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Native Paddy Cultivation: Understanding of the Practice and Crop Management among Sarawak's Farmers

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ABSTRACT

Native paddy is widely acknowledged for its authentic taste and fragrance but is often reported with low yield. Hence, the objective of this paper was to identify the practice and crop management of native paddy in Sarawak. About 56 targeted participants who actively cultivated native paddy were surveyed from January to June 2021. Our results have revealed their background and management contributed the most to the yield where no irrigation system, low fertiliser application, and the possibility of impurity seedlings become the significant constraints. Besides, unpredictable weather and long-distance travel to buy agricultural supplies worsened this problem. The participants apply fertiliser in low amounts compared to their cultivation areas (>2.5 ha), and those who mixed cropping will share the fertiliser with another crop. Paddy varieties such as Rotan (Wai), Biris, and others need a longer period of growth (5½ months) and are cultivated once a year. This showed unproductive production and a high infestation of pests and diseases. Therefore, we suggest intensive paddy cultivation by addressing the issues found in this study.

Contribution/Originality: This study contributes to the understanding of the practice and crop management of native paddy cultivation in Sarawak. It seeks the main problem that led to low yield as reported by the farmers. Despite understanding their farming practice, issues related to their crop management may help to overcome the problem in the future and help this industry to become more productive.

1. Introduction

In most advanced democratic countries, the conduct of by-elections is an integral part in Native paddy in Sarawak has an authentic taste; some are fragrant, have excellent taste and texture, and are considered high quality, such as Biris and Rotan (Wai). Other important varieties include Bario (Adan), Mahsuri Mutant, Jarum Mas, and Serendah. However, most of them are susceptible to blast disease caused by a fungus (*Pyricularia oryzae*) favourable to tropical climate regions (Rijala & Devkota, 2020; Simkhada & Thapa, 2021). In addition, the native variety has a poor yield ranging from 2.5 tan/ha to 3.5 tan/ha and needs up to 5½ months before the harvesting season (Hanafi et al., 2009; Sohrabi et al., 2012).

There are also other well-established varieties as a substitute for native paddies, such as MR27 (Kadaria), MR30, MR52 (Manik), Mahsuri Line 17, Saratani, and others that exhibit superior quality in terms of yield production (3.0 tan/ha to 6.0 tan/ha) and short growing period (up to 4½ months). However, local farmers prefer the old native paddy variety due to numerous reasons that support their decision e.g., rice texture and aroma, and accessibility to the hybrid seeds. Most of the farmers produce their own seedlings and share among themselves resulting in poor crop growth. This was caused by the impurity of their seedling, including genetic damage during their collection and storage (Ansari et al., 2021). Moreover, no irrigation system, unpredictable climate conditions, and low fertiliser application may contribute to the low yield as well. They also live in remote areas where accessing agricultural supplies such as fertiliser, pesticides, or other important supplies may be high cost due to long-distance travelling. These issues have sometimes led certain farmers to grow native rice equated to a natural farming system under low chemical inputs (Hollaus et al., 2022).

Cultivating native paddy was important to them and they had to accept the difficulty of sustaining the production. Most of them prefer to manage their own paddy straw which has become an alternative to sustain soil fertility. It was common to leave the paddy straw to decay naturally as the crop was only cultivated once a year. Burnt straw was an initiative to dispose of agricultural waste that had benefited soil fertility. In Malaysia, burning paddy straw was practised widely to eliminate soil-borne pathogens, remove weeds, and provide ash to alleviate soil acidity and increase soil organic matter (Saothongnoi et al., 2014; Izzah et al., 2020; Toan et al., 2022). However, straw management depends on farmers' preferences and intention to dispose of it. Therefore, the objective of this paper was to identify the practice and crop management of native paddy in Sarawak.

