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Original article

Capturing the relationships between local foods and residents: A case in the Noto region, Japan

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ABSTRACT

Background: Under the influence of global trends, most regions are at risk of losing their local-food knowledge. In this context, analyzing the transmission of the knowledge, understanding the context of transmission, and implementing precise activities and policies are required. Noto is known for its unique ethnic fermented food products.

Methods: Through our questionnaire survey and analysis of the Noto peninsula, we explore the relationships between the attributes of local food producers and the variety of foods they produce, attempting to identify the key attributes related to making diverse local foods and the transmission of local food knowledge.

Results: Our analysis showed a correlation between the diversity of local foods made by residents and the number of years they had lived in the municipality.

Conclusion: The results implied that adequate management of social networks by local residents, who depend on the local environment, is required in transmitting the knowledge of local foods.

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1. Introduction

Knowledge systems transmitted from generation to generation in a local environment can contribute to sustainable regional management [1]. Knowledge related to food is included in local knowledge systems, as the residents use local-food knowledge in their daily food choices and cooking activities; they also share this knowledge with their family and neighbors. However, under the influence of global trends—including urbanization, population aging, and climate change—most regions are at risk of losing their local-food knowledge. Therefore, analyzing the transmission of the knowledge, understanding the context of transmission, and implementing precise activities and policies are required.

Analyzing such knowledge systems is an urgent task as they are disappearing rapidly. Rural areas in Japan are parts of the at-risk regions. The Noto region, with its unique Japanese rural landscape called *satoyama* [2] and its culture, is the research site. In this paper, the transmission of local-food knowledge in the region is

explored through a questionnaire survey and statistical analysis, and the individual attributes related to the local environment of the residents are provided as key factors of the sharing of local foods among generations.

The study area, the Noto region, was designated as a Globally Important Agriculture Heritage System site in 2011 as a symbolic *satoyama* landscape [3]. The *satoyama* system of the region has been evaluated as a sustainable socio-ecological system, and the local residents acknowledge the abundance of ecosystem services in the *satoyama* environment. In order to transmit the rich ecosystem services to future generations, local residents have cultivated their traditional knowledge to make processed foods, and they have made their local processed foods including fermented seasonings as ethnic foods. For example, *ishiru*, which is made from salted sardines, is produced as a regional ethnic fermented seasoning, and it is included in the main three fish sauces (made from fermented salted marine products) in Japan. The Noto region that provides unique traditional foods and seasonings such as *ishiru*, is an important region for the conservation of ethnic foods in Japan. The region is located in the central parts of Japan (Fig. 1). It takes about 2 hours from the region to the Tokyo or Osaka metropolitan area by rapid train. The region belongs to the Ishikawa prefecture. The Kanazawa City is the largest city in the

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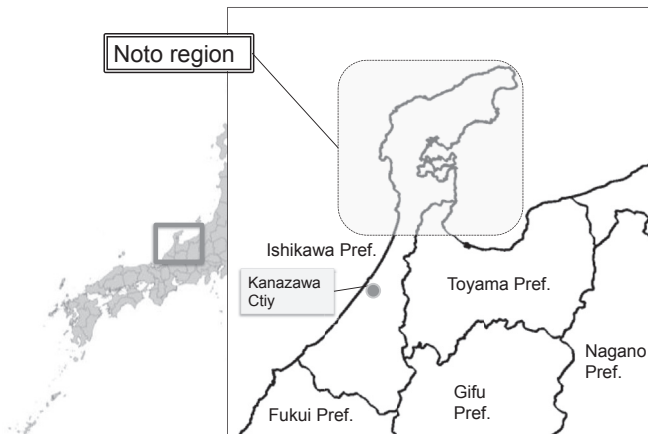


Fig.1. Location of the Noto region. Pref., prefecture.

prefecture and well known as a historical city with a culture of warrior families.

Noto's main local foods as ethnic foods are registered as Noto's traditional vegetables including eggplants and white radishes, processed marine products, and Japanese *sake* [3]. Local people with professional knowledge to make *sake* have been called *Noto touji*, and Noto's *sake* has been well known as regional *sake* in Japan. As the unique ethnic foods produced with local food knowledge in the *satoyama* landscapes, parts of Noto's agricultural and marine processed products including *ishiru* and dried persimmons have been registered as the composition elements of the Noto Globally Important Agriculture Heritage System site (Figs. 2–4).

