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Socio-ecological dynamics of local crop persistence beyond adaptation: an interdisciplinary approach to Takenoko-imo taro in rural Japan

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Abstract

Local crops are generally valued for their adaptation to specific ecological and agricultural conditions. However, this study examines contrasting socio-ecological dynamics in the mountainous Itsuki–Gokanosho area of Japan. Here, the taro variety Takenoko-imo (*Colocasia esculenta*) persists despite significant ecological and agronomic constraints. An interdisciplinary approach was used that combined ecological surveys with socio-cultural analysis. We found that Takenoko-imo is well-established as a local crop. It continues through intergenerational transmission and local circulation. Yet it mismatches local conditions, such as high frost vulnerability and a poor fit with historical shifting cultivation systems. These findings indicated that the persistence of local crops could not be explained solely by ecological or agronomic adaptation. Instead, it reflects the interaction among environmental constraints, social networks, market relations, and daily practices. Thus it was suggested to reconsider the role of human-mediated processes in sustaining agrobiodiversity in marginal rural areas.

Keywords: *Colocasia esculenta*, agrobiodiversity, socio-ecological systems, interdisciplinary approach, marginal mountain area

Introduction

In recent years, scientists and policymakers have prioritized conserving local crops as a key part of agrobiodiversity and sustainable food systems (Strobl, 2022; Ogwu, 2023; Schmitz *et al*., 2023). Farmers in specific regions usually preserve and select local crop varieties over generations (Mukarumbwa and Taruvinga, 2023). These crops often adapt to local environmental and agricultural conditions (Yamagata Local Crops Research Group, 2007; Aoba, 2013). Many agronomic studies emphasize that local adaptation drives the persistence of these crops. However, if we focus only on persistence through adaptation to current conditions, agrobiodiversity will decline and resilience to environmental fluctuations will drop.

Not all local crops fit this pattern. Our observations show that some crops are grown even when they do not fit local ecological and agronomic conditions. Studying these cases helps reveal why agrobiodiversity persists, especially in marginal rural areas facing environmental constraints and socio-economic changes. These studies help maintain local varieties that are not well adapted to current environments and improve the resilience of local agriculture to environmental fluctuations.

Taro (*Colocasia esculenta*) is one of Japan's oldest cultivated root crops (Motohashi *et al*., 2024); while some varieties have adapted to local ecological and agronomic conditions, others have not, making it a prime example for examining such dynamics. Introduced during the Jomon period, before the introduction of rice cultivation, taro has diversified into wide local varieties across Japan. These varieties reflect various climates and culinary practices (Matsumoto, 2012). Previous studies have focused on taro's varietal classification by morphology and its cultural significance, especially in rituals and ceremonies (Kumazawa *et al*., 1934; Tsuboi, 1979). Few studies have examined cases where taro varieties persist despite documented ecological or agronomic disadvantages.

This study examines Takenoko-imo, a taro variety cultivated by farmers in the mountainous Itsuki–Gokanosho area of Kumamoto Prefecture, Japan. Here, farmers maintain it through intergenerational transmission, local circulation of planting material, and daily food practices (Hayakawa *et al*., 2024). Yet, it shows several traits that poorly fit local conditions. Frost can damage

or destroy seed-tubers. It is labor-intensive, not supported by historical shifting cultivation, and requires more labor than other home-field crops. Despite these constraints, farmers continue cultivating Takenoko-imo in the Itsuki–Gokanosho area. This raises an important question: why does a crop that is not well adapted to local environmental and agricultural conditions persist over time?

To address this question, we investigate how Takenoko-imo persists using an interdisciplinary approach. We focused on three analytically derived factors, identified inductively from field observations and interview data: (1) role of planting material networks in maintaining cultivation, (2) limited integration into market-oriented systems, and (3) everyday practices related to food preparation and use.

By clarifying these mechanisms, we aim to understand how local crops persist when adaptation alone cannot account for their survival. These cases highlight the role of human influences: social networks, markets, and daily practices shape agrobiodiversity in marginal areas.

Materials and methods

Study area: We conducted the study in Itsuki Village and the Gokanosho area, in southeastern Kumamoto Prefecture, Japan (Figure 1). In this paper, we refer to these areas as the "Itsuki–Gokanosho area." Administratively, Itsuki Village belongs to Kuma District, while Gokanosho is part of Izumi Village, Yatsushiro City. Gokanosho includes five settlements: Hagi, Shiibaru, Momigi, Nitao, and Kureko. Although these two areas now have different administrative units, they have long shared a culture and maintained close historical ties (Sakai 1973).

