



Photo 1. Trace of liquefaction (Minami Aso).



Photo 2. Rifts in wheat field (Mashiki)



Photo 3. Rifts in cabbage field (Mashiki)



Photo 4. Fall-down of paddy wall



Photo 5. Cracks of reservoir (Ohzu)



Photo 5. Collapse of reservoir (Nishihara)

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A Study on the Conditions and Disaster Responses of Schools in Iwaizumi Town During Typhoon 10 (2016)

Yoshihiro KIKUCHI* and Shinya MORIMOTO**

1. Introduction

On August 30, 2016, Typhoon 10 approached Tohoku District, greatly changing its course and making landfall near Ofunato City, Iwate Prefecture. This large-scale typhoon brought record heavy rainfall in Iwate and Hokkaido and both areas suffered serious damage. The authors have conducted a survey on the actions undertaken by schools at the time of Typhoon 10 in Iwaizumi Town, in cooperation with the Iwate Prefectural Board of Education and the Iwaizumi Town Board of Education. The purpose of this study report is to analyze the disaster response of schools through focused case studies.

2. Method

The aim of the survey is to record the measures taken by schools during Typhoon 10. Also, survey members tried making the document applicable for future disaster responses based on the findings. The survey period is between November and December 2016. The subjects of the hearing survey include the principals or vice-principals of elementary schools, junior high schools, and a high school in Iwaizumi Town. There are 16 schools in total.

Results

(1) Case of School K

Response on the day before the disaster

August 29, 2016: The staff of K school examined measures preceding Typhoon 10 and decided to take action to address the situation while monitoring it closely. Until the morning of August 30, it had not rained much.

Response on the day of the outbreak

Morning of August 30, 2016: The school shortened the school hour, fed the children early lunch, and decided to let them go home. The school contacted the guardians in the morning. Also, the school staff communicated the special schedule to the school bus driver.

Evening and night of August 30, 2016: The road in front of the school flooded with water before 18:00, and the volume of water increased steadily. Although it stopped raining after 20:00, the flood situation did not readily settle. The school was not designated as a shelter, and so nobody was evacuated that night.

Response following the first day

August 31, 2016: Communication and transportation were hit, and public housing for teachers was damaged. Therefore, teachers made posters informing of the school's closure. In addition, the staff of the school made a safety confirmation list and walked through the neighborhood in the morning to confirm student safety. The road was isolated and in a state of disuse. The bridge was clogged with driftwood, and traffic movement was difficult.

September 1-2, 2016: The roads were partially opened, making movement by car possible, and school staff started commuting as well. All families were confirmed as safe on September 2. After that, teachers gave homework to children and considered the curriculum until the school reopened.

(2) Case of School L

Response on the day before the disaster

August 29, 2016: The administrators of the school decided to close the school the next day at about 15:00. They handed an information document detailing the school's closure and let the children go home. This was

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communicated to the guardians by email beforehand.

Response on the day of the outbreak

The school staff went to work as usual, but the principal appealed to them to go home early. However, several staff members worked the regular hours. It is considered that the clock-out time coincided with the time the wind and rain were at its strongest.

Response following the first day

August 31, 2016: The school landline and many cell phones were cut off, and the situation of the staff could not be easily confirmed. The school staff that commuted went to see the state of the area.

September 1-2, 2016: The school staff attended work on September 1, and shared information on traffic movement. They were able to assess the state of the school district from around September 2 and confirmed the safety of all children at this point in time.

(3) Case of School P

Response on the day before the disaster

August 28, 2016: The school principal assumed correspondence with regard to the typhoon attack a week prior to the damage. The route of the approaching typhoon, by the Meteorological Agency, showed the risk of a direct hit.

August 29, 2016: To ensure the safety of the children, they decided to temporarily close the school the next day. Each class teacher explained preparations for seeking refuge, and necessary actions in case of an emergency, to children in the homeroom. Absentees were contacted on the telephone.

Response on the day of the outbreak

The administrator urged the staff members of the school who must prepare for the typhoon for their families to take their annual leave. Particularly, those who commuted from distant places returned home early. Then, items at a risk of breaking due to strong winds were put away safely by the staff.

Response following the first day

August 31, 2016: The school staff confirmed the safety of the children. In addition, they confirmed the damage conditions and communicated the school's closure for a week. About half the children obtained the information.