Most of the Noto's ethnic foods are eaten with steamed rice in daily life. A representative seasoning, *ishiru*, is used as a seasoning to make fish and vegetable soup. Dried persimmons are eaten as confectionery with Japanese green tea.



Fig. 2. Bottled *ishiru*.



Fig. 3. Process of making dried persimmons.



Fig. 4. Dried persimmons in a rural landscape.

Local ethnic foods made in each household are shared among neighbors through the sharing activities called *osusowake* in the Noto region. *Osusowake* can be seen in other parts of Japan; however, the activities have become inactive in most urban and rural areas. Nonmarket exchanging activities contribute to strengthen the community networks that support the cultural activities including local festivals and seasonal events.

Semicultivation has been implemented by way of agriculture in the Noto's *satoyama* environment, and Chen and Qiu [4] have discussed the methodology of environmental management involving the consumer. The process of traditional-knowledge transmission in the production of mushrooms as nontimber forest products has also been clarified in the Noto region [5]. In that process, tacit knowledge is made explicit by the local agricultural organization as the mediator.

Research has also analyzed the relationships between traditional events and local foods [6]. Nonetheless, research is limited on local foods throughout the entire Noto region. Specifically, the relationship between local foods and residents, which is important in the context of sharing local food among generations, has been overlooked and has not been fully investigated.

In the next section, we review precedent research related to "localness" and socioeconomic characteristics of food in the globalization era. We then provide the method of analysis and the

results. Finally, we discuss the transmission of local-food knowledge based on the results.

2. Review

This section presents the results from a brief literature review concerning local foods that have been historically produced in a certain region. In particular, the focus is on research about the value of local foods and the stakeholders, including the people who process or make local foods. Studies relating to the following three themes are reviewed: (1) the role of local foods in managing the socio-ecological environment; (2) consumer awareness of the choice of local foods; and (3) the meaning in making local foods and the awareness of the local residents who make the food.

Prior research suggests that sharing local foods among generations and developing local food networks can contribute to enhancing regional resilience. In order to share local foods with the next generations, human resources must be developed to process or make local foods. This is an urgent task in regions where the population is rapidly aging and decreasing. An understanding of the attitude toward local foods from the people who make them is required for planning the development of the human resources needed to share local foods with future generations. However, the attitude and the relationships between local foods and residents have been overlooked. In the following sections, we provide details of the review results as a foundation of our research.

The definition of local foods often depends on the distance from the production site to the consumption area. However, in some studies, local foods are defined as those made by the local people, including relatives, friends, and neighbors [7]. Community foods are included in local foods, and a definition frequently used for the community foods system has been proposed: “A collaborative effort to build more locally based, self-reliant food economies—one in which sustainable food production, processing, distribution, and consumption is integrated to enhance the economic, environmental, and local health of a particular place” [8]. Most ethnic foods are included in local foods because a significant amount of ethnic food is produced and consumed in local districts.

In this study, foods that are processed or made by local residents are focused upon as local foods, and these are not limited to the agricultural or fisheries products made in the neighborhood. The reason for not imposing this limitation is that although local processed foods are the focus of this paper, the foodstuffs used to process these foods are often not produced in the neighborhood.

2.1. Roles of local foods in managing the socio-ecological environment

In recent years, consumer attention to local foods has increased. Local foods systems have been discussed as alternative systems capable of supplying food without depending on remote regions [9]. Promotion of local food also leads to community self-reliance and environmental sustainability [10]. Local foods can be produced at houses and often shared within the community without going through the market.

Using a rural area as a case study, Kamiyama et al [11] found that local food production and consumption contributes to the maintenance and development of the social network and resilience in a community. As the demand for local food increases, the potential for contributing to environmental management is enhanced [12]. Developing the production and consumption of local goods is considered a key element not only for rural areas but also for suburban and urban areas in the sustainable management of Socio-ecological Production Landscapes [13]. Finally, local food systems

are frequently considered as counter-measures for globalization as part of the antiglobalization movement. It is important to develop inclusive and reflexive politics in order to maintain and enhance local food systems [14].