Both areas sit in the upper reaches of the Kawabe River, with Gokanosho further upstream. The total land area covers about 253 km² in Itsuki Village and 143 km² in Gokanosho. Forests cover more than 90% of the land (Ministry of Agriculture, Forestry and Fisheries 2005). Several mountains in both areas rise above 1,000 m. Settlements in the Itsuki–Gokanosho area range in elevation from about 300 to 1,000 m. Our surveyed settlements were from about 300 to 750 m. Due to the high altitude, winter temperatures often drop below 0°C. Snowfall occurs frequently. No Japan Meteorological Agency observation station operates directly in the area.

Shifting cultivation was widespread in the Kyushu Mountains until the mid-twentieth century (Ikeya 2022). In the Itsuki–Gokanosho area, this system produced crops like foxtail millet, common millet, buckwheat, soybean, adzuki bean, rice bean, taro, sweet potato, barley, and maize (Sakaguchi and Kino, 2022). In Itsuki Village, shifting cultivation reportedly continued until 1990. Farming there is now small-scale. In 2023, only 13 households had more than 3,000 m² of farmland and annual sales exceeding 7,500 USD. Most households mainly farm for their own

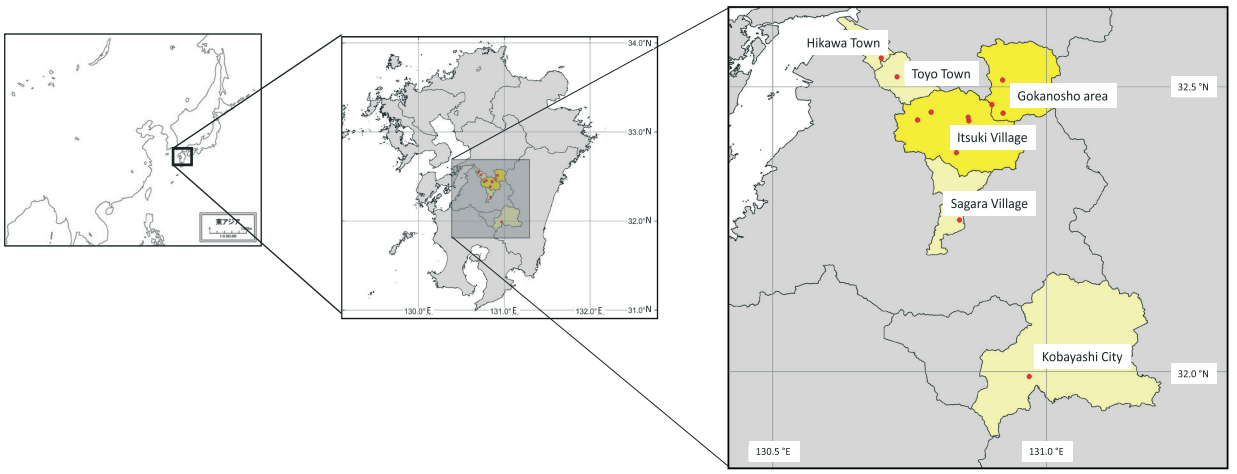


Figure 1. Study site of the survey.

use. Over 50% of the population is aged 65 or older, and many self-consumption farmers are as well.

Interview survey: We conducted semi-structured interviews with Takenoko-imo growers to document naming, cultivation, storage, use, and seed continuity. We carried out the main fieldwork from October to November 2023, with follow-up in August 2024 and November 2025.

In the Itsuki–Gokanosho area, we interviewed eight individuals. Although the exact number is unclear, there are approximately 30 Takenoko-imo growers in the area. Fewer growers know about the history, cultivation, and local names of taro, including Takenoko-imo. Thus, the number of 8 people represents over 30% of the eligible subjects for this survey. These included five current growers in Itsuki Village, two current growers in Gokanosho, and one former grower in Gokanosho who had cultivated Takenoko-imo for a long period but was not cultivating at the time of the survey. We identified interviewees via a previous survey by Terashima (2022) and through introductions from known growers. All current growers cultivated Takenoko-imo mainly for self-consumption. In this paper, we refer to these respondents collectively as self-consumption growers, including both current and former growers unless otherwise specified. The interviewees were aged in their 70s to 80s: seven women and one man. As mentioned earlier, many self-consumption growers are 65 years of age or older, and vegetable cultivation is often carried out by women. Therefore, this age and gender composition can be considered representative of Takenoko-imo growers in the area.

