

**Bridging the Diffusion Gap: Farmer Awareness and Perceptions of MIDORI
Rice Practices in Itoshima, Japan**

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INTRODUCTION

Rice remains central to global food security and rural livelihoods, especially in Asia, while paddy cultivation is also a major source of agricultural methane emissions (Fukagawa & Ziska, 2019; FAO, 2024; Qian et al., 2023). In Japan, rice is still the country's largest crop by volume, and current sustainability pressures have pushed the Ministry of Agriculture, Forestry and Fisheries (MAFF) to promote the Strategy for sustainable food systems MIDORI (U.S. Department of Agriculture, Foreign Agricultural Service [USDA/FAS], 2023; Ministry of Agriculture, Forestry and Fisheries [MAFF], 2023). MIDORI provides a policy framework for reducing chemical fertilizers and pesticides, expanding organic and eco-friendly cultivation, and supporting climate-smart practices such as alternate wetting and drying, integrated pest management, and nutrient optimization (MAFF, 2023). However, policy targets alone do not ensure farm-level adoption (MAFF, 2022). The transition to sustainable rice systems depends on whether farmers are aware of these practices, perceive them as useful and feasible, and receive the institutional support needed for adoption. For this reason, farmer-level diffusion is not only important for Japan, but also for agricultural extension more broadly, where sustainability goals often depend on how effectively new practices move from policy into farmer behavior.

Against this background, this study examines farmer awareness and perceptions of MIDORI-aligned rice practices in Itoshima city, Fukuoka prefecture, and identifies the socio-economic and institutional factors influencing their adoption. The study is guided by diffusion of innovation theory (DIT) and the technology acceptance model (TAM), which together provide a basis for examining how awareness, perceptions, institutional support, and barriers shape diffusion. DIT helps explain how communication, social networks, and innovation characteristics influence the spread of new practices (Rogers, 2003). TAM focuses on perceived usefulness and ease of use as key elements affecting adoption (Davis, 1989). Although recent studies show that farmer networks, technical support, and perceived benefits influence adoption of sustainable rice practices in Japan, comparable empirical work remains limited in Kyushu and Fukuoka, particularly for the wider bundle of MIDORI-aligned practices and within local extension contexts (Du et al., 2025; Li et al., 2025). This study addresses that gap by focusing on Itoshima as a municipal case of sustainable rice transition. Itoshima provides a relevant local setting because of its commercial rice production, proximity to urban markets, visible sustainability initiatives, and active JA and extension networks. These features make it an appropriate case for examining how farmer knowledge, perceptions, and institutional exposure relate to the early diffusion of MIDORI-aligned practices.

MATERIALS AND METHODS

The study employed a cross-sectional survey design and used a structured questionnaire covering key domains related to farmer demographics, awareness, perceptions, institutional support, barriers, and adoption behavior. The present paper reports findings from a pilot sample of $N = 10$ rice farmers, which was used to test the instrument and generate preliminary evidence before implementation of the planned larger survey. Reliability testing showed acceptable internal consistency across the major constructs, indicating that the questionnaire was suitable for the broader study. Thus, the pilot serves both as an initial assessment of the diffusion context in Itoshima and as a foundation for the full-scale investigation of the diffusion gap, major barriers, and the relative importance of support and perception in shaping adoption.

RESULTS AND DISCUSSION

The pilot study involved 10 rice farmers from Itoshima City and showed that the sample was skewed toward older farmers, with a median age in the late sixties, while institutional training exposure was limited, as 80% of respondents reported no access to training programs and 90% reported no training initiatives from local institutions. One of the key findings was a substantial diffusion gap between awareness and actual practice. Respondents were moderately to highly knowledgeable about MIDORI practices ($M = 3.25$) and had positive perceptions of these innovations on average ($M = 3.45$), yet this favorable orientation was not reflected in actual farm-level adoption, which remained low ($M = 1.79$). These trends suggest that MIDORI-

related information is reaching farmers, but its application is constrained by practical and structural barriers rather than by lack of awareness alone. Among the perceived barriers, market uncertainty ($M = 3.67$) was ranked highest, followed by technical difficulty ($M = 3.57$) and labor constraints ($M = 3.53$), while lack of interest ($M = 3.17$) was ranked lowest. Overall, these findings indicate that farmers are not primarily resistant due to negative attitudes, but rather due to uncertainty about markets, technical feasibility, and labor availability.

The exploratory correlation patterns provide further preliminary insight into this diffusion gap. Adoption was positively associated with institutional support ($r = 0.428$), suggesting that assistance through JA, training, or guidance related to subsidies may play an important role in encouraging MIDORI practice adoption. This interpretation is consistent with recent work showing that farmer networks, information sharing, and data-related support can strengthen adoption of low-emission rice water management in Japan, while extension access and training are positively linked with improved performance in rice farming systems (Du et al., 2025; Amrullah & Tokuda, 2025). Similarly, perceptions were moderately and positively associated with adoption ($r = 0.398$), indicating that usefulness, compatibility, and ease of implementation may be more influential in shaping behavior than awareness alone. This pattern is supported by recent evidence showing that perceived compatibility and perceived ease of use are important drivers of continued climate-smart agriculture adoption, and that Japanese rice farmers' preferences for innovative machinery are shaped by perceived benefits, functionality, and practical feasibility (Erekalo et al., 2025; Li et al., 2025). By contrast, the relationship between knowledge and adoption was relatively weak ($r = 0.169$), implying that awareness may be necessary but not sufficient to produce actual behavior change. This also aligns with recent findings that information or subsidies alone do not guarantee adoption when broader psychological, technical, and structural conditions remain limited (Alam et al., 2024). Knowledge was, however, strongly correlated with perceptions ($r = 0.857$), indicating that knowledgeable farmers also tended to hold more favorable attitudes toward MIDORI practices. Similarly, the findings suggest that awareness alone is not enough to encourage adoption if farmers do not also receive practical and structural support. Overall, these preliminary results show that institutional support and farmers' positive perceptions may influence adoption more strongly than knowledge alone.

CONCLUSIONS AND WAY FORWARD

This pilot study suggests that the impediments to the adoption of sustainable rice farming in Itoshima may be more structural and economic than educational. Farmers appear to be aware of MIDORI-aligned practices, but face constraints linked to an aging workforce, technical complexity, labor demands, and unstable markets. Market uncertainty emerged as the highest-ranked barrier, indicating that perceived economic risk may influence adoption decisions more strongly than environmental awareness alone. These findings suggest that support strategies should not rely only on technical seminars, but also consider labor-saving assistance and stronger market support for MIDORI-compliant rice. At the same time, these pilot trends should be interpreted as exploratory and validated through a larger-scale study to confirm the findings across a broader and more representative sample.

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