

Exploring the Role of Kenyah Traditional Culture in Upland Rice Cultivation

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ABSTRACT

Sarawak hill or upland paddy farming has sustained indigenous communities for centuries, deeply intertwined with their cultural identity and livelihoods. Preserving these practices is crucial for food security, sustainable agriculture, and potential agritourism development. This study explores the traditional culture of the Kenyah people in upland rice cultivation through a qualitative approach, involving purposive sampling of Sarawak's hill paddy farmers. Data were collected via in-depth interviews and participant observations. Findings reveal that cultural traditions such as Ramay Pelepek Oman (a festival marking the transition between harvesting and planting seasons, commonly held before the harvesting season), unique social structures, communal harvesting (senguyun), local delicacies, and handicrafts contribute to the sustainability of hill paddy farming. However, some animistic beliefs are fading due to some factors such as religious conversions, affecting traditional aesthetics but potentially improving farming efficiency. These findings highlight the Kenyah's people cultural role in upland rice cultivation, emphasizing the need for preservation efforts.

Keywords: Borneo culture; ethnic; hill paddy; Orang Ulu; Sarawak

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INTRODUCTION

Kenyah peoples are one of the indigenous groups in Sarawak, Malaysia, with a distinct cultural heritage that passed down through generations. Their cultural traditions and expressions are a unique blend of animism, agriculture, and social organization that reflect their way of life, beliefs, and values.

Hill paddy farming is a traditional agricultural practice that has been carried out for centuries in many countries around the world, across the continents (Godfrey et al., 2025; Nayak et al., 2023; Zhang et al., 2021). The unique features of this farming system, including swift farming, the cultivation of a wide range of crop varieties, and the integration of livestock and forestry activities, have allowed communities to adapt to mountainous landscapes and develop sustainable agricultural practices (Barah, 2010). This paper highlights the importance of recognizing and supporting the role of cultural heritage in sustainable agriculture and rural development.

Sarawak, one region of Malaysia that is situated in Borneo Island, has a unique upland paddy farming tradition and mechanisms. It is characterized by its traditional methods of cultivation, which have been passed down through generations of indigenous communities. This practice is closely linked to their cultural traditions and identity, and it plays a vital role in ensuring food security and sustainable livelihoods in the region. Beyond being a source of sustenance, hill rice cultivation also serves as a means of enhancing property and land ownership within families. By engaging in this practice, families can establish a lasting legacy that inherited by future generations, thereby promoting long-term security and stability (Dorairaj & Govender, 2023).

Culture and tradition play a vital role in facilitating the transfer of knowledge across generations and preserving traditional practices. This is particularly important in the context of agriculture, where sustainable practices and techniques have been developed over generations.

According to Yusop et al. (2021), the Sarawak hill paddy farmers have no access to modern farming tools; hence, the traditional tools such as *ketam*, *tepoh* and *parang* are the main farming tools. *Ketam* is used to harvest paddy, *tepoh* (a long-handled hoe) and *parang* (a machete), which are used for planting, weeding, and harvesting. For land preparation, traditional method slash-and-burn still practiced. Fertilization is very minimum and mainly uses organic fertilizers.

Interestingly, Sarawak hill paddy farming is characterized by its unique crop diversity. Following the burning process, farmers turned to growing vegetables and plants that can provide quick sources of food. In Sarawak, beside upland rice, farmers cultivate a variety of crops such as papaya, sweet potatoes, cassava, and various vegetables. The cultivation of diverse crops plays a crucial role in ensuring food security and promoting resilience in the face of climate change and pest outbreaks (Lin, 2011). By cultivating a range of crops, farmers can mitigate the impact of crop failures and disruptions to the food supply chain, ensuring that there is a consistent supply of food available for the local community.

The practice of hill cultivation in Sarawak is mainly concentrated among the Dayak ethnic groups such as the Iban, Orang Ulu, and Bidayuh (Allan et al., 2023; Robin et al., 2023; Sah et al., 2024). However, each of these ethnic groups cultivates different types and varieties of rice that are unique to their respective regions. Each ethnic group, and even individual tribes, cultivates their own heirloom paddy varieties. The significance of these specialty rice in enhancing food accessibility in Sarawak cannot be disregarded. It has the potential to compensate for the insufficient rice Self-Sufficiency Level (SSL), especially in the rural areas, while simultaneously decreasing the dependence on imported rice in the region (Omar et al., 2022).

Sarawak hill paddy farming is deeply embedded in the cultural traditions and identity of indigenous communities in the region. Hill paddy farming is associated with traditional rituals and ceremonies, such as the Gawai Dayak festival: an annual celebration among the Iban and Bidayuh communities, which held to mark the harvest season and promote social cohesion (Chua, 2012). This cultural tradition of the Dayak community is a way of expressing gratitude for the harvest and acknowledging the transition to a new season. The festival serves as a time for reflection, as well as a time for sharing and connecting with family, friends, and the wider community. By coming together to celebrate the harvest, the Dayak community strengthens their bonds and renew their commitment to support one another in the future.

The practice of hill paddy cultivation has declined in recent times due to the modernization of the agricultural system, which places a greater emphasis on high financial returns (Echoh et al., 2017; Omar et al., 2022). Encouraging the community to continue actively planting hill paddy is a challenge that is closely tied to the changing mindset towards agriculture, as hill paddy cultivation requires the involvement of a large group working together. Additionally, hill paddy cultivation in Sarawak faces several challenges, including changes in land-use patterns, government policies that prioritize modern agriculture, and limited access to markets and infrastructure (Echoh et al., 2017). However, despite these challenges, there is potential for sustainable tourism and eco-agriculture to provide new opportunities for farmers and contribute to the preservation of traditional practices. By exploring these new avenues, farmers can not only continue the practice of hill paddy cultivation but also generate new income streams while promoting the conservation of their cultural heritage.