For comparison, we interviewed three growers or former growers in Sagara Village, Toyo Town, and Hikawa Town in Kumamoto Prefecture, where growers cultivate Takenoko-imo mostly for sale. We refer to them as commercial growers. These areas lie at lower elevations (60-320 m), offer more flat land, and have warmer weather with little or no snow. The interviewees were in their 70s to 80s: two women and one man.

The interview topics included local names for the crop, introduction history, sources of seed tubers, cultivation calendars, earthing-up practices, fertilizer use, storage methods, uses of parent and daughter tubers, and experiences of seed-tuber shortage. For commercial growers, we also asked additional questions about sales channels and pricing. We interviewed the staff of JA Kobayashi in Kobayashi City, Miyazaki Prefecture. This is the largest production area of Takenoko-imo in Japan. We obtained information on cultivation recommendations, grading standards, and shipment practices.

All interviews received the participants' prior consent.

Morphological measurements of parent tubers: To compare parent-tuber characteristics across production contexts, we collected tubers from growers' fields when harvestable material was available at the time of the survey. Since the size of parent-tuber varies with the number of growing shoots, we focused on parent-tubers with only a single shoot. We collected nine parent tubers from four self-consumption growers in the Itsuki–Gokanosho area and five parent tubers from two commercial growers, but we did not collect enough samples because they were outside the harvest season. In addition, we obtained 10 Grade A, size 2L parent tubers (Table 3) from JA Kobayashi, representing the shipment class with the highest shipment volume in the 2023–2024 season.

We measured the length and width of all sampled tubers. We analyzed group differences using the Tukey-Kramer test for multiple comparisons after confirming homogeneity of variance using Bartlett's test.

Analytical approach: This study adopted an interdisciplinary, comparative approach, combining qualitative interview data with quantitative measurements. We compared (1) self-consumption growers in the Itsuki–Gokanosho area, (2) commercial growers in lower-elevation areas of Kumamoto Prefecture, and (3) the commercial production and grading system documented through interviews with JA Kobayashi. Through this comparison, we examined how the persistence of Takenoko-imo in marginal mountain communities relates to ecological constraints, labor requirements, and socio-cultural valuation.

Results

All interviewees recognized the name Takenoko-imo (Table 1). Among the eight self-consumption growers in the Itsuki–Gokanosho area, three also used the name

Seka-imo, two used Taiho-imo, and two used Teppo-imo. Taiho means "cannon" in Japanese and is thought to refer to the shape of the Takenoko-imo, while Teppo means "gun" and may refer to its shape or to the secondary tubers. Commercial growers used only the name Takenoko-imo. Staff at JA Kobayashi reported that the name Kyo-imo has been used for branding since the 1950s, to evoke the image of Kyoto cuisine, which is widely regarded as refined and of high quality in Japan, although they also recognized the name Takenoko-imo. They also noted that the crop had previously been referred to as Taiwan-imo.

Seven of the eight self-consumption growers consumed both parent and daughter tubers, whereas one consumed only parent tubers. Two of the three commercial growers consumed both parent and daughter tubers, whereas one consumed only parent tubers. In the JA Kobayashi production area, parent tubers were mainly sold, whereas daughter tubers were mainly used for self-consumption. Leaf stalks were not used at the time of the survey, although five of the eight self-consumption growers stated that they had eaten them in the past. Parent tubers were cooked by boiling in salted water or in a sugar-and-soy-sauce mixture. These cooking methods were similar to those used for other taro varieties in the region, and no clear distinction in usage was reported. Four self-consumption growers who particularly preferred Takenoko-imo and cultivated 50 or more plants stated that they preferred its firm flesh and its resistance to disintegration during cooking.

Self-consumption growers cultivated 10–100 Takenoko-imo plants annually, with a mean of 48 plants (Table 2). The proportion of Takenoko-imo among all taro plants cultivated by these growers ranged from 7% to 65%, with a mean of 39%. In 2023, two of the seven current self-consumption growers sold surplus tubers at farmers' markets when they could not consume all of them; these two growers cultivated 20 and 50 plants, respectively. Other self-consumption growers distributed surplus tubers to neighbors or family members living elsewhere. Commercial growers cultivated approximately 150–600 plants annually and sold most of their harvest at farmers' markets. Two self-consumption growers sold both parent and daughter tubers, whereas commercial growers sold only parent tubers. Although the number of plants cultivated by individual growers within the JA Kobayashi area was unknown, JA Kobayashi as a whole shipped 690 t in 2005, 420 t in 2010, and 60 t in 2023, indicating a substantial long-term decline in production. At JA Kobayashi, only parent tubers were shipped outside the prefecture, whereas both parent and daughter tubers were sold at local farmers' markets.