2.2. Preference of consumers for local foods

Local foods depend on networks of both consumers and producers. A rich literature exists on consumers' preferences in product selection, and the existing literature suggests a conceptual framework for how they choose foods. In the classical model, food context is considered relevant to local foods and is considered to be the main influence in food choice [15].

The majority of the literature considers demographic characteristics to be the critical element in understanding consumers' attitudes and purchasing behavior, which indicate consumer preference [7]. Given that consumers include the producers of the local foods, we consider that the demographic characteristics are the key for analyzing the local residents who produce the foods.

Consumer behavior towards Korean ethnic foods has been analyzed [16]. The results showed that information related to the country of origin is important to consumers. For example, whether or not the product is of local origin will affect consumer behavior. Food-related information, including geographical indications, needs to be shared with producers and consumers alike for the sustainability of local foods. Another study implies that accurate information shared with consumers will enable the local community to select local foods [17].

2.3. Meaning of sustainability of local foods and awareness of producers

Local foods are passed down from generation to generation in the course of daily life. The procurement and preparation of foods, especially in households, are gaining salience in the research into behaviors related to food. Thus, a need has been identified to analyze the influence of long-term cooking behavior [18]. In a similar vein, the analysis and production of local foods as fostered throughout history is likely to require long-term perspectives. In considering the long-term development in local food, it is necessary to include the views of both consumers and producers, as well as their networks.

As the social value of cooking behavior has become more widely recognized, studies have explored the meaning and restrictions for each individual. For example, in the United States, it became clear that the time required for cooking and/or affordability are the major restrictions [19]. A survey of the Flemish people revealed that although cooking is considered laborious for cooks, it is also considered as something pleasurable for themselves and others, and the family situation and time constraints are influential for the cooking experience [20].

Local food is closely linked to local communities and “placeness” in addition to the physical environment and land use [21]. The lifestyle, preferences, and local attitudes fostered toward the places are embedded with history and the local foods. In an era of mass production and mass consumption, diverse places are transformed into common and unified places. This transformation is mostly directed towards unsustainable production and consumption.

Lifestyles throughout history provide a reference point for re-evaluating and reconstructing local food systems that will contribute to maintaining unique social and ecological landscapes. Such unique landscapes will contribute to resilient food systems.

The literature review clarifies that local foods contribute to enhancing the social and ecological resilience of communities at the phases of selection, process, and supply. The urgent task is to

foster the producers of the local foods. However, the attitudes and views of local food producers have not been fully explored in existing literature. As a first step, it is necessary to clarify the relationship between producer attributes and local foods. Analysis of the producers is possible from multiple perspectives. How is the knowledge related to local foods transmitted? Attempting to answer such a question further leads to the diversity in and degrees of processing and cooking local foods. In other words, the production of local foods can be considered as one indicator of attitudes towards local foods.

Through an analysis of the Noto region, we explore the relationships between the attributes of local food producers and the variety of the foods produced, and attempt to identify the key attributes related to making diverse local foods and transmitting local food knowledge.

3. Methodology

3.1. Hypothesis

Based on the review in the previous section, the following hypothesis was derived: "The diversity of local foods made by residents correlates with the social and environmental attributes of the residents." Prior research has suggested that demographic characteristics, including gender and age, influence the food choice. In addition, because local foods are closely related to regional environments, residents' geographical location can deeply influence their cooking behavior.

To verify this hypothesis, we conducted a questionnaire survey of residents in the Noto region. The survey revealed which local residents with different attributes process or cook which local foods, based on a list of the local foods. By performing a statistical analysis of the survey results, the attributes key to the transmission of traditional knowledge of local-food cooking are identified.

Table 1

A list of the fermented seasonings, pickles, and other processed foods made by local residents.

Fermented seasonings
1. Miso
2. Nanba-miso
3. Ame-miso
4. Ishiru
5. Other
Pickles
1. White radish
2. Eggplant
3. Cucumber
4. Turnip
5. Udo plant
6. Chinese cabbage
7. Zuiki
8. Kataha
9. Yamato persimmon
10. Mushrooms
11. Other
Other processed foods
1. Tofu
2. Pickled plums
3. Tokoroten
4. Natto
5. Dried radish
6. Dried persimmons
7. Persimmon and dried sardine
8. Ekko-persimmon
9. Konka-sardine
10. Other

3.2. Materials and Method

In order to investigate the relationship between local foods and the residents who make those foods, we performed statistical tests and crosstabs on the data gleaned from the questionnaire survey. The significant attributes of the residents are explored through the analysis. Specifically, we provided a list of local foods (Table 1), including fermented seasonings, pickles, and other processed foods, to the residents of the Noto region, and they were asked whether they make each food on the list. The attributes of respondents acquired from the survey are gender, age, the region where they now live, and the number of years that they have lived in the municipality.