METHOD AND APPROACHES

This study used qualitative method, employing distribution of questionnaires to selected respondents. This method chosen as it allows the collection of necessary information on predetermined variables at a single point in time from a uniform group of Kenyah communities. The research methods selected, as it is more appropriate for exploring cultural and social phenomena in depth.

The study used purposive sampling to select participants who are Kenyah hill paddy farmers in Sarawak, Malaysia. Individual interviews were conducted with 30 selected Kenyah farmers across the selected locations. The participants were selected based on their experience and knowledge of traditional hill paddy cultivation practices. In-depth interviews and observational method were used to gather data on traditional upland rice cultivation practices, as well as cultural and social factors that may affect the community. The interviews conducted in Kenyah language with the assistance of a translator and were audio-recorded with the consent of the participants. The selected respondents for questionnaires were the same respondents participated in the in-depth interviews, ensuring consistency in the data sources.

The interviews were semi-structured and covered four major sections: processes of rice planting, rice planting equipment, taboos and beliefs. The subsections covered topics such as soil preparation, seed selection, planting, weeding, pest management, and harvesting, as well as cultural and social factors that influence Kenyah community.

Participant observation involved spending time with the farmers in the field to observe their cultivation practices. This also allowed for a deeper understanding of farmers' practices and experiences, complementing the insights gathered from individual interviews and enabling cross-verification of responses within the community. Informed consent was obtained from all participants, and they have the right to withdraw from the study at any time.

RESULTS AND DISCUSSION

According to the survey, the Kenyah's cultural tradition and expression in hill paddy farming highlighted in Figure 1 below:

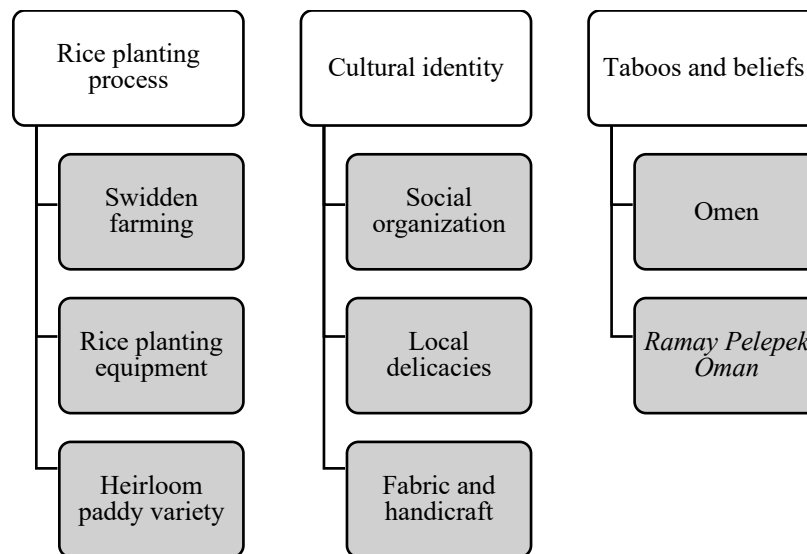


Figure 1. Kenyah's cultural tradition and expression in hill paddy farming

Rice Planting Process

Swidden Farming

One of the most important cultural traditions of the Kenyah people is their agriculture practices. They practice shifting cultivation or swidden farming, which involves clearing land by cutting down trees and vegetation, burning the land to release nutrients, and planting crops such as rice, corn, and vegetables. The swidden farming method, also known as slash-and-burn agriculture, is a traditional practice among the Dayak community that not only provides sustenance but also contributes to increasing land property and ownership (Imang et al., 2022). This practice instills a sense of pride in the Dayak people as it provides the foundation for the livelihoods of future generations of children and grandchildren. By preserving and promoting swidden farming, the Dayak communities can ensure the continuation of their cultural heritage and sustainably manage their land for the benefit of future generations.

Improve soil fertility

Soil fertility, as noted by Mishra and Ramakrishnan (1983) can be affected by the prior soil burn, which can cause an initial decrease in nutrients such as carbon and nitrogen due to volatilization,

but nitrogen recovery starts later in the cropping phase. Available phosphorus follows a similar trend to nitrogen. During slash and burn, soil pH and fertility level of soil may be altered positively due to burn of biomass and decomposition of organic matter, leading to reduced acidity and positive crop growth with minimal to none synthetic fertilizer (de Pinho et al., 2023).

Scientifically, the impact of slash-and-burn agriculture on soil fertility has been studied in various regions. In Kembera, West Kalimantan, Indonesia, Kleinman et al. (1996) found that swiddens had improved soil fertility after burning compared to fallows. Similarly, Kettering and Bigham's study (2000) revealed that soil carbon and nitrogen were only reduced at high burn severity levels. This suggests that the severity of burning in slash-and-burn agriculture has a significant impact on soil nutrient availability. At low to medium burn severity levels, phosphorus availability increases, making the nutrient more easily accessible to crops. However, at high burn severity levels, there is a reduction in soil carbon and nitrogen, indicating a loss of organic matter. Exchangeable calcium decreased to preburn levels, and aluminum saturation increased significantly. These changes could potentially impact soil fertility and plant growth in the long term. Exchangeable calcium (Ca) and aluminum (Al) are important components of soil fertility because they are both involved in regulating soil acidity. While exchangeable calcium is an essential nutrient for plant growth and is necessary for the structural integrity of plant cell walls, it also plays a critical role in regulating soil pH (Bache, 1984). Calcium can neutralize soil acidity by replacing hydrogen ions in the soil solution, which can improve nutrient availability and promote plant growth.