Neither self-consumption growers nor commercial growers sorted tubers by size before sale, and no difference in price per unit weight by parent tuber size was reported by either group, suggesting limited standardization at the local level. Self-consumption growers set the price of Takenoko-imo at farmers' markets at the same level as, or slightly lower than, that of other taro varieties (data

Table 1. Name and edible part of Takenoko-imo at Itsuki-Gokanosho area (self-sufficient growers), near the area (commercial growers) and Kobayashi city (JA Kobayashi)

Grower's type	Name*	Edible part **	
		Present	Past
Self-consumption (n=8)	Takenoko-imo (8/8)Seka-imo (3/8) Taiho-imo (2/8) Teppo-imo (2/8)	parent tuber (8/8) daughter tuber (7/8)	parent tuber (8/8) daughter tuber(7/8) leaf stalk(5/8)
Commercial (n=3)	Takenoko-imo(3/3)	parent tuber (3/3) daughter tuber (2/3)	parent tuber (3/3) daughter tuber (2/3)
JA Kobayashi	Takenoko-imo Kyo-imo	parent tuber daughter tuber	parent tuber daughter tuber

*: The results are presented as the number of growers using a specific name per interviewee.
**: The results are presented as the number of growers using a specific part per interviewee.

Table 2. Number of cultivated Takenoko-imo and its seller at Itsuki-Gokanosho area (self-sufficient growers), and near the area (commercial growers)

Grower's type	Number of cultivated Takenoko-imo plants			Number of seller*	
	Average	Minimum	Maximum	parent tuber	daughter
Self-consumption (n=8)	48	10	100	2	2
Commercial (n=3)	343	150	600	3	0

*This figure combines the number of growers who have sold Takenoko-imo both currently and in the past.

not shown). In contrast, commercial growers set prices slightly higher than those of other taro varieties. Parent tubers shipped through JA Kobayashi were classified into three quality grades and nine size categories before shipment (Table 3). Market data from the Tokyo Central Wholesale Market showed that the price per unit weight of Takenoko-imo from Miyazaki Prefecture was roughly the same as, or slightly lower than, that of taro from Miyazaki Prefecture (Figure 2). Within Takenoko-imo, the 2L-sized tubers were the most expensive, while the smaller parent tubers had a higher shipment volume but a lower price (Table 4).

The mean length of parent tubers was 21.0 cm in samples from self-consumption growers, 31.0 cm in samples from commercial growers, and 29.5 cm in 2L-grade tubers obtained from JA Kobayashi (Table 5). According to JA Kobayashi's grading standards, the tubers from self-consumption growers corresponded approximately to the 2S–S grades, whereas those from commercial growers corresponded approximately to the 2L–3L grades. No clear difference in width was observed among the groups. Therefore, although the Takenoko-imo in the Itsuki–Gokanosho area were somewhat small, they were not genetically extremely small.

All growers and JA Kobayashi transplanted Takenoko-imo in March–April, earthing up in June–July, and harvesting in October–November (Figure 3). JA Kobayashi recommended earthing up at least three times. Self-consumption growers stated that two to three earthing-ups were necessary. Among commercial growers, the two current growers stated that two times were necessary, whereas growers with previous cultivation experience

Table 3. Criteria of three quality grades and nine size categories of Takenoko-imo established by JA Kobayashi

Quality		Size		
Grade	Criteria	Categories	Length (cm)	Weight (g)
A	Tuber must be free from disease and pest damage, with a slightly tapered shape and no curvature exceeding 3 cm. The tuber interior must not be exposed at the removal point of normal single or double buds.	5L	45-	1150-
		4L	40-44	950-1149
		3L	35-39	800-949
		2L	30-34	650-799
B	Second-best quality after Grade A. Second-best quality after Grade A. curvature exceeding 5 cm and a large cut end. The tuber interior is exposed at the removal point of buds.	L	25-29	580-649
		M	23-24	500-579
		S	20-22	450-499
C	Second-grade product. Tubers that have been cut in half.	2S	15-19	300-449
		3S	-14	-299