Fig. 5 shows the attributes of the respondents ($N = 1,662$).

4. Results

The rates of respondents who make fermented seasonings, pickles, and other processed foods are shown in Figs. 6–8, respectively. In the questionnaire, multiple answers were allowed; thus, the sum of the percentages in the bar charts is not 100%. More than half of the respondents make *miso* in fermented seasonings, and pickles of Japanese white radish (*daikon*), eggplant, cucumber, turnip, and Chinese cabbage (*hakusai*; Figs. 6 and 7). In other processed foods, pickled plums is made by 57.5% of the respondents (Fig. 8).

Tables 2 and 3 show the total items of fermented seasonings, pickles, and other processed foods made by the respondents, who are grouped by the number of years they had lived in the municipality, age, gender, and region of residence. Chi-square tests were performed to identify differences in the average number of items in each group identified. The average numbers of items in gender groups are relatively similar among those groups, and the averages in the gender groups are not significantly different at the 5% level of significance: $\chi^2 = 1.9487$, degree of freedom = 2, $p = 0.3774$.

The average numbers of items in the higher age groups tended to be larger than those in the lower age groups. However, the averages in age groups were not significantly different at the 5% level of significance: $\chi^2 = 11.474$, degree of freedom = 10, $p = 0.3218$.

The average for respondents who live in mountainous regions was slightly higher than that of respondents who live in the other regional groups: urban areas, plain with agricultural land, and coast-line areas. However, the averages in regional groups were not significantly different at the 5% level of significance: $\chi^2 = 5.7783$, degree of freedom = 2, $p = 0.05562$.

The average numbers of items for the respondents who have lived longer in the municipality tended to be larger than those for respondents who have lived in the municipality a shorter time (Fig. 9). The averages in the groups for the number of years in the municipality are significantly different at the 5% level of significance: $\chi^2 = 26.151$, degree of freedom = 14, $p = 0.02476$.

Therefore, the time lived in a municipality can be considered as an important factor for local residents in making local foods, including fermented seasonings, pickles, and other processed foods.

5. Discussion

The result of the analysis demonstrated that years of residence in the municipality where the respondents live is a significant factor in the diversity of the local foods made by the respondents. The years of residence correlates with more diversity in local foods, possibly because the older people may have expanded their social networks in daily life in the municipality, and might have