According to our survey, most paddy farms allow a substantial recovery period. During this time, the vegetation is allowed to naturally regenerate following the harvest, and the next planting typically occurs after a period of 10 – 22 years. Soil fertility indicators showed a positive correlation with fallow length, indicating that soil resources were not degraded by slash-and-burn agriculture (Kleinman et al., 1996).

Reduce dependence on pesticide

This study has revealed that none of the farmers included in our research reported using pesticides. This observation can be attributed to several factors, such as limited access to appropriate pesticides, inadequate financial resources and labor, and notably, relatively low pest incidence that does not warrant the use of pesticides.

Swidden farming systems typically involve growing a variety of crops, including traditional crops such as cassava, yams, and maize, as well as various types of beans, fruits, and vegetables. This diversity of crops and the use of crop rotation can help to reduce the prevalence of pests and diseases by disrupting their life cycles and reducing their ability to spread (Gurr et al., 2016). In addition, the use of natural pest control methods such as intercropping, crop diversification, and biological control agents can help to further reduce the need for synthetic pesticides.

Promote biodiversity and enhance food source for local community

The *Dayak* community typically practices swidden cultivation by clearing virgin forest that is deemed suitable for hill paddy cultivation. After cutting down trees and letting the leaves dry, they

burn the land, which encourages the growth of various plant species such as ferns, forest ginger, forest bananas, palms, and climbers that quickly dominate the area after the rice harvest. This change in the forest's ecology also attracts animals that prefer plant-based diets to inhabit the area.

Rice planting equipment

Ketam or *ilang asau/ ajau* is a traditional handcrafted tool used for harvesting rice in Southeast Asian countries like Malaysia and Indonesia. It is typically made from wood, often from the trunk of a coconut tree or other types of hardwood and is designed to make the process of harvesting rice much easier and more efficient.

The *ketam* consists of a long wooden handle with a curved metal blade attached to the end. The blade is usually made of high-quality steel and is sharpened to a fine edge, allowing it to easily cut through the rice stalks without damaging the grains. The blade is also curved to make it easier to reach the rice plants and to cut them cleanly.

In addition to its functional use, the *ilang asau/ ajau* (Figure 1) also often designed with intricate woodcarving on the handle, adding a decorative element to the tool. These carvings can range from simple geometric patterns to more elaborate designs featuring animals, plants, or mythical creatures. Creating an *ilang asau/ ajau* requires a skilled artisan who can select and shape the wood to create a handle that is both comfortable to hold and visually appealing. The metal blade is then attached to the handle using traditional techniques such as riveting or binding with rattan strips. Hence, *ilang asau/ ajau* has many significant roles in sustainable agriculture of hill paddy.



Figure 2. *Ketam* or *Ilang asau/ ajau*

Firstly, the use of *ilang asau / ajau* in harvesting rice is an environmentally sustainable practice: a manual tool that does not require the use of fossil fuels or other non-renewable resources. It is also a low-impact tool that minimizes damage to the rice plants and surrounding environment, allowing for a more sustainable and resilient agricultural system. Secondly, the art of creating *ilang asau / ajau* is a valuable form of traditional knowledge that passed down from generation to generation. By continuing to use and craft *ilang asau / ajau*, the communities are preserving their cultural heritage and knowledge, which can be shared and passed on to future generations. Moreover, the use of traditional tools like the *ilang asau / ajau* in agriculture also promotes local self-sufficiency and economic sustainability. It encourages the development of local industries and the use of local

resources, which can support the local economy and reduce dependence on external sources. The use of *ilang asau / ajau* in agriculture not only supports sustainable and environmentally friendly farming practices but also preserves traditional knowledge and promotes economic sustainability. By continuing to value and utilize traditional tools and knowledge, communities can create more resilient and sustainable agricultural systems for the future.

Although modern harvesting equipment has largely replaced traditional tools like the *ilang asau / ajau* in many areas, it is important to recognize that the *ilang asau / ajau* still holds great significance as a symbol of cultural heritage and agricultural traditions in Southeast Asia. In some villages, such as those studied, the *ilang asau / ajau* remains an essential tool for rice harvesting, and its use and craftsmanship continue to be celebrated as an important part of local culture. It is important to conserve and document the use and craftsmanship of traditional tools like the *ilang asau / ajau* to preserve the cultural heritage and knowledge of local communities. By documenting the use and artisanship of the *ilang asau / ajau*, we can gain insight into traditional agricultural practices and the unique cultural identities of different Southeast Asian communities. This documentation can also serve as a valuable educational resource, allowing future generations to learn about and appreciate the traditional tools and knowledge that have been passed down for centuries.



Figure 3. *Kayu togan*

The *kayu togan* is a crucial tool in Kenyah paddy cultivation, playing an important role not only in planting rice but also in fostering community cooperation. This traditional equipment is primarily used by men to create planting holes by firmly punching it into the soil. Following this, women work alongside the men, placing a few rice seeds into each hole. Once the seeds are sown, the holes are left as they are, marking the beginning of the rice-growing process. This collaborative approach highlights the harmonious division of labour within the Kenyah community.

This tool holds significant value in Kenyah craftsmanship culture and contributes to environmental preservation. Designed specifically for creating planting holes, it relies solely on human labor, primarily from men, avoiding the use of machines that could disturb the soil structure and health. With sufficient experience, this tool allows planting holes to be created efficiently and

effectively. Furthermore, as hill paddy is typically cultivated in high-altitude areas, the use of heavy machinery is impractical, making this traditional tool an ideal choice for planting.