September 1-2, 2016: The school revealed that it would stay closed until September 7 and arranged an attendance shift for the staff. They visited shelters in the town block and the workplace of guardians on September 2 and confirmed the safety of all children. Also, school support supplies were provided to the children.

4. Discussion

The survey clarified the acquisition method of disaster information, closure timing of schools, safety of the school staff, communication method at the time of the blackout, correspondence at the time the school became a shelter, and early reopening of the class and routine provision of school-provided lunch. Moreover, Typhoons 12 and 13 came in close succession at the beginning of September 2016. Therefore, the stricken area was put in a situation where it had to prepare for the next typhoon without being fully restored. Stakeholders of the disaster response have to assume a case of multiple disasters and develop the action plan in advance. Furthermore, this survey was carried out for introducing the Timeline to examine the action plan for disaster prevention before the disaster struck. For the reconstruction of the community based on disaster mitigation, it is believed that the Timeline method of disaster response will spread steadily.

5. Conclusion

Among schools surveyed by the authors, two schools were consolidated with other schools and shut down in March 2017. On the day of the disaster, both these schools received requests by the local inhabitants to become a shelter. The facilities of the school remained in those areas, but their functions disappeared. Local inhabitants and public institutions need to consider countermeasures for similar disasters. The coast of Iwate was hit by a disaster again before it could recover from the damage of the Great East Japan Earthquake. Based on interviews with the schools, the weakness of the area was further highlighted. Moreover, the potential of disaster response in the rural area was observed, for example, through management of shelters in cooperation with the community.

Acknowledgments

The authors would like to thank survey members Y. Sawaguchi and K. Nakajima. We are also grateful to the schools and associated organizations that cooperated with the survey.

Revival of Rural Traditional Event OYAMA- SANKEI (Holy Mountain Visit) of T Community Association

Hiroyuki FUJISAKI*

1. OYAMA-SANKEI

OYAMA-SANKEI(お山参詣) is the Autumn's most significant event of TSUGARU Region, at the northern end of Main Island, Japan. Each rural community's residents visit the holy IWAKI Mountain in groups on the 1st August in the old calendar. Dozens of residents walk in procession from their village to the mountain and pray for a plentiful harvest and the safety of their family. The procession consists of the leader, the mark flag, the offerings, GOHEI(the stick with wood shavings), the big flag, and the musical accompaniment band. Like so many other traditional events, the number of visiting community is decreasing.



Photo 1 Procession of OYAMA-SANKEI

2. Progress of revival of OYAMA-SANKEI of T community association

T community association resurrected OYAMA-SANKEI for the first time in 65 years. T community is located in the suburbs of HIROSAKI City, has 187 households, 536 persons, has T TSUGARU Lion Dance Preservation Party, and carries out NEPUTA (Big Lantern Festival).

The president of T community association had once experienced OYAMA-SANKEI in childhood and wanted to revive it and made it the pride of T community as well as Lion Dance and NEPUTA. He explained his hope to the members of the board of the community association. In January 2012, the application for HIROSAKI-City's grant to revive OYAMA-SANKEI was approved at the general meeting of T community association unanimously. After the city grant was approved, T community association organized eight working groups and prepared the OYAMA-SANKEI in referring to the community member's old materials. One group prepared various goods while another group considered the staff allocation. Fortunately, T TSUGARU Lion Dance Preservation Party inherited TOZAN-BAYASHI (musical accompaniments of OYAMA-SANEI). Most of the preparation was made by T community members only, but about making GOHEI carpenters of T community gained some technical advises of other community's carpenter. Finally, in August 2012, about 100 community members joined OYAMA-SANKEI. Moreover, in 2013, about 90 community members did.



Photo 2 OHATA-AGE (Hoist Big Flag)
in front of the IAWAKIYAMA Shrine

3. Community members attitude towards OYAMA-SANKEI

We distributed questionnaires to 150 households, through the members of the board of the community

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association, and had 138 questionnaires returned by post in January 2014. 57% of respondents were male, and 12.5% was under 40 years old, 16.9% was in the 40's, 17.6% was in the 50's, 29.4% was in the 60's, and 23.5% was over 70 years old. About occupations, 48.5% was agriculture, and 14.7% was an office worker.