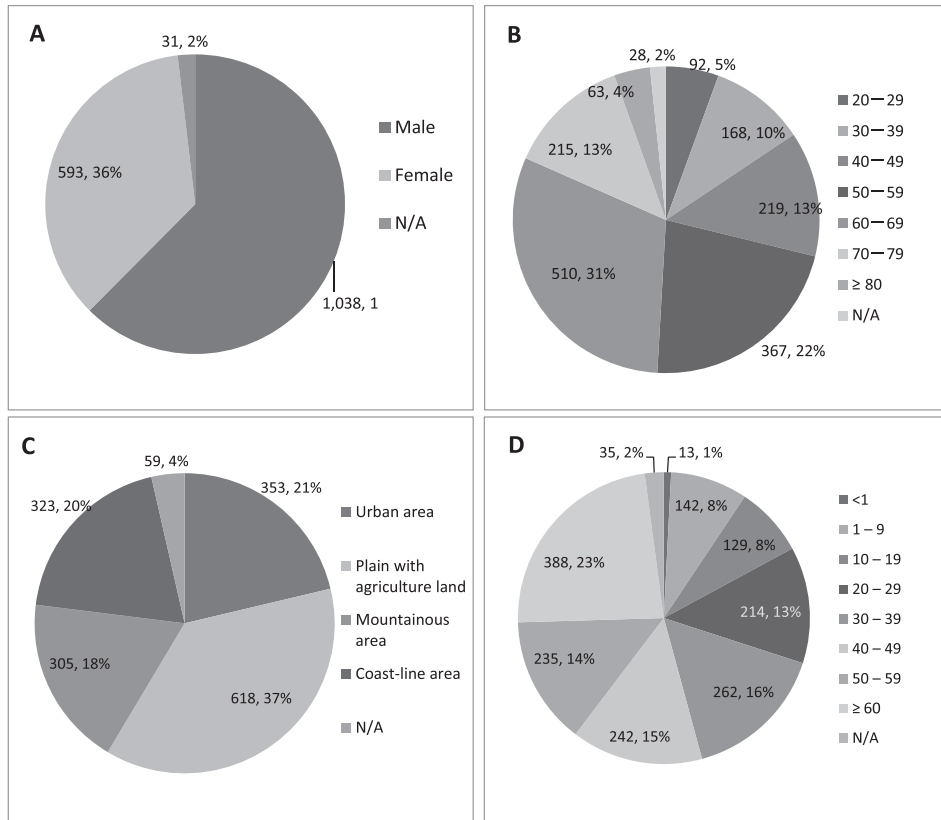


Fig. 5. Individual attributes of respondents. (A) Gender. (B) Age. (C) Region. (D) Years of living in the municipality. N/A, not applicable.

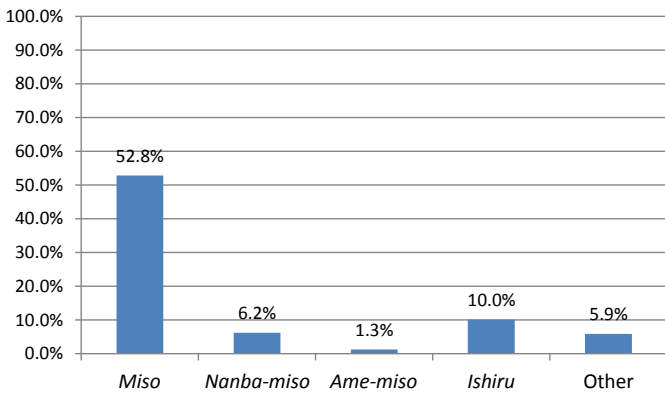


Fig. 6. Percentages of residents who made each fermented seasoning.

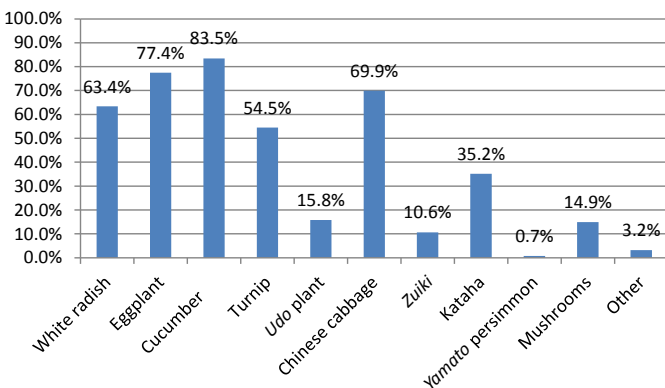


Fig. 7. Percentages of residents who made each type of pickle.

frequently accessed the local food knowledge, which was transmitted from person to person in the social networks there.

The respondents in our research include the following two types: (1) people who have continued to live in the same municipality; and (2) people who have lived in different municipalities. Those who have experienced living in different municipalities might have had opportunities to access information on a variety of local foods. For example, local restaurants and markets disseminate different knowledge of local foods; therefore, by living in different places, it is possible to access more diverse sources of food information. Older people have had more opportunities to live in

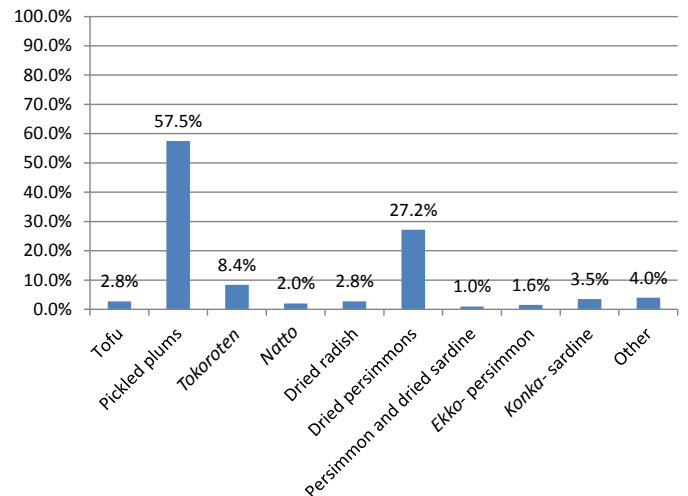


Fig. 8. Percentages of residents who made each type of processed food.