Thus, these rice-planting tools play a vital role in the Kenyah culture, particularly in the context of hill paddy cultivation. Their importance extends beyond their practical application, as they embody the community's dedication to preserving traditional knowledge, cultural practices, and sustainable agricultural methods. Passed down through generations, these tools are a testament to the Kenyah people's respect for their heritage and their harmonious relationship with nature.

Unlike commercial rice varieties, hill paddy is not yet cultivated on an industrial scale or marketed extensively, which limits the adoption of modern machinery in these remote agricultural areas. This has allowed the Kenyah community to maintain their reliance on traditional tools, ensuring that these methods remain valuable. The continued use of these tools not only preserves cultural identity but also supports environmental conservation by avoiding practices that could harm soil health or disrupt natural ecosystems. By embracing these traditions, the Kenyah people sustain a way of life that is deeply rooted in their history while promoting ecological balance.

Heirloom paddy variety

Upland rice cultivation has been a central aspect of the traditional culture of the Kenyah people in Sarawak, Malaysia for generations. The Kenyah community has preserved their own varieties of rice that are well suited to the upland conditions and have developed traditional knowledge and practices for soil preparation, seed selection, planting, weeding, pest management, and harvesting.

Among the heirloom paddy (*padai* in Kenyah language) varieties that the Kenyah communities take the most pride in *padai alek*, *padai kabe'ng* / *abeng*, *padai kerawing timai*, and *padai kerawing empat*. *Padai alek*, a variety of rice grown by the Kenyah, characterized by its red, oblong seeds and fragrant aroma when cooked.

The term *padai alek* refers to a type of rice variety that is highly valued by Kenyah people, as the word *alek* in their language conveys the meaning of frequent and the idea of a craving that can never be fully satisfied. The Kenyah people treasure the *padai kabe'ng* or *abeng* variety for its fragrant aroma and the term *kabe'ng* in their language reflects its quality of quick consumption due to its delicious taste. The locals often joke about this particular rice variety, boasting that it is so incredibly delicious that when people eat it, the sounds of conversation muffled due to the mouth constantly filled with the delectable rice. Meanwhile, the villagers of Lebu' Kulit and Lepo' Badeng hold *padai kerawing* in high regard due to its delightful taste and aroma. Additionally, they appreciate its ability to stay fresh for a longer period after cooking.

Indigenous communities hold their paddy varieties and seedlings in high esteem, often treating them as heirlooms that are guarded and preserved. They are generally not willing to share them with other communities. As a result, these varieties are not widely known outside their respective villages and are at a high risk of disappearing from the biodiversity record.

Cultural Identity

Social organization

The Kenyah people, like most indigenous people in Sarawak, have a unique social organization based on the longhouse community. A longhouse is a communal dwelling that houses several families, with each family having their own living quarters but sharing a common veranda known as the *osey* in the Kenyah language. The longhouse is the center of social and economic activities and is where important decisions are made. This social organization fosters cooperation and mutual support among families and reflects the Kenyah people's emphasis on community and collective responsibility. Figure 3 shows the typical longhouse of Kenyah communities.

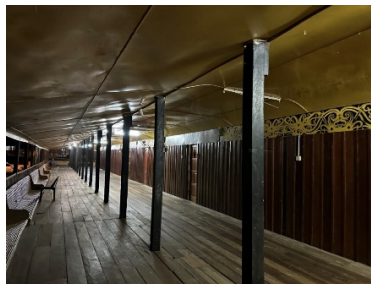


Figure 4. Kenyah longhouse at Lepo' Badeng Sungai Koyan Belaga

This form of social organization plays a crucial role in sustaining hill paddy cultivation by facilitating strong community involvement. In rural Kenyah communities of Belaga, paddy farming is often a collective effort, with families and neighbours working together during key agricultural stages such as field clearing, planting, and harvesting. This communal labour system, known locally as *senguyun*, is a long-standing tradition in rice agriculture. According to Liao and Ahmad (2022), such collaborative practices are deeply embedded in the social fabric of these communities. *Senguyun* exists in two forms: a permanent form (*nu'gan*) typically practiced during the sowing stage, and an incidental form, which is more spontaneous and involves mobilizing work force for other farming activities as needed (Sindju, 2003). These communal practices not only reflect cultural heritage but also support the intergenerational transmission of agricultural knowledge. Skills and techniques related to paddy farming are often shared orally, passed down from elders to younger generations through everyday interaction and cooperation. This knowledge-sharing process is context-specific, shaped by local environmental conditions and farming experiences. Similar practices are also found among other Kenyah tribes in Indonesia, where working collectively is regarded as an essential cultural value (Mary & Uda, 2025).

It is also important to highlight that Kenyah communities place elders and individuals with expertise in planting and cultivation in high regards. In the villages where this study was conducted, older farmers are particularly respected for their wealth of experience and knowledge, and their advice is frequently sought on critical agricultural matters. This practice not only ensures that the wisdom of older generations is passed down but also preserves the cultural heritage of the community. These traditional practices play a vital role in transmitting the skills and expertise necessary for sustainable and effective paddy farming. Furthermore, they help to strengthen the

community, ensuring the continuity of paddy farming traditions and the safeguarding of agricultural practices for future generations.

We observed that Kenyah paddy cultivation passed down from one generation to the next through a combination of oral tradition and hands-on experience. This transfer of knowledge and skills is an important aspect of cultural heritage and helps to ensure that the traditional practices and techniques of paddy cultivation are preserved and continue to be used in the future.

Local delicacies

The Kenyah community has long used their hill paddy harvest to prepare a variety of dishes, displaying the unique flavors and culinary traditions of their paddy cultivation process. However, in recent years, these dishes have also become a valuable source of income for local farmers and rural communities due to their distinctive taste and commercial appeal. Among the Kenyah's delicacies related to hill paddy are *adut*, *pusit*, *ubek*, *anyeh*, *empung kampung* and *kelupis*.

