

RESEARCH ARTICLE

EDGE OF TRADITIONAL PADDY CULTURE OF KAMPUNG TUBIH MAWANG, ITS CHALLENGES AND CULTURAL VALUES

S. Y. Mok, Y. Z. Liu, C. X. Chong, J. T. Goh and S. K. Ting*

Faculty of Engineering, Computing and Science, Swinburne University of Technology (Sarawak Campus), 93350 Sarawak, Malaysia

ABSTRACT - Kampung Tubih Mawang is one of the most valuable in cultural identity and rich in traditional paddy farming in Sarawak. Among various agricultural practices, paddy cultivation has gained greater importance due to the region's local conditions, climate and culture. This study utilizes related global resources, newsletters, academic articles database and field tour to draw on the values of traditional paddy farming culture and unexplored challenges. The current study aimed to document and report challenges that could be prominence in the local village on the uniqueness of paddy cultivation in the village. Some categorized surveys of challenges in the village were documented, including manpower, pest control, post-harvest drying and dam irrigation issues. Preserving indigenous values is becoming increasingly important, considering the growing emphasis on sustainable cultural practices within the village. The survey results in our study have widened the perception of the need to enrich the paddy farming practices not merely for heredity but also for village implications intended to conserve indigenous values.

ARTICLE HISTORY

Received : 21st Aug. 2025
 Revised : 30th Oct. 2025
 Accepted : 18th Nov. 2025
 Published : 29th Dec. 2025

KEYWORDS

Cultural
Paddy cultivation
Challenges
Sustainable
Indigenous values

INTRODUCTION

Kampung Tubih Mawang is a rural village located in the Serian Division of Sarawak, Malaysia, as shown in Figure 1 and is surrounded by Mount Sinmajau and Peyang Hill (Mapcarta). The average daily temperatures range from 23°C in the early morning to 32°C during the day. The region experiences two monsoons, which are the Northeast Monsoon (November to February) bringing heavy rainfall and the Southwest Monsoon (May to September) is relatively drier. The village was established in 1938 when Mr. Saweng Ak Not led nine families from Kampung Reteh Mawang to settle along the Tubih River (BITUBIH). The settlers engaged in hill paddy farming and cultivated rubber and pepper. Over the years, the village received certain development of infrastructure such as SK Sungai Sameran, a primary school opened in 1959, and St. Adrian Catholic Church, established in 1978 as well as facilities upgrade through Rural Transformation Programme (Geri, 2010). A modern community hall was built in 1986 to facilitate social activities. The village has also benefited from government initiatives, including the provision of wireless internet services and improved mobile network coverage, providing the villagers with 4G Wi-Fi coverage. The government had also improved the road and building infrastructures in the village and had provided subsidies for pesticides, fertilisers and paddy seeds for their farming activities. Other necessary infrastructure, including a bus station, adequate electricity or powerlines, and proper sanitary facilities like toilets, was also provided and is accessible at the village. The village has asphalt roads in good condition and can support cars and lorries. Moreover, the village has access to operational water pumps managed by the Rural Water Supply Department and gravity water. In addition, most houses have satellite dishes, and some of them even have a solar panel for extra electricity generation. The village houses were built with bamboo in the past, but now all the new houses are built with concrete. However, there were still some buildings built with wood, as they were built many years ago, such as the Bari, which is a hut that stores paddy grains.

The village consists of Bidayuh people, an indigenous ethnic group in Sarawak, Malaysia, with a community size of over 300 people and a total of 59 families. They mainly speak Bidayuh dialects, but they are also able to communicate in Malay and English with visitors. The governance structure of the village includes multiple committee members that are appointed by the government, who are the chairman or head of the village, secretary and treasurer. There are also multiple bureaus that handle different aspects of the village, including education, development, information and communication technology, agriculture, and health and safety. Additionally, there are several community areas that can be accessed at the village, including the community hall for the usage of general meetings and celebrations of festivals, the school in neighbouring villages, a market at Serian, paddy fields, palm oil fields, a small store that is accessible within the village, and also a church at the entrance of the village. The paddy field is located about a 6-minute drive away from the village on well-maintained roads and each family in the village has access to one acre of farming land. Moreover, the most culture of the village is still partaken in the paddy cultivation. In the past, the villagers inherited paddy seeds and land from their ancestors, which is still being used today for the villagers' agricultural practices. In the paddy field, there is an office with grid power used by the Department of Irrigation and Drainage Sarawak, which is responsible for managing an irrigation

dam that was also built in the paddy field. This irrigation dam is connected to an irrigation pond which stores water and irrigates the paddy field. Among the traditional practices discovered from the survey, paddy cultivation was identified as the most important unique identity that is currently still being practiced in the village. It acts as the main food source of the villagers with their own unique method from planting to food processing.