2. Methodology

This survey was conducted among targeted participants who actively cultivated native paddy in Sarawak. About 150 survey questions were distributed from January 2021 to June 2021, and only 56 sets were returned with complete answers. Other sets were either missing or unable to be analysed due to technical errors by the translators and enumerators, and undeclared information by participants. The targeted participant's participation was voluntary, and a translator was used as an intermediary to facilitate this process due to the language barrier. The survey questions were divided into three sections with section A focused on participant demographics (Table 1). Native paddy cultivation was primarily questioned in Section B (Figure 1), and Section C attempted to comprehend their management during paddy seasons (Figure 2). Prior to this study, a

pilot test involved a total of 30 Diploma and Bachelor students from the Universiti Putra Malaysia Bintulu Sarawak Campus in verifying the consistency and understanding of the questions. The collected data was arranged and sorted according to the objective of this study, and the mean of the data was calculated using Microsoft® Excel for Microsoft 365 version 2210 and later presented in a table and graphical images.

3. Results and Discussion

3.1. Participants Background

In this study, 56 participants answered the survey questions which came from different parts of Sarawak (Table 1).

Table 1: Participant profiling (N=56)

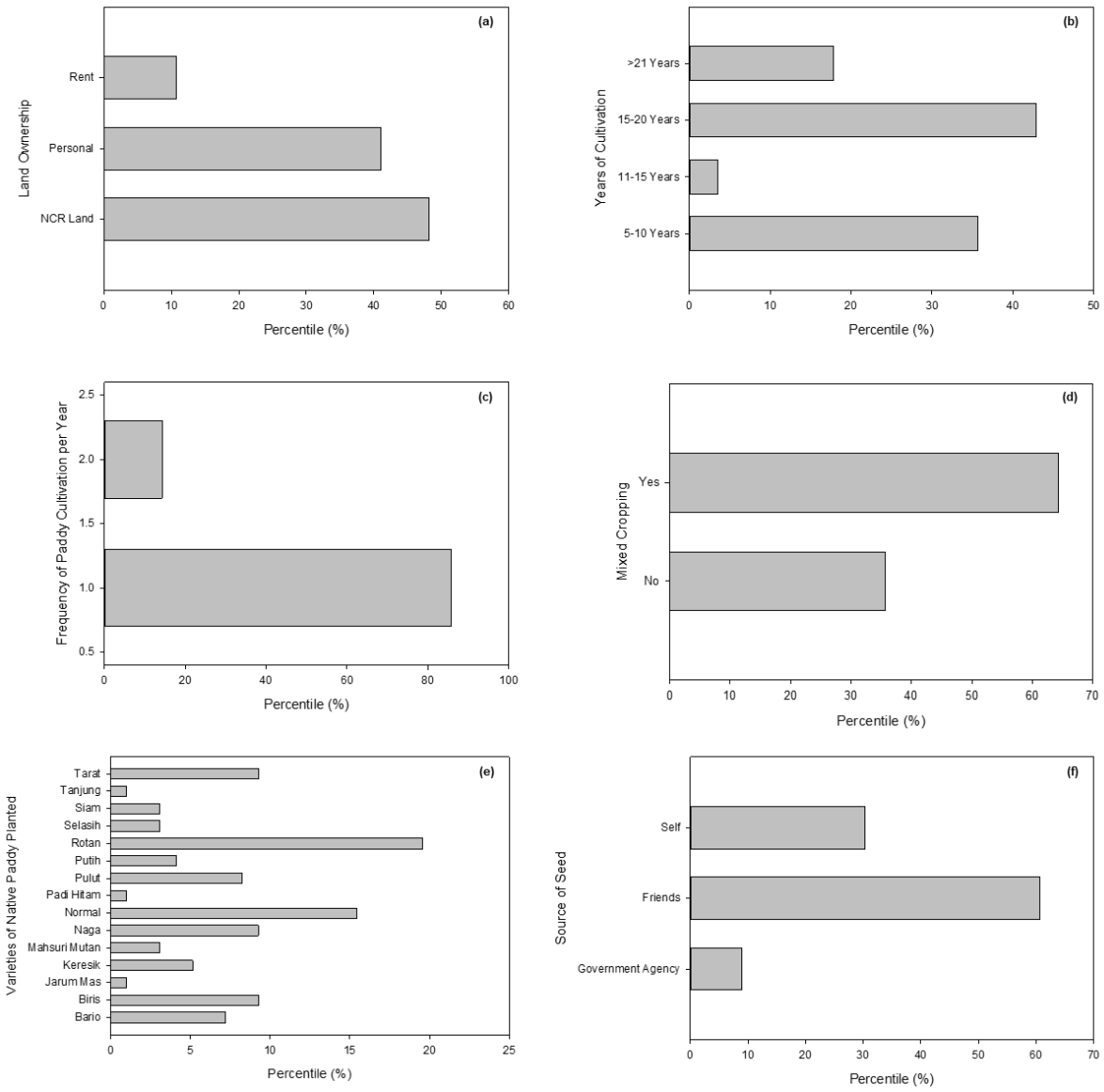
Items	Percentile (%)
Origin	3.57
Bakun	7.14
Baram	7.14
Belaga	10.71
Betong	8.93
Daro	8.93
Kapit	14.29
Lundu	1.79
Segan	16.07
Serian	21.43
Tatau	3.57
Gender	7.14
Male	50.00
Female	50.00
Age	
26-35	8.93
36-45	5.36
46-55	44.64
56-65	30.36
66-75	10.71
Ethnic	
Bidayuh	17.86
Iban	50.00
Kayan	7.14
Kenyah	5.36
Melanau	8.93
Salako	10.71
Marital Status	
Divorce	8.93
Married	87.50
Single	3.57
Mode of Farming	
Full-time	83.93
Part-time	16.07
Size of Land	
<2.5 ha	58.93
2.5-4.0 ha	25.00
4.0-6.5 ha	16.07