Adut is a traditional meal in the Kenyah community, made from glutinous rice that wrapped in *liris* (*tarit* in Kenyah Language) or *Calathea lutea* leaves. The rice is usually soaked overnight and then boiled until cooked in a pot. *Adut* is also used as a way of calling someone to engage in plowing activities to plant rice in huma / paddy fields. While *pusit* is, a popular snack made from rice grains that have started to form, but are still soft. The name *pusit* refers to rice grains that have been opened, and the snack is usually eaten like sunflower seeds while chatting in the rice field.

Ubek (Figure 4) is another snack that made from half-cooked rice, typically from glutinous rice. The rice is separated from the seeds and stalks, then fried until some of the seeds start to explode, producing a fragrant smell. The fried rice then cooled and pounded in a wooden mortar, resulting in a flat, greenish-colored rice called *ubek*. The rice husk dust removed from the *ubek*, resulting in a clean and fragrant snack that can be eaten directly. *Ubek* is a unique snack that maybe considered a variation of *padi pengemping*, a traditional snack that originated from Indonesia, particularly from the Javanese community. While *padi pengemping* typically made from glutinous rice, *ubek* made from the freshly harvested immature grains of young rice. This snack holds great significance for the Kenyah communities as it symbolizes the beginning of rice maturation.



Figure 5. *Ubek*

The use of immature rice grains gives *ubek* a distinct taste and texture. The rice grains are pounded and flattened before after fried until crispy and golden brown. The resulting snack is light, crispy, and slightly chewy, with a subtle nutty flavor. Overall, *ubek* is a unique and meaningful snack that portrayed the cultural traditions and culinary heritage of the Kenyah community.

Anyeh is a traditional dish made from rice that has been soaked until slightly soft, and then pounded using a mortar or ground with a grinder. This process results in a unique texture and flavor that is distinct from regular cooked rice. Some people prefer to eat *anyeh* plain, while others mix it with sugar to add sweetness. Either way, it is a delicious and nutritious dish that is enjoyed by many in the community. *Anyeh* (Figure 5) is a beloved traditional delicacy among the Dayak people, particularly the Orang Ulu in Borneo. It is made using glutinous rice and is usually shaped into round or oval forms before being fried. To make *anyeh*, the glutinous rice is first soaked until it becomes slightly soft, and then pounded using a mortar or ground using a machine into rice powder called as *anyeh*. The resulting powder is then mixed with a little water to form a dough, which is then shaped into the desired form and fried in preheated oil. The crispy, golden-brown exterior and soft, chewy interior make *anyeh* a delicious treat that enjoyed by many in the Kenyah community. Sometimes, *anyeh* transformed into a sweet dessert by mixing it with coconut milk and brown sugar, then steaming it in banana leaves to create a compact and slightly sweet cake. This delectable treat is often served during festivals and special occasions. *Anyeh* has a soft and chewy texture, complemented by a subtle coconut flavor and a hint of sweetness from the brown sugar. The use of banana leaves to steam the mixture imbues it with an aromatic quality that enhances the dish's overall flavor profile. Overall, *anyeh* is a delicious and distinctive delicacy that highlight the Dayak people's rich culinary heritage in Borneo.



Figure 6. Making *anyeh*

Empung kampung is a traditional rice cake made from *anyeh* or rice powder, which is formed into a round or oval shape according to personal preferences. The cake is then boiled in water until it floats or becomes slightly transparent. Once cooked, it can be enjoyed with additional seasonings, such as milk and sugar, to enhance its flavor.

Kelupis is a popular snack among Kenyah and other indigenous communities of Borneo, often enjoyed during festivals and special occasions, such as weddings, Christmas, and *Ramay Pelepek Oman*. To make *kelupis*, glutinous rice mixed with salt as a preservative and a small

amount of oil to prevent it from sticking to the pan during cooking. The rice is then cooked in a pan with salt and oil until it is half-cooked. The half-cooked rice is then wrapped in banana leaves in an oval shape, steamed for 30 minutes until fully cooked, and served. *Kelupis* has a slightly sticky texture and a subtle coconut flavor with a hint of saltiness. It is often served with other traditional dishes such as smoked fish, *serunding*, *umai* (raw fish salad), and *ayam buluh* (chicken cooked in bamboo). The leaves used to wrap *kelupis* (Figure 6) may vary, but banana leaves are the most commonly used, imparting a unique aroma and taste to the snack. The wrapped husks then boiled in a pot of water for a few hours until the rice is fully cooked and the flavors blend, creating a delicious and flavorful snack.



Figure 7 & 8. *Kelupis* ready to be cooked (left) and *kelupis* ready to be consumed (right)

Fabric and Handicrafts

Another important cultural expression of the Kenyah people is their weaving and handicrafts. They are known for their intricate and colorful weaving patterns that are used to make textiles, baskets, and other household items. Their weaving techniques have been passed down through generations and are an important part of their cultural heritage. The Kenyah people also produce unique handicrafts such as beaded jewelry, woodcarvings, and traditional hunting tools. Figure 8, 9, and 10 show some of the handicrafts of Orang Ulu. With the passage of time, traditional handicrafts that were once solely used for specific purposes have evolved into products that can now be commercialized and adapted to modern styles. The shift in consumer preferences has driven artisans to innovate and update their techniques, while still preserving the cultural and historical significance of their craft. As a result, traditional handicrafts have become more widely recognized and valued for their unique designs and artisanal quality, providing economic opportunities for artisans and promoting the preservation of cultural heritage.