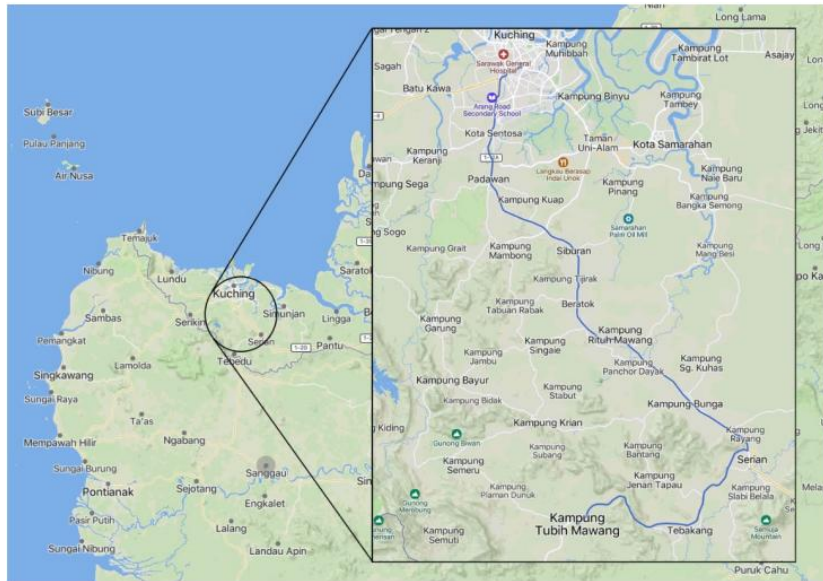


Figure 1. Location of Kampung Tubih Mawang

Most indigenous youth face economic pressures and modernization aspirations for urban lifestyles (Yusoh, 2023) that shape their decisions to move from villages to city that mostly work as wage labourers and it is similar influences as observed in this village. While remain the elders in the village living as self-subsistence-based lifestyle where they often obtain food from the farms and depend little on money. The overall challenge faced by the village is mostly young population exodus; and leads to a critical shortage of human labor needed to continue paddy fields cultivation and gradually loss of traditional practices. The loss of youth passion towards paddy practices was identified as the most significant issue in the village. Besides, the low revenue generated from grain and land was converted to infrastructure development, new pattern of land use for modern agricultural (Geri, 2010), shifting away from subsistence-based farming to a more commercial based agricultural practice. This phenomenon discourages the new generation of farmers from continuing subsistence-based farming practices but instead switching to higher-income-generating crops like palm oil that offer a more revenue and the support from Malaysian Palm Oil Board (MPOB) (Sivapalan, 2015). The survey found that the arrival of mining industry companies to the nearby village had brought a large environmental impact, such as river pollution, land deterioration and the destruction of habitats in the local wildlife, especially damaging to the river ecosystem. Fortunately, the irrigation of paddy fields from the nearby pond is still protected from the polluted river, which was constructed before under a drainage scheme called Payang Swamp Scheme by the Department of Irrigation and Drainage Sarawak (Sarawak, 2025). The mining activities had brought more risks of frequent landslides, and there is a sign of a rising pest intensity that could greatly harm local paddy fields. Most of the village land was sold to companies for various purposes, resulting in a reduction of land owned by the villagers.

MATERIAL AND RESEARCH METHODS

The study begins with literature study of the Kampung Tubih Mawang to gather background information of the village. The analysis of the spatial data from number of field tour through photo images taken was used to study the village environment condition. The landscape, facilities, tools and resources particularly used for the local paddy cultivation were documented to study its challenges, its local harvesting was also documented in the second tour. It associated indigenous values were identified and the potential cultural appropriated solution was proposed. Figure 2 is one of the photos shows the village paddy field during harvesting stage.

RESEARCH FINDING AND DISCUSSION

Identified Challenges

The insights into the paddy cultivation process in the village were obtained through the paddy field tour in the village. Traditionally, most cultivation process begins with land clearing to remove trees and grass through burning. However, weed killer is used in the current practice prior to burning to ensure more effective removal of weeds. Previously the seeds were passed down from ancestors (*Nenek Moyang*) or sourced from relatives, particularly cousins. Today, quality seeds of varieties are subsidised by the government, capable of supporting two harvests per year. Despite this, villagers typically cultivate only once annually due to a shortage of labour, an issue exacerbated by the younger generation's preference for

urban employment, which presents a critical constraint on productivity. In the village, seeds are first germinated and grown in a separate nursery area before planting in the dedicated field. After approximately one month, when the seedlings reach 5 to 6 inches in height, they are transplanted into the paddy fields. The poking holes in the soil with a stick is a traditional method of planting used widely in the village previously, and now it has been replaced by a local tool known as *Kuku Kambing*, a goat hoof-shaped was designed to speed up the planting process.

As the paddy fields is the primary food source in the villagers, paddy cultivation is known to be a unique identity and a culture that is still visible in the village. However, the traditional way of paddy cultivation place significant physical demands on workers. Paddy cultivation tasks generally involve prolonged exposure to the hot sun. Occasionally, the farmer normally rests in the small paddy field shelter, as shown in Figure 3. The village remains largely engaged in rice farming but only teenagers leave the village to work in the city and leaving the elders to sustain themselves mostly on the food produced by the farms.