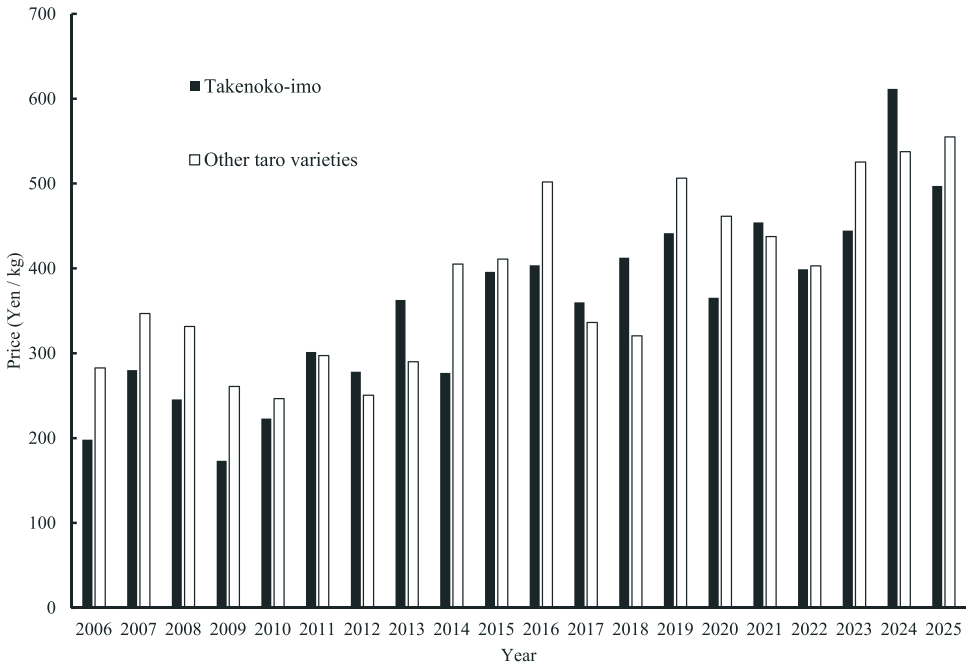


Figure 2. Prices of Takenoko-imo and other taro from Miyazaki Prefecture at Tokyo central wholesale market.

stated that four to five times were necessary. Among the seven self-consumption growers cultivating Takenoko-imo in 2023, two were unable to perform sufficient earthing-up due to age-related health problems. Among the two current commercial growers, one was unable to perform sufficient earthing-up because of unfavorable weather conditions.

JA Kobayashi recommended removing excess shoots to promote enlargement of the parent tuber. Neither self-consumption growers nor commercial growers practiced bud removal, and multiple small parent tubers were sometimes harvested (Figure 4).

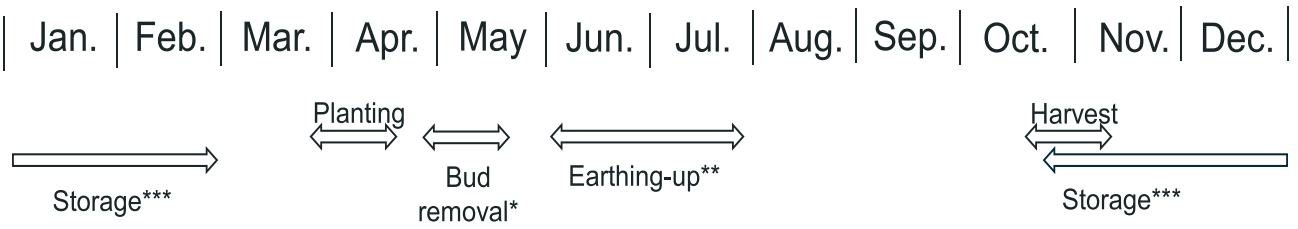
Table 4. Average shipment volume and price of Takenoko-imo per year from JA Kobayashi, 2016-2022.

Size Categories	Shipment amount (kg)	Price (Yen /kg)
5L	1154	285
4L	3550	343
3L	5754	385
2L	7695	423
L	5818	415
M	6246	358
S	5190	319
2S	8759	269
3S	5597	299

JA Kobayashi stored harvested Takenoko-imo in pits dug in the field for at least two weeks before shipment. This storage period is required by the brand and intended to improve tuber quality. Self-consumption growers and commercial growers also stored harvested tubers in field pits, locally called imo-gama or imo-tsubo, and used them as needed. However, no fixed storage period before sale or consumption was reported among these growers.