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Figure 9. Sunhat or *saung* (top) and *Tapan* (below)



Figure 10. *Engen* or basket



Figure 11. Handmade bags (*kopeh wai*) for the handheld bags in the shape of a box and *kerien* for round bottom bag (the front bag)

Paddy waste is often transformed into traditional indigenous crafts that carry deep cultural significance and historical value. Repurposing agricultural by-products like rice straw not only promotes sustainability but also highlights the potential for creativity and resourcefulness in building a greener future. For example, rice straw is a biodegradable and eco-friendly material that can be crafted into brooms, offering an excellent alternative to those made from plastic. This practical reuse of natural materials reflects the wisdom of the Kenyah people, whose lifestyle emphasizes respect for and sustainable use of environmental resources. Figure 14 shows a bundle of rice straw prepared for broom-making.

In addition to its functional uses, paddy waste also serves ornamental purposes. Dried paddy panicles are carefully arranged and placed in vases as decorative elements. These indigenous crafts not only demonstrate the creativity and resourcefulness of the indigenous people, but also serve as important cultural artifacts that reflect the rich history and traditions of the region. By utilizing paddy waste, artisans are able to reduce waste, promote sustainability, and preserve their cultural heritage.

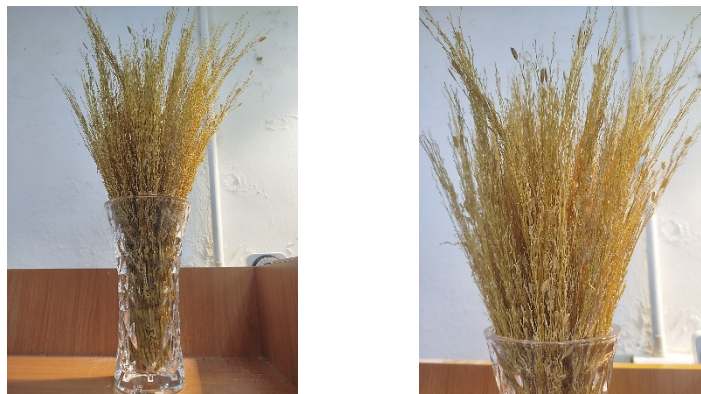


Figure 12 & 13. Dried paddy panicles used for decoration



Figure 14. Rice straw bundle on a *tapan*

Beliefs and Taboos

Ramay pelepek oman

In many indigenous communities in Sarawak, religious ceremonies and rituals are performed before, during, and after the paddy planting season. These rituals are believed to ensure a successful harvest and to appease the gods and spirits of the land. However, as most of the Dayak community have now embraced Christianity, the way of celebrating thanksgiving after the rice harvest season has become much simpler and more relaxed compared to the old ways. The cultural and nutritional practices have changed significantly, leading to a new way of observing this tradition.

Gawai Dayak is a festival celebrated by the Dayak communities, who are indigenous to the island of Borneo, which shared by Indonesia, Malaysia, and Brunei. The festival typically takes place in May or June and is a time to give thanks for a bountiful harvest and to seek blessings for the upcoming planting season. The Gawai Dayak festival in the Kenyah community called *Ramay Pelepek Oman*, which celebrated a few weeks after the rice-harvesting season ended. The festival's date is determined by the villagers' consensus after the completion of the harvest, which means it is not fixed. However, in recent times, the Orang Ulu community has been increasingly following the official calendar to facilitate holiday planning and allow families to celebrate the festival together.

Gawai Dayak plays a crucial role in promoting sustainable agriculture and facilitating knowledge transfer within Dayak communities. This festival serves as a platform for community members to come together and exchange agricultural knowledge and practices, fostering a sense of unity and shared heritage. Traditional farming techniques, such as shifting cultivation, are celebrated during the event, while the younger generation is educated on the significance of preserving these time-honoured methods. This ensures the continuity of sustainable agricultural practices, safeguarding them from being forgotten over time.

Moreover, Gawai Dayak emphasizes the consumption and cultivation of traditional crops and varieties, such as rice and an array of local vegetables and fruits. By doing so, it helps to maintain regional biodiversity while reinforcing the cultural identity of the Dayak people. Beyond cultural preservation, the festival also promotes sustainable agriculture practices that support the livelihoods of local communities, creating a harmonious balance between tradition, environmental stewardship, and economic well-being.

These festivals often involve traditional music, dance, and food, and are an opportunity for families and communities to come together to celebrate their agricultural heritage. It becomes a platform for the exchange of knowledge and expertise in paddy farming. Farmers from different communities come together to share their experiences and exchange ideas, which helps to spread best practices and improve the overall quality of paddy cultivation.

Another important cultural expression of the Kenyah people is their music and dance. They have a rich tradition of vocal and instrumental music, accompanied by dance performances that often tell stories of their daily lives, myths, and legends. Their music characterized by the use of *sape*, gongs, bamboo instruments, and traditional percussion instruments, and performed during

festivals, weddings, and other important ceremonies. In context of hill paddy farming, cultural traditions and expressions have been identified as critical in preserving traditional practices. For example, in Sri Lanka, traditional festivals and rituals, such as the *Aluth Sahal Mangalyaya* and *Keth Gangul* used to promote sustainable agriculture and rural development (Coombe, 2005). In China, the celebration of traditional festivals, such as the Dragon Boat Festival, used to transfer knowledge about rice farming and promote cultural identity (McCartney & Osti, 2007). The study found that cultural traditions, such as the use of traditional farming methods and the celebration of festivals and rituals, were essential in maintaining the sustainability of rice farming and promoting rural development.