Figure 2. Village's paddy field



Figure 3. Wooden paddy field hut

Obviously, the survey revealed that the primary challenge faced by the village is a shortage of labour required in order to sustain the paddy cultivation in the village, with only a few old farmers that is still involved in this demanding work. The traditional seeding methods used in the village involve manually digging holes using *Kuku Kambing*, as shown in Figure 4, and also manually planting seeds into each prepared hole, one by one. This process is not only time-consuming but also physically exhausting and challenging, especially for the aging population farmers. Paddy cultivation demands are used for better efficiency. The pesticides are sprayed twice, first in the second month when the seedlings are young, and again in the fourth month as the crops begin to flower, using hand-pumped pesticide sprayers, as illustrated in Figure 5. It helped in increasing yields to some extent, but new pest types, such as worms and snails, became noticeable, where the effectiveness of the method seems insufficiently addressed.



Figure 4. Kuku kambing (Perlis, 2020)



Figure 5. Pesticide sprayer used by villagers

Previously, the villagers' paddy cultivation relied entirely on rainfall for irrigation. At present, the process is carried out using a drainage system connected to an irrigation pond that was constructed as a water storage for the paddy fields shown in Figure 6 under a drainage scheme called Skim Paya Payang. Apart from serving as the irrigation pond, an irrigation dam was also used to help control the water level of the pond to prevent flooding and store water required during droughts. This dam is easily accessible to anyone who visits the paddy field, as it is unfenced. A walkway can be seen that goes above the dam, which is wide enough for people and motorcycles to pass through. Moreover, a small stream can be seen connected to the dam, where the water from the irrigation pond would flow out when the dam is opened.



Figure 2. Irrigation pond and dam

The management and control of the irrigation dam can only be administered by the Department of Irrigation and Drainage Sarawak, where the dam can only operate manually by hand using a sluice gate control wheel and jackscrew mechanism, as shown in Figure 7. There is no power grid surrounding the area; the availability is only over a kilometre away from the dam itself. This presented an issue in implementing the power-operated dam in future. Whenever the dam needs to be opened, an officer must physically travel to the site to perform the operation. Due to rust, corrosion, and jamming, turning the wheel by hand can be heavy and labour-intensive.



Figure 7. Sluice gate control wheel and jackscrew mechanism

At present, the villagers rely on the dam as their primary means of preventing floods and droughts in the paddy fields. They can also request irrigation or drainage services by submitting a request to the dam authorities at the office. However, the control wheel and jackscrews were stolen most often in the village. Thus, the irrigation dam in the paddy field is no longer functional due to the theft of essential control components, posing a risk of flooding disasters of adjacent paddy fields if the irrigation pond overflows and potentially causes damage to the crops, especially during the critical time of growth stage. Hence, this was identified as one of the most pressing unresolved infrastructure issues. If the dam is stuck in an open position, a lot of water stored in the irrigation pond would run out, possibly leading to the paddy fields drying out and hindering the growth of paddy crops (Bernama, 2020). If there is insufficient water in the paddy fields, weeds can start to grow and compete with the paddy crops for resources, decreasing the yield and quality of paddy (Tiwari, 2019). On the other hand, flood disasters can lead to the loss of the paddy cultivation's unique identity because farmers might abandon their paddy fields to avoid bearing the high costs of damages. It is also discovered that flood disasters worsen soil erosion and greenhouse gas emissions due to the disruption of the carbon cycle, causing environmental harm, which goes against the values of the villagers. Floods can adversely affect local food security by damaging crops through soil oxygen deficiency (Panda & Barik, 2021) and bring a bad impact to the village. If security at the dam site remains unresolved, further thefts may occur, resulting in regular losses and maintenance required. Over time, this could cause villagers to lose confidence in the infrastructure due to its frequent nonfunctionality.

Once the crops reach maturity, the village still uses the sickle knife (*Pisau Sabit*) when harvesting the paddy. As per tradition, the grains are separated by hitting the stalks against the edge of a basket, or threshing. With governmental aid, most villager able to use machine thresher to complete this job easily. While some paddy cultivation practices have changed to take on modern approaches, the process of drying grains after harvest remains unchanged, where the sun drying method is still used. This is a crucial process to elongate the storage lifespan of grains by removing moisture from them. It is done by first pouring grains onto a bamboo banquet as shown in Figure 8. This bamboo banquet is used due to

the availability around the village. This can also be used to enhance heat dissipation, to prevent spoilage of grains due to accumulating too much heat, as bamboo is a good heat dissipation material.