JA Kobayashi recommended application of 30 Mg/ha of compost and 172 kg/ha of nitrogen, 200 kg/ha of P_2O_5, and 184 kg/ha of K_2O as basal fertilizer, with an additional 28 kg/ha of nitrogen and 34 kg/ha of K_2O as top dressing. Among self-consumption growers, four used both compost and chemical fertilizer, two used only compost, and two used only chemical fertilizer. Seven applied only basal fertilizer, and one applied only top dressing. All commercial growers used both chemical fertilizer and compost.

With the exception of one commercial grower, growers generally used daughter tubers as seed tubers (Table 6). Five self-consumption growers had experienced a seed-



*: Bud removal is recommended by JA Kobayashi, while the growers within and near Itsuki-Gokanosho area do not remove bud.
**: Minimum 3 times earthing-up is recommended by JA Kobayashi and the growers within and near Itsuki-Gokanosho area also recognize the importance.
***: Longer storage period than 2 weeks is necessary for branding by JA Kobayashi, while the growers within and near Itsuki-Gokanosho area do not impose a fixed storage period

Figure 3. Cultivation calendar of Takenoko-imo within and near Itsuki-Gokanoshoarea and Kobayashi city.

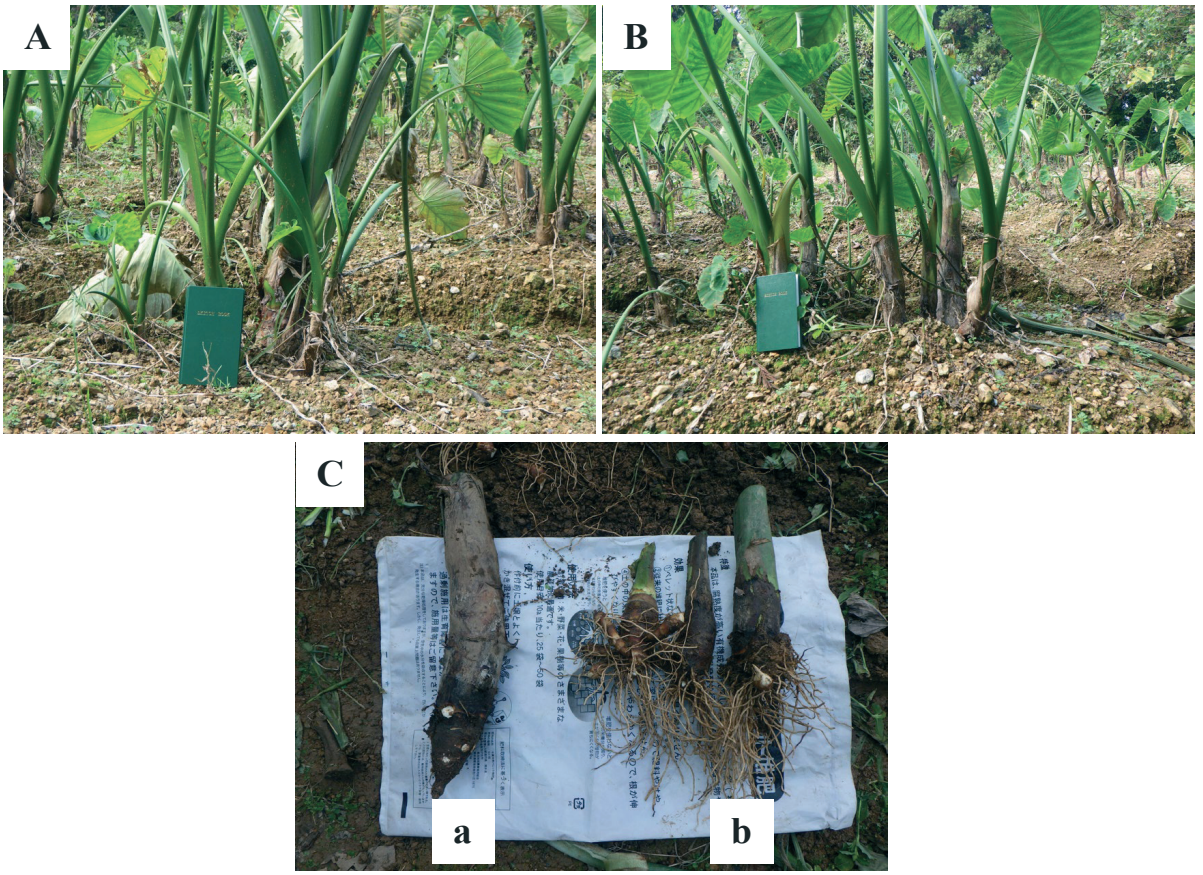


Figure 4. Appearance of Takenoko-imo, A and C-a: Single parent tuber with bud removal, B and C-b: Multiple parent tubers without bud removal.