Omen

The Kenyah people have a rich history of animistic beliefs that have shaped their farming practices. Before the conversion to Christianity, there were various taboos and omens in paddy planting, which were closely linked to their traditional beliefs. The Kenyah people believe that spirits inhabit the land and must be appeased through rituals and offerings before any land clearing or farming activities can take place.

To maintain a harmonious relationship with the natural environment, the Kenyah people adhere to practices that respect spiritual beliefs and ecological balance. They believe that certain animals, such as pigs and chickens, hold spiritual significance within their agricultural traditions. During the planting season, rituals may include the sacrifice of a pig to appease the spirits of the land and to seek blessings for a successful harvest. Central to Kenyah cosmology is the belief in the interconnectedness of all living beings—humans, animals, and plants—which sustains a system of mutual dependence essential for survival. This worldview underpins their reluctance to use chemical pesticides and fertilizers, as such inputs are seen to disrupt the natural balance and harm the environment. Consequently, hill paddy cultivation among the Kenyah typically involves minimal reliance on agrochemicals.

In addition to these practices, the Kenyah people also interpret natural signs and omens as guidance for their daily activities, including farming and hunting. For instance, the flight pattern of birds is believed to convey messages from the spiritual realm: birds flying from right to left are considered a bad omen, prompting a halt in activity, whereas birds flying from left to right are interpreted as favourable, allowing work to proceed with confidence. Specific bird species are also associated with good fortune. For example, the *Embuas* (Banded Kingfisher) is seen as a positive sign when flying toward individuals working in paddy fields, while the appearance of the *Beragai* (Scarlet-Rumped Trogon) is considered auspicious during hunting. These beliefs reflect a deep cultural integration of spiritual and ecological knowledge in Kenyah agricultural life.

Overall, these animistic beliefs have played a significant role in the sustainable agriculture practices of the Kenyah people, promoting a deep respect for the natural environment and fostering a harmonious relationship between humans and nature. Since the arrival of Christian missionaries in Sarawak, Malaysia in the early 20th century, the Kenyah people have gradually converted to Christianity, leading to the loss of many traditional taboos and omen practices. As the Kenyah people adopted Christian beliefs and practices, their animistic beliefs and rituals became less important in their daily lives.

Today, while some Kenyah people still adhere to traditional animistic beliefs and practices, many have fully embraced Christianity and no longer practice their ancestral traditions. This shift towards Christianity has brought about changes in Kenyah culture and way of life, including changes in their farming practices and relationship with the environment. Despite the loss of some traditional beliefs and practices, the Kenyah people continue to maintain a deep connection with the land and the natural environment. They still practice sustainable farming techniques and prioritize the preservation of their natural resources. The Kenyah people have also found ways to incorporate their traditional knowledge and practices into modern agriculture and land management, ensuring that their cultural heritage and agricultural traditions preserved for future generations.

Conceptual Framework between Kenyah's Hill Paddy Farming Practice and Knowledge Transfer in Hill Paddy Cultivation

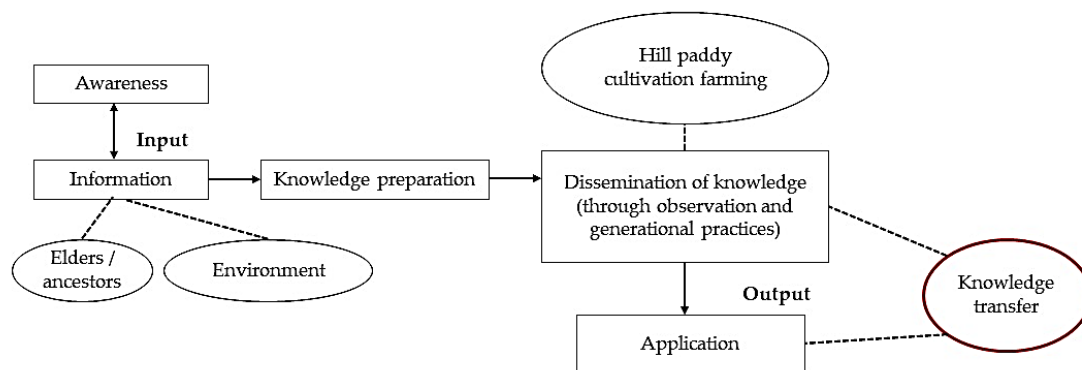


Figure 15. Conceptual framework on knowledge transfer from Kenyah hill paddy cultivation practices

The cultivation practices of the Kenyah communities are deeply rooted in generational or hereditary traditions, passed down through many generations. Knowledge of hill paddy cultivation is primarily inherited from elders, such as grandmothers and grandfathers, who share their expertise with their children and grandchildren, each family often cultivating their preferred heirloom paddy varieties. This knowledge transfer extends beyond the family unit to the surrounding community and environment, ensuring the continued dissemination of traditional agricultural practices. In line with their traditional lifestyle, the rice is commonly processed at home, fostering cooperation and unity within the family. Rice processing often becomes a shared activity, where family members work together, strengthening familial bonds. This sense of collaboration is also evident in their social organization, particularly in their use of shared spaces, such as the common veranda or *osey*, which serves as a communal hub for interaction and cooperation.

The process of knowledge transfer begins at a very young age through pure observation, where children learn by watching their elders. This dual process of knowledge exchange not only

ensures the survival of traditional practices but also influences how the younger generation perceives and internalizes this knowledge. As described by Kahneman (2003) and Slatter and France (2011), the knowledge imparted by the older generation plays a crucial role in shaping the perspectives and practices of the younger generation, ensuring the sustainability of Kenyah cultural and agricultural heritage.