After the grains are placed on the banquet, a tool is used to pave the grains evenly on the banquet, as shown in Figure 9. This can ensure that all grains are exposed to the sunlight evenly, allowing the grains to dry evenly. Grains that are unevenly dried can result in additional work later, as undried grains need to be picked out and undergo a repeated drying process. Moreover, this can also lead to reduced grain quality as the grains can potentially have excess to insufficient drying, these paved grains usually need to be left under the sun for a whole day to ensure drying. The drying place is often an open-air platform made from the bamboo material, extended from the land in front of longhouses. Since sunlight is required to dry the grains, no protective structures are built on the platforms to protect the grains from rain, making the process highly weather-dependent, which can lead to grain spoilage when rain falls on the grains, particularly during unpredictable weather seasons. Rain can bring moisture to the grains, reversing the progress of drying, while also leading to a higher chance of mould growth. The evidence (Mohd Ramli et al., 2021) stated that grain showed a consistent water activity after three months of storage, which indicating the important of drying required on the grains. The repeated drying process increases community work and may also result in over-drying of the grains. At the same time, acidic rain can also contain contaminants, making grains unsuitable for consumption. Therefore, during this process, villagers usually need to stay beside the drying grains to ensure immediate collection of the grains if rain occurs. After drying, some parts of the grain separation process have been modernised using rice remover machine. These machines help to separate grains more effectively, reducing the need of labour-intensive task. Meanwhile, the later stages involve removing husks and final grain separation, and some still perform this using traditional tools, although village do have husk separation machines to carry out this task.



Figure 8. Drying rice outside houses



Figure 9. Traditional tool used to pave grains evenly

The storage of rice also carries its own issues. Traditionally, rice is stored in a dedicated space in the Bari. While they now use gum traps to deal with mice, rice bugs are still repelled using lemongrass. Over time, the stored rice turns yellow and develops a poor taste, and there is no appropriate system to maintain optimal storage conditions. This issue remains unresolved and affects long-term food quality. Lastly, the practice of alternating between two plots for paddy cultivation is still maintained to help the soil recover its fertility. However, increased landslides, reported to occur 3 to 4 times a year due to mining activities, have caused damage to these farming plots with no current mitigation strategy in place.

In summary, the study found that the villagers are gradually losing their unique identity as a paddy cultivation village. This is caused by several factors, including the lack of manpower, as it is common that youth prefer to work in cities as wage labour. The rice production costs are not competitive in the market, which makes the villages in Serian district gradually shifted away from paddy cultivation to palm oil plantation (Nwanesi & Peter Samat, 2021) that generate more better revenue and livelihood for the community. Additionally, the presence of pest control issues, the non-functionality of the dam and the grains drying challenges can present major issues to the village. This could potentially lead to a gradual loss of unique identity and reduced traditional food production system in the village and causing local food security challenges in the near future.

The core of indigenous values lies in long-standing ancestral knowledge, cultural practices, and connections to the land that are increasingly at risk due to a range of challenges. The modern lifestyle, soil degradation, and climate change have disrupted the traditional ways of life and affected the sustainability of indigenous practices. The decline in soil quality and global warming that cause the unpredictable changing of weather patterns undermine indigenous communities' ability to continue engaging in paddy farming activities to maintain their core cultural identity and survival entity. The following are the categories of Indigenous values identified through the analysis of the collected survey data, supported by relevant literature:

COMMUNITY WELL-BEING

With the accelerating impacts of global climate change, rural farmers are more likely to be exposed to extreme weather conditions and prolonged heat exposure when working in the paddy field. Due to their continuous exposure to strong sunlight, villagers engaged in manual labour are more likely to experience long-term health issues. Long-term exposure to ultraviolet (UV) radiation can raise the risk of skin damage, causing premature aging and an increased chance of acquiring skin malignancies, including melanoma and non-melanoma. Over time, cumulative UV damage can harm the eyes and raise the risk of cataracts (World Health, 2017). High ambient temperatures can cause heat stress, which can result in heat exhaustion or even heat stroke during the extremely hot working hours. Since villagers are sometimes required to work long hours outside without immediate access to cooling facilities or medical support, the risk of heat-related illnesses is particularly alarming. The demanding nature of their work and prolonged exposure to high temperatures further exacerbates dehydration and chronic fatigue among farmers (D'Souza et al., 2021). Furthermore, many rural farmers underestimate the risks of prolonged sun exposure, and they may not always take the necessary precautions. The cumulative effect of UV exposure over time might result in chronic conditions that affect their general health if sun-protective gear, sunscreen, and frequent skin checks are not consistently used (Woods et al., 2020).

Reducing the required work in carrying out the seeding process under the hot sun can minimise the physical strain on elderly farmers who currently form most of the agricultural workforce in the village. This can contribute to improving physical health and safety by reducing exposure to harsh weather and the risk of injury caused by strenuous, repetitive tasks. Paddy fields play a vital role in supporting the villagers' well-being, as rice serves as their primary and nutritious staple food. Since the irrigation dam is located adjacent to the paddy fields, regulating the water level in the irrigation pond is crucial to prevent flooding that could damage crops and disrupt the community's food supply. Effective water management in the paddy fields can enhance rice yield, maintain its nutritional quality, and directly support food security and overall health and well-being. According to the article (Omar et al., 2022), most indigenous rice in the village has better nutritional values that help reduce the risk of cardiovascular diseases and diabetes. It is also evidence that this rice is a good source of protein, the village depends very much on it as a primary source of energy required to support farming activities.