The results exhibited an equal number of males and females involved in native paddy cultivation. The age of our participants was more than 46 years old, which accounted for 85.71%. Native paddy is often cultivated by the Iban ethnicity (50.00%), followed by Bidayuh (17.86%), Salako (10.71%), Melanau (8.93%), Kayan (7.14%), and Kenyah (5.36%). The marital status of our participants was 87.50%, and largely, they were full-time farmers (83.93%). The size of land used to grow paddy was 58.93%, with participants owning less than 2.5 ha, while the rest were between more than 2.5 ha and 4.0 ha and 4.0 ha to 6.5 ha.

3.2. The Practice of Paddy Cultivation

The practice of paddy cultivation for our participants was shown in Figure 1. Our findings revealed that 48.21% of participants had Native Customary Rights (NCR) land ownership.

Figure 1: Practice of paddy cultivation subject to (a) land ownership, (b) years of cultivation, (c) frequency of paddy cultivation per year, (d) mixed cropping, (e) varieties of native paddy cultivated, and (f) source of seed



While the rest were self-owned, including hereditary from their parents, which was classified as personal land ownership (41.07%). Because native paddy cultivation is well established in East Sarawak, we anticipate a long year of cultivation on the respected land, with a timeframe of 15 to 20 years for 42.86%. This includes the management practices on the frequency of cultivation per year, dominated by once per year (85.71%), and it was common to cultivate the native paddy with mixed cropping (64.29%). Among hundreds of native paddy varieties in Sarawak, Rotan was the most famous cultivated by our participants with 19.59%, and their source of seedlings is shared between friends (60.71%).

Sarawak has plenty of unexplored lands, which can be used for farming activity and applied for NCR land ownership based on legal definition and recognition by the high court of Sarawak and Sabah, Malaysia. This privilege has expanded agricultural activity in a remote area and represents our participants' land ownership. This includes a larger land size for their agricultural activities, as presented in Table 1. Most of our participants prefer cultivating native paddy due to its authentic taste and fragrance, even though it takes a longer time (5½ months) and is susceptible to diseases such as rice blast (*Pyricularia oryzae*) compared to the hybrid paddy variety such as MR27 (Kadaria), MR30, and others as suggested by the Department of Agriculture Sarawak (DOAS). The hybrid paddy variety was tolerant to pests and diseases and shortened cultivation days to only 4 to 4½ months. In this study, Rotan or Wai (19.59%) were preferable for their cultivation even though it takes 5½ months with low yield (3.0-4.5 t/ha) (Hanafi et al., 2009; Sohrabi et al., 2012). The ability to produce this native paddy was low, and participants could only grow it once a year (85.17%). However, the majority of farmers need more than 6 months to harvest for several reasons. The main problems were no irrigation system, unpredictable climate conditions, low fertiliser application, and the possibility of impurity of seedlings obtained from their harvesting period (30.36%). Our participants obtained their seedlings from their friends (60.71%) and relatives to make sure the supply was sufficient. Most of the participants stayed in a remote area (Table 1) and accessing high-quality seedlings from a government agency (8.93%) such as the Malaysian Agricultural Research and Development Institute (MARDI) and DOAS was mainly constrained. Moreover, the participants practised mixed cultivation (64.29%) during the off-season with pineapple, oil palm, baby corn, and other potential crops that provide other income, especially for full-time farmers (Zaimah et al., 2018a; Zaimah et al., 2018b).