Table 2

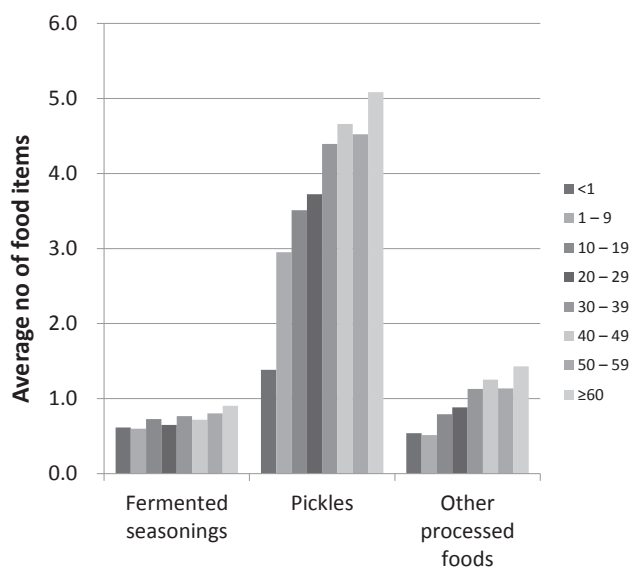
The total items of fermented seasonings, pickles, and other processed foods made by respondents in each group by the number of years of living in the municipality/age group.

No. of y living in the municipality	Fermented seasonings	Pickles	Other processed foods	Age group (y)	Fermented seasonings	Pickles	Other processed foods
<1	8	18	7	20–29	51	238	55
1–9	85	419	73	30–39	106	527	124
10–19	94	453	102	40–49	149	799	194
20–29	139	797	189	50–59	282	1,511	375
30–39	201	1,151	296	60–69	391	2,509	611
40–49	174	1,128	303	70–79	204	1,144	362
50–59	189	1,063	267	≥80	61	317	87
≥60	351	1,973	555				

Table 3

The total items of fermented seasonings, pickles, and other processed foods made by respondents from each group by gender/region.

Gender group	Fermented seasonings	Pickles	Other processed foods	Regional group	Fermented seasonings	Pickles	Other processed foods
Male	793	4,354	1,133	Urban area	246	1,246	252
Female	449	2,686	676	Plain with agricultural land	462	2,774	699
				Mountainous area	246	1,505	410
				Coast-line area	273	1,400	417

**Fig. 9.** Average number of local-food items in each group according to the number of years of residence in the municipality.

different municipalities than those who are younger. However, the results of the statistical analyses show that the age of the respondents is not a significant factor in the diversity of the local foods produced by the respondents. Therefore, in everyday life, the food-producing behavior of respondents might not be deeply affected by information on local foods that has been disseminated from food-related stores or markets.

However, people who have continued to live in the same municipality have had relatively fewer opportunities to access local food information from restaurants or markets located outside the municipality. Instead of having information sources outside of where they live, they may have obtained information by expanding and strengthening their social networks in the municipality.

The transmission of local-food knowledge through such social networks was not implemented in the short period of time in which people have been able to obtain information on the Internet. We did not observe that the diversity of local foods made by the local residents is especially high in certain age groups. The reason for this

trend may be that the speed of transmission of the knowledge is relatively slow.

Aging has accelerated rapidly in the Noto region, compared with the national average in Japan. Considering the slow speed of the transmission of local-food knowledge, the Noto region may suffer from the risk of failing in knowledge transmission. In this study, we found that the diversity of local foods among the local residents correlates with the years each resident has lived in the municipality. The result suggests that adequate management of social networks by local residents, which depends on the surrounding environment, is required in transmitting the knowledge of local foods.

Further research is needed to investigate the function of social networks in transmitting local-food knowledge. Understanding the function of social networks can contribute to the official support for development of social networks by local residents.

Conflicts of interest

All authors have no conflicts of interest to declare.

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