Community-Connectedness

The rice farming practice plays an important role in bringing the community together. As farming is often a family activity in the village, maintaining the paddy field culture enables family members to work together, which strengthens their family bonds. As rice farming involves many families, sustaining paddy field practices can support community cooperation, which normally occurs during planting and harvesting seasons, making the community more connected. This traditional knowledge of rice farming can be widely shared and passed down to future generations to further preserve the unique identity of rice farming culture.

Food Sovereignty and Self-Sufficiency

Rice is the main staple food for the villagers that normally harvest once a year. After harvesting, the grains need to be dried under the sun for storing to preserve their quality and shelf life. The traditional drying process can be a tedious job that highly relies on weather conditions, and constant monitoring is required to avoid rain damage. Rain during this stage can cause the grains to reabsorb moisture, grow mould, and sometimes become contaminated, leading to spoilage and food loss (Food and Agriculture Organisation of the United Nations, 1994). Since the villagers only store enough rice for a year and prolonged storage reduces quality, properly preserving the harvest is essential to ensure year-round food availability.

Adaptation and Resilience

The village is facing a labour shortage, with the agricultural sector rely heavily on the older generation as the primary workforce. Tasks required to cultivate paddy fields require significantly more time and effort. Despite these challenges, the village continues paddy cultivation, demonstrating both their adaptability and resilience. Labour shortage remains a key challenge in the village, as many young villagers prefer wage labour in the city over farming and an aging farming population. As a result, paddy cultivation is constrained to once a year, despite the availability of subsidised seeds that support two harvest cycles. They continue to use traditional knowledge to produce healthy grains and sun-drying methods to prolong a sustainable consumable source of grains in the village.

Ecological Nature

Over time, pesticide residues can lower soil fertility, disrupt the microbial activity in the soil, and, as a result, reduce overall crop resilience, which degrades the quality of grains. Nearby water bodies may get contaminated because of excessive pesticide runoff (Selvadurai n.d.). In addition to lowering water quality, this contamination damages non-target creatures, upsetting aquatic ecosystems. Ultimately, this affects biodiversity and undermines the environment's ability to function sustainably (Selvadurai, n.d.; Mohamad et al., 2021).

Future Implications and Potential for Development

Fostering Indigenous cultural practices and values involves preserving traditional practices while emphasising sustainable approaches to ensure future resilience. These practices, such as weeding, irrigation, pest control, bio-fertilisation, harvesting, drying, grain separation, storage, and soil restoration, are deeply rooted in a local culture. By strengthening these aspects, communities not only safeguard their identity but also promote conscious methods that contribute to solving food security challenges and sustainable livelihoods. Preserving and encouraging the transmission of these values to the younger generations can ensure continuity and adaptation in the face of new agricultural challenges.

Through the survey, their unique form of paddy cultivation had unveiled the villagers' indigenous knowledge values, which should be acknowledged in formulating future solutions. This includes their self-sufficiency for quality of life, as the village can farm their own food to be self-sufficient and sustainable. The paddy cultivation practice can develop a more social cohesion within the community that demonstrate supportive effort in the rice farming. Furthermore, shifting cultivation was also adopted in the past and is still partly adopted today as it alternates between plots of land, allowing soil fertility to recover, which demonstrates the use of indigenous knowledge to support ecological balance for sustainable future solutions. Recently, a quarry had been found near the village at Mount Sinmajau, triggering opposition from the community in the villagers and neighbouring villages due to major deforestation and river pollution that creates a risk to crop plantations and depletes the river's fish population (Vlog, 2021). This reflects that the villagers deeply care about their surrounding environment and highlights the community connectedness in the village, trying to defend and protect their land.

In the village, the farmers irrigate their paddy fields using water stored in the irrigation pond through the drainage systems. Their knowledge revealed that irrigating paddy fields requires an ideal water height of around 3 to 5 cm to ensure there is enough water to prevent weeds from growing and not too much water to prevent the paddy from rotting. The excessive water level in the irrigation pond directly influences the flooding in the paddy fields and might overflow. The villagers know how to regulate the pond's water level through a hand-operated jackscrew to irrigate the paddy field through the dam based on local knowledge. Thus, with this knowledge and the existing infrastructure can be leveraged to improve the irrigation system that functions on the same principle. It is possible to reduce the required manual control by installing a gearmotor on the dam itself without overhauling the existing infrastructure to turn the lead screw automatically. Integrating the local knowledge on the irrigation understanding can reveal the importance of proper water level control and provide more proactive ways to address potential flood and drought risks that damaging the paddy fields. The village places a strong value on quality of life by remaining self-sufficient, producing their own healthy food to ensure food security, enhance nutrition, and support the overall well-being of the community. Additionally, the economic value of the indigenous people can be enhanced through income generation by outsourcing the grain product. Upgrading dam facilities can directly strengthen this value by ensuring optimal operation of the paddy farming system. At the same time, the social cohesion value can be safeguarded, as maintaining fertility that allows harvesting yearly supports the spirit of *gotong royong* across the families in the cultivation practices. This continuity not only preserves traditional farming but also strengthens community bonds through collective effort.