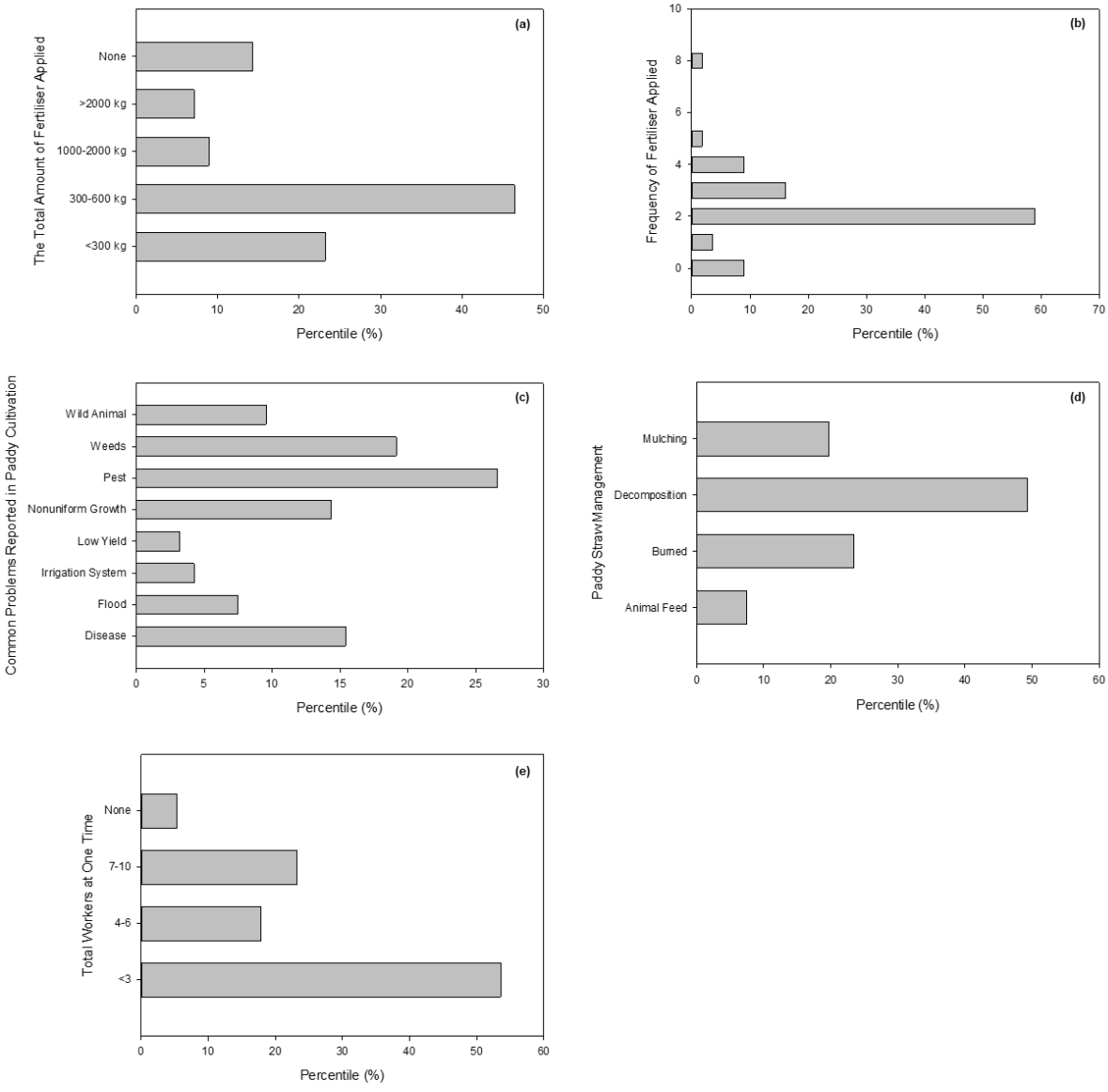
3.3. Crop Management

In this study, crop management techniques used by participants were analysed and shown in Figure 2. The findings showed our participants had problems with pests (26.60%) and followed by weeds (19.15%), diseases (15.43%), and others. The participants used between 300 kg to 600 kg (46.43%) fertilisers and applied twice per season (58.93%). Few participants burn paddy straw after the harvesting season. At the same time, 49.38% prefer to leave the paddy straw on the ground for decomposition. Due to the small size of the farm (Table 1), all farming activities were assisted by family members with fewer than three manpower at a time (53.57%).

Long distance travelling (>80 km) is the main constraint for accessing sufficient agricultural supplies such as fertiliser, pesticides, and others, which has led to high-cost production. Subsequently, insufficient nutrient application affects native paddy growth and is susceptible to pests and diseases. According to DOAS, native paddy needs at least

50 kg N, 40 kg P_2O_5, and 30 kg of K_2O per hectare to support its growth by using NPK green and NPK blue. However, our participants were unable to supply at the recommended dosage, particularly when practising mixed cropping. Personal communication has revealed their preference to allocate half of the fertiliser on mixed cropping, especially on oil palm. Moreover, only 46.43% could supply fertiliser up to 600 kg per season, but the amount is considered insufficient to cover a minimum of 2.5 ha of land, especially involving mixed cropping during the paddy season. The frequency of fertiliser applications was twice per season (a month and a third month after planting) without considering the plant growth stages that need a different amount and nutrients (Ismail et al., 2014; Hussain et al., 2022), and eventually, lead to low yield (3.19%). Infestation with pests (26.60%) and disease (15.43%) was also reported by most of our participants, especially in conditions of malnutrition (Kamal et al., 2012; Ansari et al., 2021).

Figure 2: The management of paddy by participants with (a) the total amount of fertiliser applied, (b) frequency of fertiliser applied, (c) common problems reported in paddy cultivation, (d) paddy straw management, and (e) total workers at one time