tuber shortage, and four of them attributed it to frost or low-temperature damage. Commercial growers had not experienced a seed-tuber shortage. Among the three self-consumption growers who had never experienced a seed-tuber shortage, two continued cultivation using planting material inherited from the previous generation, and one continued cultivation for about 20 years using seed tubers obtained within the village. When a seed-tuber shortage occurred, three of the five affected growers reintroduced planting material from within the Itsuki–Gokanosho area, whereas two obtained it from outside the area.

Table 5. Length and width of Takenoko-imo cultivated in Itsuki- Gokanosho area by self-sufficient growers, near the area by commercial growers and at Kobayashi city

Grower's Type	Length (cm)	Width (cm)
Self-consumption	21.0 b	6.4
Commercial	31.0 a	6.6
JA Kobayashi *	29.5 a	5.6

Different letters within the same column indicate a statistically significant difference at the 5% level, as determined by the Tukey-Kramer test (n=9, 5, and 10 at Self-consumption, Commercial, and JA Kobayashi respectively) after confirming homogeneity of variance using Bartlett's test. *: Grade A, Size 2L Takenoko-imo shipped by JA Kobayashi, which accounted for the largest volume in circulation 2023-2024 season were measured.

Table 6. Parts of seed tuber used, experiences with seed tuber shortages and their reasons, and sources of seed tubers at Itsuki-Gokanosho area (self-sufficient growers), and near the area (commercial growers)

Grower's type	Number of growers using each tuber as seed		Number of growers experienced seed tuber shortage	The reason of seed tuber shortage*	Where to obtain seed tuber *		
	Parent tuber	Daughter tuber			Takenoko-imo currently cultivated	A year of seed tuber shortage	A typical year
Self-consumption (n=8)	0	8	5	Low temperature (4/5) Unknown (1/5)	■ Continuous self seed tuber saving (2/8) ■ Within Itsuki-Gokanosho area (4/8) ■ Outside Itsuki-Gokanosho area (2/8)	■ Within Itsuki-Gokanosho area (3/5) ■ Outside Itsuki-Gokanosho area (2/5)	■ Self seed tuber saving (7/8) ■ Within Itsuki-Gokanosho area (1/8)
Commercial (n=3)	1	2	0	-	■ Continuous seed tuber saving (1/3) ■ Outside the each area (1/3) ■ Unknown (1/3)	-	■ Self seed tuber saving (3/3)

*The numbers in parentheses indicate the number of eligible growers per the number of interviewee.

Discussion

Takenoko-imo as a local crop in the Itsuki–Gokanosho area: The results indicate that Takenoko-imo can be regarded as a local crop well established in the Itsuki–Gokanosho area based on criteria such as intergenerational transmission, localized naming, and subsistence use, while traits such as the size of the parent-tuber that differed from those in other regions were not selected. Previous research has identified Takenoko-imo as one of the most widely cultivated taro varieties in this region (Terashima, 2022). Consistent with this, our survey showed that self-consumption growers cultivated Takenoko-imo at relatively high proportions among their taro crops, with values ranging from 7% to 65% and averaging 39%.

Although the exact time of its introduction remains unclear, several growers have continued its cultivation from the previous generation, and some have maintained it for decades using locally sourced planting material. In addition, when seed-tuber shortages occurred, growers frequently reintroduced planting material from within the Itsuki–Gokanosho area.

Takenoko-imo is also integrated into everyday food practices. It is used similarly to other taro varieties and is consumed as part of daily meals rather than for specific

ritual or ceremonial purposes. Furthermore, locally specific names such as Seka-imo, Taiho-imo, and Teppo-imo have developed within a limited geographic range, indicating localized naming practices.

Taken together, these findings suggest that Takenoko-imo has been maintained through intergenerational transmission, local circulation and reintroduction of planting material, and integration into daily subsistence practices. These characteristics are consistent with those of local crops maintained within a specific region.

Takenoko-imo as a non-typical local crop: However, Takenoko-imo in the Itsuki–Gokanosho area cannot be considered a fully adaptive local crop. Several self-consumption growers experienced seed-tuber shortages due to frost damage or low-temperature stress, indicating that the crop is vulnerable to local climate conditions. In this respect, Takenoko-imo does not conform to the common expectation that local crops are well adapted to their environmental conditions (Dwivedi *et al*., 2016).