About the participation experience of OYAMA-SANKEI of other community before the revival of T community's, 50.4% was never. However, about the participation experience of OYAMA-SANKEI of T community, none was only 12.6%, 36.3% was both years, 48.9% was one year.

Table 1 shows effects on participants themselves. Respondents answered in 4 levels (+3 yes, +1 a little, -1 little, -3 no). The figures are the average value. The sense of solidarity and attachment to T community were higher than themselves pleasure. Moreover, the more participation experience, the more effects, and Future participation intention.

About the participation fee, the most answer was 61.3% in about 3,000yen. The answer in 5,000yen was 33.1%.

About the future frequency of OYAMA-SANKEI, the most answer was 51.1% in every 4 to 5 years.

About the future difficulties of OYAMA-SANKEI, in descending order, inheritance of skills, to secure leaders, fund-raising, and to secure staffs were.

Table 1 Effects on Participants Themselves (+3 yes to -3 no)

participation	both year	one year	none
getting along with participants	2.57	2.40	2.00
companion spirit	2.28	2.01	1.25
attachment to K community	2.41	2.04	1.38
cherishing tradition	2.32	2.10	1.25
getting pleasure	1.63	0.79	-0.13
blessings of the holy mountain	1.04	-0.13	-0.75
future participation intention	1.68	1.16	0.18

4. Operating costs of OYAMA-SANKEI of T community association

Table 2 shows the operating costs of OYAMA-SANKEI. In 2012, since OYAMA-SANKEI of T community was held for the first time in 65 years, too many donations gathered. So, supplies expenses increased due mainly to food and beverage expenses. In 2013, since long-use implements were not necessary to buy, implements cost sharply decreased, and donations decreased.

It is not preferable to rely on city's grant. So we make two proposals. According to the 2012 budget, the supplies estimate 720 thousand yen. In case of the proposal A, the participation fee is fixed. Increasing the donations is necessary. However, the donations were decreasing. So, in the proposal B, participation fee needs to be raised to 5,000yen.

Table 2 Operating Costs (thousand yen)

year		2012 budget	2012 accounts	2013	proposal A	proposal B
participants*		120	130	106	100	100
income	participation fee	360	390	318	300	500
	donations	390	919	339	450	250
	city's grant	500	489	350	0	0
expenses	implements	530	530	50	30	30
	supplies	720	1,268	957	720	720

* include other community member

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State and Improvement of Legal System of Rural Disaster in Korea

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1. Introduction

Rural Society generally refers to areas, villages, or farmhouses where most of the inhabitants make farming. In order to lead agriculture has the form of colonies constituting scattered farms or farmhouses because large land is needed relatively. The large scale and complex damage has been increasing due to a number of related disasters. Especially disaster management in Korea is organized around cities. There is a different characteristic such as urban, social, environmental each other in rural areas. Therefore, disaster management system that reflects the characteristics is needed. Recently, Korea is promoting the capacity and responsibility of disaster response by local government as one of the national safety management promotion strategies. Although there is the difference of specificity and uniqueness of region between rural areas and cities, rural areas are not institutionally considered. This study is to analyze and problem Korean legislation on disasters in rural areas and to identify problems. In addition, we identified the problems of the legal system so that we could cope with disaster more effectively and actively in rural areas and searched for solutions.

2. Body

Korea's disaster management law began in 1967 with the enactment of the Flood Hazard Countermeasures Act. The Act provided systematic prevention of disasters, such as prevention of disasters, prevention of disasters, emergency preparedness and restoration. The accident beyond natural disasters was prepared according to instructions. The collapse of the West Sea in 1993, the collapse of Seongsu Bridge in 1994, and the collapse of the Sampoong Department Store in 1995 led to a 『 Disaster Control Act 』 in 1995. The Act was enacted for the purpose of establishing a disaster management system for national and local governments and responding to human disasters and social disasters. The 『 Flood Hazard Countermeasures Act 』 was amended as a 『 Countermeasures against Natural Disaster Act 』 for the purpose of integrating the natural disasters of natural disasters. Korea operated a management system by separating natural disasters and social disasters. In the 2000's, 『 Framework Act on the management of disaster and safety 』 was enacted to unify human disasters, social disasters and natural disasters. Since 2010, the nation has enacted national disaster management standards and redefined the concept of disaster.

