Research on the Comprehensive Evaluation of Ecosystem and Socioeconomic Sustainability through Environmentally Friendly Agriculture: A Case Study on Cultural Ecosystem Services in Ikeda Town, Fukui Prefecture, Japan

KUNII Daisuke

1. Introduction

In Japan, the number of farmers is decreasing and the farm household is aging, then improving labor productivity is crucial. At the same time, addressing global environmental issues and achieving the Sustainable Development Goals (SDGs) are also essential challenges. To build a sustainable society that balances economic, social and environmental factors, it is important to promote environmentally friendly agricultural practices.

Have you ever heard of the concept of "Ecosystem Services (ES)?" This term refers to the benefits that humans receive from ecosystems and has been widely used globally since the United Nations published the Millennium Ecosystem Assessment (MA) in 2005. It gained particular attention as a key term during the 11th Conference of the Parties (COP11) to the Convention on Biological Diversity. In Japan, the "Biodiversity Strategy of the Ministry of Agriculture, Forestry and Fisheries" emphasizes the conservation of biodiversity and ecosystem services in rural areas. Similarly, in the European Union (EU), the ES concept plays an important role in biodiversity strategies and other policy frameworks (Bouwma et al., 2018). Furthermore, research on the impact of ES-related policies in the EU shows that approximately 54% of studies focused on the three dimensions of economy, society, and environment (Zolyomi et al., 2023). This suggests that utilizing ES allows for a more comprehensive and multidimensional analysis.

Given that, Policy Research Institute, Ministry of Agriculture, Forestry and Fisheries (PRIMAFF) collaborated with a research group led by Tokyo University of Agriculture and Technology to conduct a comprehensive evaluation of ES in Ikeda Town, Fukui Prefecture. Specifically, PRIMAFF focused on evaluating cultural ecosystem services, while the collaborating research group assessed provisioning and regulating services.

In this article, the findings of PRIMAFF study are introduced, which examined how people both inside and outside the region perceive the cultural ecosystem services provided by farmland in Ikeda Town. The study used photo and map-based surveys to gather insights into these perceptions.

2. Overview of Ikeda Town

Ikeda Town is located in a mountainous area in the upper reaches of the Asuwa River, a tributary river of the Kuzuryu River in Fukui Prefecture. Forests cover approximately 91.7% of the town, however, agriculture plays a more significant economic role than forestry, with the total agricultural output being about ten times the revenue from timber sales. Among agricultural products, rice is the most important, accounting for approximately 61% of the total agricultural output (Ikeda Town, 2021). As of March 2024, the town's population stands at 2,196 people (880 households), with an aging rate of 47%(Website of Ikeda Town). Despite these challenges, the town has been actively promoting environmentally friendly agriculture through unique town's certification programs, such as "Ikeda Town's Organic and Honest Farming" and "Life-Friendly Rice Farming," which emphasize sustainability and environmental conservation.

3. Results and Discussion

(1) Awareness Survey on Cultural Ecosystem Services Using Photographs

To examine the relationship between agricultural production activities and the cultural ecosystem services perceived by people, we conducted a survey to assess preferences for various rice farming landscapes in the region. The survey was carried out during the "Ikeda Food Culture Festival," held annually in November, in 2022 and 2023. The survey featured a "The Election of Rice Farming Landscape in Ikeda Town," in which visitors voted on different rice farming-related photographs. We prepared 25 photographs taken by professional photographers in Ikeda Town, covering five key ES related categories: "Landscape," "Production," "Biodiversity," "Food," and "Culture." These photos were displayed at the festival venue, and participants were asked to vote on (1) their favorite photo within each category, (2) their most favorite category, and (3) the category they felt best represented Ikeda Town (the third question was only included in the 2023 survey). As a total, 761 people participated in 2022 and 816 people in 2023, with 732 and 686 valid responses used for analysis, respectively.

The analysis related that "Landscape" and "Food" were the most popular categories. Additionally, women showed a stronger preference for food-related images than men, and elementary school students favored biodiversity-related images more than adults. These results indicate that both local and non-local participants value the landscape and traditional food culture associated with rice farming in Ikeda Town. Furthermore, "Landscape" and "Production" were the most popular categories representing the

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town. Non-residents of Fukui Prefecture more likely to associate "Production" with the town's identity. It was thought that these findings highlight the cultural role that agricultural landscapes play in shaping Ikeda Town's image and suggest that people appreciate the aesthetic and cultural benefits provided by farmlands.

(2) Mapping Cultural Ecosystem Services

To analyze the specific locations where people perceive cultural ecosystem services in Ikeda Town, we conducted a questionnaire in March 2024. Participants included attendees of a sports festival in the town, visitors to the town market and tourist information center "Cottecote Ikeda" and cafes, and students from Ikeda Town Elementary and Middle Schools. Participants were asked to mark up to three locations on a map that they considered important in terms of "Landscape," "Recreation and Relaxation," "Biodiversity," and "History & Culture." They were also asked, if possible, to provide names for those locations. A total of 111 responses was collected, with 99 valid responses used for the analysis.

The mapping results revealed distinct spatial patterns based on category and age group. "Landscape" and "Biodiversity" were strongly associated with agricultural land and rivers, while "Recreation & Relaxation" and "History & Culture" were linked to specific sites such as leisure sites and shrines. Although no direct effects of agricultural practices such as environmentally friendly agriculture were observed, this study confirmed that people perceive values in farmland and its surroundings and benefit from various cultural ecosystem services.

Figure 1. Voting scene at the Ikeda Food Culture Festival

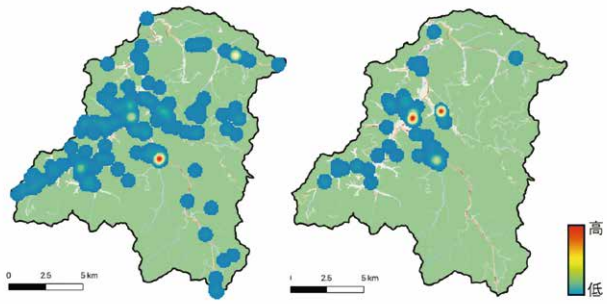

Figure.2 Heat maps indicating locations in Ikeda Town considered important for "Landscape" (left) and "History & Culture"(right)

4. Conclusion

This study demonstrated that people benefit from cultural ecosystem services provided by farmlands in Ikeda Town through a preference analysis using photographs and spatial mapping. Our findings suggest that maintaining farmland and promoting farming activities contribute to sustaining and enhancing cultural ecosystem services for both local and external communities. Although the study could not fully integrate a comprehensive evaluation of all ES within the project period, by conducting further analyses alongside the research results of the collaborating research group, it is possible to demonstrate that agricultural activities allow people to enjoy various ecosystem services from farmland.

In the Ikeda Town, various initiatives to revitalize agriculture has been implemented, including projects led by the Agricultural Corporation and the "Life-Friendly Rice Farming" movement, which began in 2007. These efforts not only promote sustainable farming but also encourage environmental conservation at the regional level. It is likely that these continuous efforts have contributed to preserving the rural landscape and enabling people to enjoy various ecosystem services. As society increasingly emphasizes ecological sustainability, it becomes more important to understand and appreciate the ecosystem services that support our well-being. We hope that the findings to this collaborative research contribute to raising awareness and promoting informed discussions on this topic.

For more details on the research conducted by the Tokyo University of Agriculture and Technology group, please refer to the following webpage.

https://www.maff.go.jp/primaff/kanko/review/attach/pdf/250131_pr123_03.pdf (in Japanese)

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