This lack of fit is not limited to present conditions. Historically, shifting cultivation was the dominant agricultural system in this region, and crops suited to it were typically low-labor-input and tolerant of marginal soils. However, Takenoko-imo was not cultivated in shifting cultivation fields, presumably because it requires deep soil for the development of elongated parent tubers and repeated labor inputs such as earthing-up, which are difficult to perform in distant shifting cultivation fields. Consequently, Takenoko-imo has been cultivated in small fields near houses since its introduction (Terashima, 2022).

A similar mismatch can be observed under current farming conditions. In small fields near houses, where Takenoko-imo is cultivated, there is a general tendency to select vegetables that require less labor, according to our observation. Nevertheless, Takenoko-imo requires repeated earthing-up and relatively intensive management, and some growers were unable to perform sufficient earthing-up due to aging or environmental constraints. In this sense, Takenoko-imo is not well aligned with either past or present agricultural practices in the region.

Taken together, these observations indicate that Takenoko-imo represents a non-typical form of local crop, whose persistence cannot be explained solely by adaptation to environmental or agronomic conditions.

Role of planting material networks in maintaining cultivation: Despite these ecological and agronomic mismatches, Takenoko-imo continues to be cultivated in the Itsuki–Gokanosho area. One key factor enabling this persistence is likely the circulation of planting material. When seed-tuber shortages occurred, growers reintroduced planting material either from within the Itsuki–Gokanosho area or from nearby regions outside the area. In addition, some growers maintained cultivation over long periods using planting material inherited from previous generations.

These findings suggest that the persistence of Takenoko-imo depends not only on local environmental conditions but also on social networks that facilitate the exchange and reintroduction of planting material. Even when local conditions periodically disrupt production, the availability of planting material through these networks allows cultivation to resume. Although seed exchange networks have been reported to play a key role in maintaining well-adapted local crops (Helicke, 2015; Pautasso *et al*., 2013), our findings suggest that such networks may also sustain crops that are not necessarily well adapted to local environments.

Limited integration into market-oriented systems: Despite its labor-intensive nature, Takenoko-imo cultivation has become firmly established in this region and continues to be cultivated. Staff at JA Kobayashi reported that one reason for the sharp decline in shipments was that, due to an aging workforce, it had become difficult to perform the labor-intensive tasks required to produce large, high-value parent tubers, such as bud removal and earthing-up. In contrast, self-consumption growers do not place value on large or elongated parent tubers and therefore do not adopt practices such as bud removal. In addition, labor-intensive practices such as earthing-up may be reduced depending on the growers' physical condition.

This limited integration into market-oriented production systems may reduce the pressure to conform to commercial standards, allowing Takenoko-imo to persist even when it is less competitive in terms of yield, labor efficiency,

or uniformity. In this sense, its continued cultivation can be understood as maintained within a socio-economic space only partially connected to broader market systems. Generally, preserving local crops requires enhancing their economic value (Raggi *et al*., 2021). However, our findings indicate that persistence may also occur due to the absence of strong market incentives.

Everyday practices related to food preparation and use: In addition, for self-consumption, not only the labor involved in field production but also that in cooking may be a factor. However, these observations are based on a limited number of respondents and should be interpreted cautiously. As reasons for preferring Takenoko-imo, some growers said that it is easy to peel without itching. Furthermore, when discussing other taro varieties, several growers mentioned that taro makes their hands itch or that its smaller size makes peeling more labor-intensive. The case of Takenoko-imo in Itsuki–Gokanosho area suggests that the selection of local crops may not be reducible to conventional agronomic, economic, or folkloric causes; rather, the effort involved in daily life, and particularly the role these crops play in the lives of women involved in cooking, may be a significant factor, although further investigation is needed. This dimension warrants further systematic gender-focused analysis.

Rethinking "adaptation" in the persistence of local crops: The case of Takenoko-imo in Itsuki–Gokanosho area suggests that the persistence of local crops cannot be fully explained by conventional notions of adaptation to environmental or agronomic conditions. Instead, it reflects a combination of factors, including human preferences, social networks for exchanging planting material, and limited integration into market-oriented production systems.

This study highlights a form of persistence that is not based on optimal adaptation but rather on the interaction between ecological constraints and socio-cultural processes. Such cases highlight the need to reconsider the role of human agency and social context in shaping the dynamics of local crop diversity, particularly in marginal rural areas. However, further research with larger and more diverse samples is needed to generalize these findings.

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