The definition of rural farming communities in Korea is specific to the 『 Framework Act on Agriculture, Fishing and Food Industry 』. The definition of rural communities in Korea is stipulated in the 『 Framework Act on Agriculture, Rural and Food Industry 』. According to Article 3 of the Act, the rural area is designated as the area designated by the Agriculture and Fishery Ministry in consideration of local agriculture, agriculture, farming and fishing areas, agricultural and fisheries fields and living conditions. The law defines the same definitions in relation to rural villages. In Korea, the rural areas are classified as spatial and township segments, not reflecting the regional properties of rural areas. In addition, it was divided into administrative and political procedures as part of the Rural Development Policy.

In contrast, the concept of farming in Japan is clearly defined in Japan's legislation. This is attributable to the unique nature of farming and farming villages.

According to Article 5 of the Food and Agriculture Community Act, the Rural Community serves as a place where local residents serve as the basis for sustainable development of agriculture, and the provision of food and other agricultural and other agricultural functions. The rural laws of rural areas include the

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development of farming villages and the development of rural areas. This is because many rural areas, including countermeasures against disasters, tend to focus on development policies. Aside from some studies, these flows continue to exist without any problems. This is a major reason why the state of the rural areas of the countryside is losing its purpose. Disaster management focused on restoration about agricultural and fishery disaster is only are scribed through 『Act on the prevention of and countermeasures against agricultural and fishery disasters』and 『Agricultural and Fishery Disaster Insurance Act』. It could occur that relatively poor rural areas do not receive sufficient financial supports because the financial support index of disaster recovery is determined based on the financial strength index. Therefore, the national system for rural areas where have occurred disaster is insufficient, it is urged to establish the system suitable for agriculture.

3. Conclusion

Although basic law of fishing villages was enacted to distinguish between rural and fishing, the definition and purpose of existing ordinance remain unchanged. It is desirable to improve to the rural specific laws considering characteristic of rural areas in the future. It is also important to consider the unity of the law and the compatibility with other laws and to reflect the regional, cultural and social characteristics of rural areas. There is a problem that the protracted experience periods of disaster due to extend over a long period of time of handling with damage in rural supporting system of natural disaster. Therefore, to seek countermeasures to reduce the indirect damage in the disaster area residents are preferred.

Acknowledgments

This study was carried out with the support of "Cooperative Research Program for Agricultural Science & Technology Development (Project No. Pj0108732017)", Rural Development Administration, Republic of Korea and "Research Program for Agricultural Science & Technology Development (Project No. Pj010873022017)", National Institute of Agricultural Sciences, Rural Development Administration, Republic of Korea.

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Field Study and Development of a Water Harvesting System for Water Scarcity in Small Upland Farm

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Minyoung KIM* , Jonggil JEON***

1. Introduction

Korea has been damaged in agriculture production in almost every 2-year for last 10 years. The reason of that can be appointed of rainfall pattern exchange and upland area promotion. Even though the annual total precipitation is increasing, the drought damages production of vegetables and crops in upland farm. Most of Korean dry field, its area under 1 ha is hard to be irrigated from large reservoir and water channel networks. The purpose of this study is to develop a water harvesting system capable of collecting rainwater efficiently in small stream channel of 1~2m, that can be helpful to irrigate small upland field of 1,000 m² area. The system is consisted with a catchment device and a storage equipment (Figure 1). Furthermore, this water harvesting system operation and effect were tested in a field farm (Figure 2).

2. Material and method

The rainwater catchment device has cylindrical shape of 150 mm diameter and 700mm length that has slits on its side designed to take water flow, which is a part of a water harvesting system for hill side slope terrain (Figure 3). This stainless steel device can ensure strong and non-corrosion of exterior shocks, Slit on its surface can separate large amounts of suspended solids, such as leaves of water flowing through the capillary system. A filter media was inserted into the size of the house by a size of 120cm × 50 cm. The maximum intake flow was analyzed in the test channel (Figure 4). This catchment device was installed in natural small channel, and its flow was monitored with cumulative water meter. The real time runoff flow was measured with V-notch flume and floating water level sensor in real time.