The integration and consideration of indigenous knowledge for future implications are crucial to gain shared values and practices that promote opportunities to bring valuable impacts to the community in the village. The shared values emphasise preservation, protection and promotion of eco-friendly livelihoods of the village, aiming to achieve a quality of life through a self-sufficiency culture rooted in the distinctive tradition of paddy cultivation. Community focusing on producing quality rice and higher yield production instead of sourcing outside food sources. Improving the management of paddy yield and quality output can significantly enhance the villagers' economic livelihoods by creating opportunities for premium rice production. With surplus harvests beyond necessity, villagers can sell the excess paddy, generating additional income that helps foster greater financial independence. The premium quality of the rice makes it more desirable in the market, increasing its value and profitability. This rise in profitability not only strengthens the economic viability of paddy farming but also makes it a more attractive livelihood option, encouraging younger generations to engage in cultivation when they perceive the prospects rather than migrating to urban areas for wage labor. Furthermore, the distinctiveness of paddy cultivation can be leveraged as a cultural and tourist attraction, prolonging its identity for future generations while supporting long-term community prosperity.

Additionally, indigenous practices strongly share the value of environmental awareness and ecological balance. One key outcome is emphasized on minimizing carbon footprints, which helps mitigate global warming and climate change by reducing the emission of greenhouse gases such as methane, nitrous oxide, and carbon monoxide. Another outcome is the prevention of water pollution, as floods can wash away pesticides, herbicides and fertilizers from the paddy fields into the drain and nearby rivers, while also causing soil erosion. By preventing floods and chemical runoff, the aquatic ecosystem in nearby waterbodies and indigenous health can avoid the risk of contamination from the toxic substances (AbuQamar et al., 2024). Preventing soil erosion can also help avert landslides, reducing the risk of damage to crops, infrastructure, and village safety.

Table 1 highlights some of the key aspects of indigenous practices with the traditional tools and methods used in paddy cultivation. Each aspect is incorporated with a deliberate approach through the supporting literature to blend with culturally enriched practices.

Table 1. Fostering Indigenous cultural practices

An aspect of Indigenous practices	Tools or Methods	Potential for culturally enriched practices
Weeding	Small knife and herbicide	Mulch consists of organic or inorganic materials applied to garden soil to maintain moisture, soil fertility, coolness, prevent erosion, and inhibit weed growth (Keat et al., 2018).
Irrigation & levelling	Hand-operated jackscrew lifting mechanism dam	The forest is used as a sponge, and water catchment areas help to store water in rainy days and release water in drier days, which can be improved by planting more trees (Ting et al., 2023).
Pest Control	Hand-pumped pesticide sprayers, gum traps to deal with mice, rice bugs repelled using lemongrass	Utilising biological control agents that target and reduce pest populations while preserving non-target species (Deshmukh, 2024).
Fertilisation	Twice a year, purchased from the government	Compost animal faeces to create manure that can add nutrients and improve soil on farmlands, boosting crop yields (Du et al., 2020).
Storing	Bari	Neem leaves used in gunny bags can combat storage pests such as pulse beetles and grain borers, allowing grains to be stored for up to one year (National Research Council Panel on, 1992).
Harvesting	Pisau Sabit	Use of a finger-bladed knife can utilise the availability of local materials, while also enhancing the ability of farmers to notice crop variations and perform seed selection to make good use of it in enhancing crop performance. The aspects benefited include grain quality, yields and disease or pest resistance (Murphy, 2017).
Drying	Dried under the sun on the bamboo banquet	Grains to be dried can be distributed on other surfaces besides the bamboo banquet (I.S et al., 2025). For example, roadsides, rooftops and any idle open-air ground. This can increase the capacity of drying grains, accelerating this process by enabling more grains to be dried at once.
Grains separation	Hitting the stalks against the edge of a basket or the husk separation machines	A grain separator called “Kodun kol” can be used for grain separation after the drying and threshing process (Chandrasekaran et al., 2009). It can separate grains from other threshed materials by shaking threshed crops.
Soil recover	Shifting cultivation, burning leftover vegetation	Cut bushes and weeds are used to make compost that is spread on farmland to recover soil nutrients and retain soil moisture (Sulaiman et al., 2019)
Manpower	Required labour-intensive	The drum seeding method is used to reduce the labour cost of paddy cultivation. Seeds are dropped onto the ground by gravity as the drum seeder is pulled by a farmer (Muralidharan et al., 2015).

To maintain the cultural identity of traditional paddy cultivation in the village, the core policies could focus on documenting and transmitting indigenous knowledge through educational programs and community sharing (Suryanto Sugian et al., 2025), by maintaining community-based sharing practices, it can contribute to cultural continuity and the sustainability of traditional farming systems in the village. This also aligns with recent efforts by the state these recent years to designate suitable land for large-scale paddy cultivation to boost self-sufficiency, protecting paddy-growing areas of indigenous land from being converted to other cash crops (Sanders, 27 May 2025). Engaging youth through homestay programmes (Samsudin et al., 2021), cultural-farming camps, and government aid to support young farmers participation in paddy farming programs (Singh, 2024).