Even though the DOAS had suggested newer hybrid paddy varieties with superior quality, most of the farmers showed the least interest compared to native paddy subjected to the authentic taste, fragrance, and traditionally eaten varieties. Moreover, they only consume their rice product and keep the seedling for the upcoming season, which is why only a few participants sell the rice to consumers or wholesalers. Accordingly, our participants managed to decompose (49.38%) and burn (23.46%) paddy straw after the harvesting season, which may be related to increased soil fertility as burned residue helps alleviate soil acidity and provide nutrients (Izzah & Wan Asrina, 2018; Toan et al., 2022). The decomposition process may decay the straw, serve as a slow-release fertiliser, and improve soil structure. This was later confirmed by personal communication with the participants as they observed improvement in soil fertility, even if low fertiliser was applied through increased crop growth and yield from the previous season.

4. Conclusion

In this study, we found that native paddy cultivation by our participants had low yields due to no irrigation system, unpredictable climate conditions, low fertiliser application, and the possibility of impurity seedlings as they repetitively used their harvested paddy. When the crop is malnourished and plagued by pests and diseases, these factors have the greatest impact. Moreover, their fertiliser application was insufficient compared to the recommended amount by DOAS due to long-distance travelling that involved high costs. Most fertilisers were only given half the weight because they had to be shared with another crop, such as oil palm. However, we found few participants practised good straw management through burning or decomposition, which later provided burned material that alleviated soil acidity and became slow-release fertilisers for the next seasons. Therefore, we suggest the native paddy should be cultivated intensively with proper irrigation, fertiliser, and seedling to sustain this crop and have an opportunity to be sold in the entire Sarawak, which later became a tourist attraction.

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Conflict of Interests

The authors reported no conflicts of interest for this work and declare that there is no potential conflict of interest with respect to the research, authorship, or publication of this article.

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