3. Result and discussion

The maximum intake flow was analysed in the test of changing the flow rate and the water level. The total flow rate was varied from 143.4 L/min to 263.5 L/min at 489.4 l / min, while varying the water level from 5 to 30 cm at each specific flow rate. The curves in Figure 5 show that the amount of collecting flow increases as the flow rate and water level increase. The maximum collecting flow of the device is 142 L/min. The devices were installed at two points of mountain small stream for field performance analysis. Point 1 is to rainfall runoff flow. Point 2 is to ordinary runoff. Total rainfall depth for this study was 334.5 mm. Total runoff flow of 1,722 ton and 7,984 ton occurred in point 1 and point 2, then 273 ton and 125 ton were collected by this rainwater catchment device (Figure 6). It was possible to 30 ton/month of rainwater harvesting and it is expected that it will help to solve short-term water shortage. In this study, a water harvesting system was developed in order to take rainwater runoff for irrigation purposes, and assess the site applicability of rainwater catchment units. Average monthly total flow rate of rainwater collected through catchment units is 30 tons, and is expected to be utilized for irrigation water to eliminate short-term water shortages in a field of roughly 10 area. The catchment ratio to runoff flow is less than 20 %, which means that periodic maintenance is required for eliminating the removal of dried dwellings and removing deposits of sedimentary sediments. This water harvesting system can catch 5 tons of water from 1 mm rainfall depth on 1 ha area.

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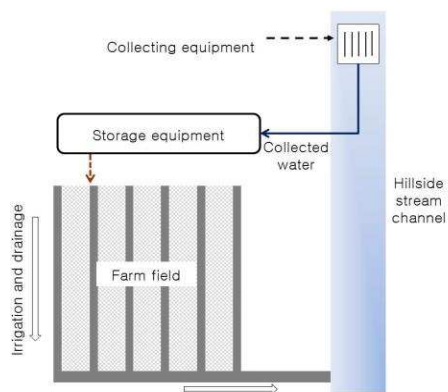


Figure 1. Scheme of Water harvesting system



Figure 2. Water harvesting system in field test

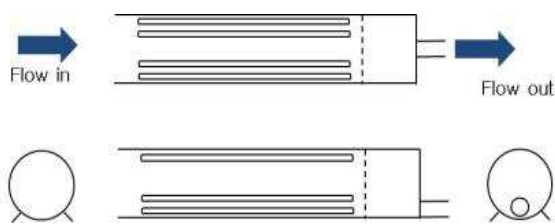


Figure 3. Rainwater catchment device

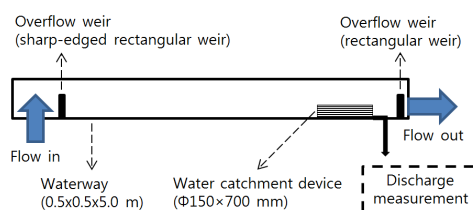


Figure 4. The test channel diagram

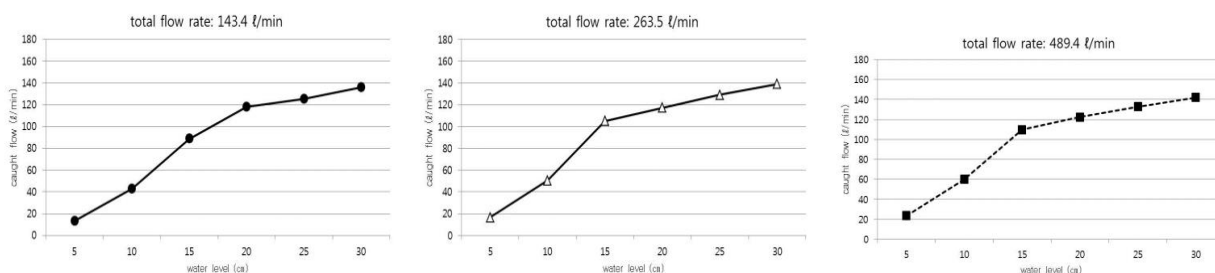


Figure 5. Water intake flow of rainwater catchment device in test

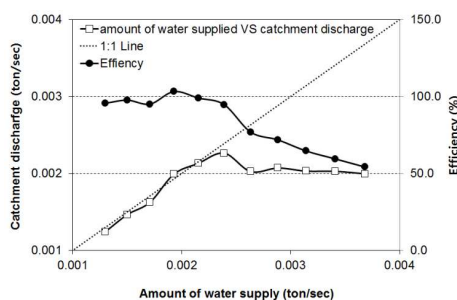


Figure 6. Water intake flow of rainwater catchment device in field

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