CONCLUSION

A major issue underlying the gradual loss of the unique identity of paddy cultivation in Kampung Tubih Mawang is well documented in this study. Among all the consequences, the decline in the younger generation's interest is of great concern, which directly led to a shortage of labour and challenging the sustainability of paddy farming in the village. The nearby quarry has caused harmful damage to the local environment and indirectly attracted more pests to the paddy fields, which causes more environmental harm when pesticides are used. In addition to a tampered irrigation dam, the unpredictable weather due to global warming issue presented a threat to paddy plantations from the heavy rainfall that caused flash flooding and droughts. The villagers' unique identity is directly tied to many indigenous values that represent the importance of sustainable livelihoods in the village. Well-being presents the most concern to the community, as the effects of harsh weather on farmers can cause major illnesses from prolonged exposure to high UV radiation while working in the empire field and other damaging factors such as increasing pests, improper pesticide use, and labour shortage can cause direct and indirect deterioration of the value. To ensure food sovereignty and self-sufficiency throughout the year, appropriate grain drying and storage methods are essential. The village demonstrates the importance of community-connectedness through the spirit of cooperation during harvest. Despite a lot of challenges, the village remains resilient, using traditional knowledge to adapt and maintain a sustainable food source and to protect the ecological nature. The study revealed that the community can safeguard the identity of paddy farming by addressing its challenges through traditional knowledge, cultural preservation, protection of community rights, and an adaptive mindset. This fosters sustainable self-sufficiency, enhances economic value, strengthens social bonds, maintains ecological balance, and promotes shared values.

ACKNOWLEDGMENT

Author would like to thank the village for giving us opportunity to conduct the field tour to Kampung Tubih Mawang located in Serian Division of Sarawak, Malaysia, and allowing us to complete the study. Besides, we are grateful to Swinburne University of Technology Sarawak for providing us with an opportunity to gain experience on this indigenous land.

CONFLICT OF INTEREST

The author would like to declare that there is no conflict of interest in the preparation of this research work.

AUTHOR CONTRIBUTIONS

S. Y. Mok, Y. Z. Liu, C. X. Chong, and J. T. Goh worked together contributed to data collection, interpretation, and manuscript writing.

S. K. Ting reviewed, edited and improve the manuscript to ensure academic rigour.

REFERENCES

- Abdullah, M. F., Ahmad, B. E., Noor, M. I. M., Jamru, L. R., & Yusoh, M. P. (2023). The socioeconomics support on indigenous community in Malaysia. *JATI-Journal of Southeast Asian Studies*, 28(1), 28-49.
- AbuQamar, S. F., El-Saadony, M. T., Alkafaas, S. S., Elsalahaty, M. I., Elkafas, S. S., Mathew, B. T., Aljasmi, A. N., Alhammadi, H. S., Salem, H. M., Abd El-Mageed, T. A., Zaghloul, R. A., Mosa, W. F. A., Ahmed, A. E., Elrys, A. S., Saad, A. M., Alsaed, F. A., & El-Tarabily, K. A. (2024). Ecological impacts and management strategies of pesticide pollution on aquatic life and human beings. *Marine Pollution Bulletin*, 206, 116613.
- Bernama. (2020, January 9). Faulty pumps, drought cause drying paddy fields in Kepala Batas. *Malaysiakini*. <https://www.malaysiakini.com/news/506782>
- BITUBIH. (n.d.). My inspiration. Retrieved April 30, 2025, from <https://jayzery1.blogspot.com/p/bitubih.html>
- Chandrasekaran, K., Veeraragavathatham, D., Karpagam, D., & Firdouse, S. (2009). Traditional tools in agricultural practices. *Indian Journal of Traditional Knowledge*, 8, 212-217.
- Department of Irrigation and Drainage Sarawak. (2025). DID Samarahan Schemes: Paya Payang Irrigation Scheme. Retrieved April 24, 2025, from https://did.sarawak.gov.my/web/subpage/webpage_view/391
- Deshmukh, K. V., & Bharati, M. S. (2024). Pest control evolution: Traditional methods and modern solutions. *Sabujeema – An International Multidisciplinary e-Magazine*, 4(4), 25–28.
- D'Souza, C., Kramadhari, N., Skalkos, E., Dutton, T., & Bailey, J. (2021). Sun safety knowledge, practices and attitudes in rural Australian farmers: A cross-sectional study in Western New South Wales. *BMC Public Health*, 21(1), 731.
- Du, Y., Cui, B., Zhang, Q., Wang, Z., Sun, J., & Niu, W. (2020). Effects of manure fertilizer on crop yield and soil properties in China: A meta-analysis. *CATENA*, 193, 104617.
- Geri, A. G. (2010). Changing patterns of rural land use among the Bidayuh: A case study of Terbat area in Serian district, Sarawak (Master's thesis, Universiti Malaysia Sarawak). UNIMAS Institutional Repository.

- I.S, A., J.I, O., & K, O. (2025). Promotion of indigenous food preservation and processing knowledge and the challenge of food security in Africa. *Journal of Food Security*, 5(3), 75-87.
- Keat, N. J., Nath, T. K., & Jose, S. (2018). Indigenous agroforestry practices by Orang Asli in Peninsular Malaysia: Management, sustainability and contribution to household economy. *Indian Journal of Traditional Knowledge*, 17(3), 542-549.
- Lyndon, N., Razak, N., Azima, A. M., Junaidi, A. B., & Sivapalan, S. (2015). Empowerment of the bidayuh rural community oil palm smallholders: A case study in serian district, sarawak, Malaysia. *Mediterranean Journal of Social Sciences*, 6(4), 55.
- Mapcarta. (n.d.). Kampung Tubih Mawang. Retrieved May 1, 2025, from <https://mapcarta.com/N2285374473>
- Mohamed Salleh, A. N., Samsurijan, M. S., & Jamir Singh, P. S. (2024). Accessibility of young farmers towards the government's paddy agricultural aid program in the MADA administration area. *Asian Social Work Journal*, 9(4), e00303.
- Mohd Ramli, S. H., Sahari, Y., Abdullah, N. F., Hashim, S. R., Abdul Rahman, A. F. W., Azizan, M. S., Azizan, S. A., Abd Karim, F., Shamsulkamal, A. R., & Sani, A. (2021). Properties of grain corn during short term storage in tropical ambient temperature. *Advances in Agricultural and Food Research Journal*, 2(2), a0000210.
- Muralidharan, P., Rajeev, M. S., Anand, R., & Nathan, A. R. (2015). Drum seeding for enhanced profitability of paddy cultivation in Kuttanad region of Kerala. *Journal of Tropical Agriculture*, 53(1), 66-69.
- Murphy, K. M. (2017). A quiet harvest: linkage between ritual, seed selection and the historical use of the finger-bladed knife as a traditional plant breeding tool in Ifugao, Philippines. *Journal of Ethnobiology and Ethnomedicine*, 13(1), 3.
- National Research Council. (1992). Effects on insects. In *Neem: A tree for solving global problems* (Chapter 5). National Academies Press. <https://www.ncbi.nlm.nih.gov/books/NBK234642/>
- Nwanesi, P. K., & Peter Samat, T. (2021). The shrinking paddy farms and the Bidayuh women rice farmers: What has/have changed? *Jurnal Borneo-Kalimantan*, 7(2), 60-72.
- Omar, S. C., Anis, N. S., & Sze, I. K. Y. (2022). Paddy and rice statistics in East Malaysia. In *The paddy and rice industry of Sabah and Sarawak* (pp. 1–186). Khazanah Research Institute.
- Panda, D., & Barik, J. (2021). Flooding tolerance in rice: Focus on mechanisms and approaches. *Rice Science*, 28(1), 43-57.
- Samsudin, P. Y., Maliki, N. Z., Rahman, S., & Omar, W. R. W. (2021). Attachment and factors of involvement among youth to paddy field activities in homestay programmes. *Planning Malaysia*, 19(16), 85–96.
- Sanders, N. T. (2025, May 27). *11,700 hectares identified for paddy cultivation to boost rice self-sufficiency*. Sarawak Tribune. <https://www.sarawaktribune.com/11700-hectares-identified-for-paddy-cultivation-to-boost-rice-self-sufficiency/>
- Sulaiman, A. A., Sulaeman, Y., & Minasny, B. (2019). A framework for the development of wetland for agricultural use in Indonesia. *Resources*, 8(1), 34.
- Suryanto Sugian, A. P., Lepun, P., Robin, T., Alan, R., Ismail, Z., Magiman, M. M., Shamsi, I. H., & King, J. H. (2025). Exploring the role of Kenyah traditional culture in upland rice cultivation. *Jurnal Borneo-Kalimantan*, 11(1), 101-122.
- Ting, S. H., Noweg, G. T., & Campbell, Y. M. (2023, January 9). Indigenous farming knowledge is science, not superstition. *CodeBlue*. <https://codeblue.galencentre.org/2023/01/indigenous-farming-knowledge-is-science-not-superstition/>
- Tiwari, P. (2019). Why rice fields are flooded with water. *Medium*. <https://pranavtiwari.medium.com/why-rice-fields-are-flooded-with-water-d108331cf3c>
- Wils Vlog. (2021). Penduduk Kampung Membantah Pembinaan Kuari di Gunung Sinmajau, Tebedu [Video]. *YouTube*. <https://www.youtube.com/watch?v=cHuStHUaMhk>
- Woods, C. E., O, S. E., Barrett, F., Bookallil, L., East, L., & Usher, K. (2020). Occupational exposure: rural Australian farmers' sun-protective behaviours. *Journal of Public Health: From Theory to Practice*, 28(6), 675-684.
- World Health Organization. (2017, October 16). Radiation: Ultraviolet (UV) radiation and skin cancer. <https://www.who.int/news-room/questions-and-answers/item/radiation-ultraviolet-%28uv%29-radiation-and-skin-cancer>