SCOPE AND LIMITATION

Since Kenyah people practice swidden farming, slash-and-burn agriculture can be beneficial but it may also become detrimental under certain conditions. At high burn severity levels, there is a reduction in soil carbon and nitrogen, indicating a loss of organic matter. Aluminum too can become toxic to plants when present in excessive amounts in the soil (Rahman & Upadhyaya, 2021). As soil acidity increases, aluminum ions become more soluble and can be taken up by plant roots, leading to toxicity symptoms such as stunted growth and root damage. Additionally, aluminum toxicity can decrease the availability of other essential nutrients, such as calcium, magnesium, and phosphorus, further impacting plant growth and soil fertility. Therefore, changes in exchangeable calcium and aluminum levels in the soil can have significant impacts on soil fertility and plant growth.

Moreover, slash-and-burn agriculture, which involves clearing and burning a plot of land, followed by cropping and fallowing, can result in a decline in mineral nutrient stock over time (Juo & Manu, 1996). The ideal scenario for conserving the total mineral nutrient stock in the ecosystem is the equilibrium model, in which nutrient input and output are balanced. However, this is difficult to achieve in practice, as a significant portion of the mineral nutrients released from burning may be lost through erosion and runoff or leaching, including potassium, magnesium, calcium, nitrate, and sulfate. In addition, plant nutrients are removed during crop harvest, further reducing the nutrient stock in the eco-system. This gradual decline in nutrient stock over subsequent cycles of fallow and cropping is known as the depletion model. Therefore, to sustain the productivity of slash-and-burn agriculture, it is important to implement appropriate land use and nutrient management strategies to minimize nutrient loss and maintain soil fertility.

This can also be associated with a decline in biodiversity. For instance, Huijun et al. (2002) observed a reduction in floral diversity over a span of 50 years when a tropical forest was converted to swidden agriculture, resulting in a decrease in the Shannon Weiner index from 5.23 to 3.97 and a loss of 50% of the original plant species. Nevertheless, there are contrasting findings that propose floral diversity may not necessarily diminish and could potentially even rise (Ticsay, 2005; Rerkasem et al., 2009).

These has increased the resilience of the ecosystem in combating climate change. A study by Ziegler et al. (2009) evidenced that traditional swidden cultivation in Montane Mainland Southeast Asia has negligible hydrological and geomorphological effects compared to intensified replacement agricultural systems. These replacement systems include cash cropping, monoculture plantations, and greenhouse complexes, which have more significant negative impacts on the environment. These impacts result from various factors, such as the cultivation of large upland catchments, repeated cultivation with limited or no fallowing, direct connection of concentrated overland flow with the stream network, reduced root strength on permanently converted hillslopes, and the use of pesticides and herbicides. Additionally, the success of these intensified systems

depends on dense road networks, which further contribute to hydrological and geomorphological disruptions. Therefore, a new conservation approach is required to address the negative impacts of these intensified upland agricultural practices.

In social and cultural context, the rapid pace of social, economic, and environmental change in the region has raised concerns about the sustainability of these traditional upland rice varieties and the transfer of traditional knowledge to future generations. Many young people today are more inclined to purchase commercially available rice for consumption rather than engaging in farming activities. This shift in preference is attributed to various reasons, such as a lack of interest in farming, a lack of knowledge or skills in traditional farming methods, and the perception that commercial rice is more convenient and reliable (Saili, Saili, & Hamzah, 2018). As a result, there is a growing concern that traditional farming practices may decline, leading to a loss of agricultural knowledge and biodiversity.

CONCLUSION

As a way forward, it is essential to adopt a multi-faceted approach that integrates traditional wisdom with modern technologies and best practices. This integration can help ensure that the benefits of both traditional and modern methods are harnessed effectively, promoting successful knowledge transfer. Providing education, training, and access to resources is also crucial to support farmers in adopting new technologies and practices.

One key strategy is to build bridges between traditional and modern practices. By combining effective traditional knowledge with innovative technologies, farmers can maximize productivity and efficiency. For instance, traditional practices that have proven effective can be maintained while introducing modern tools, such as drones for fertilizer and pesticide application, when appropriate. Providing education and training to farmers is another critical step. These programs should emphasize the advantages of modern techniques while being culturally sensitive and respecting the traditional knowledge of local communities, ensuring that new practices are adopted seamlessly.

Improving access to information and resources is equally important. Establishing community-based organizations or networks can provide farmers with the necessary tools, information, and support to adopt modern farming methods effectively. Encouraging collaboration and networking among farmers can also play a vital role. Organizing agricultural festivals or events that bring farmers together fosters social networks, facilitates knowledge sharing, and helps transfer experiences from one generation to the next. Addressing economic barriers is another significant aspect of overcoming challenges. Financial incentives or support can help farmers afford the equipment and technologies required for modern paddy farming. By tackling these barriers, farmers can adopt modern methods more effectively without compromising their financial stability.

By implementing these strategies, it is possible to strike a balance between preserving traditional practices and embracing modern techniques in paddy farming. This approach ensures that farmers benefit from both worlds, adopting the best methods for their needs and unlocking the full potential of modern paddy farming techniques.

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REFERENCES

- Allan, R., Rosli, A., Daud, A., Lepun, P., Alan, R., Robin, T., ... & Sien, L. S. 2023. Farming Practices Among Hill Paddy Smallholders in Sg. Asap, Belaga, Sarawak. *Journal of Agricultural Studies*, 11(4), 39-57.
- Bache, B. W. 1984. The role of calcium in buffering soils. *Plant, Cell & Environment*, 7(6), 391-395.
- Barah, B. C. 2010. Hill agriculture: problems and prospects for mountain agriculture. *Indian Journal of Agricultural Economics*, 65(902-2016-67935).
- Chua, L. 2012. *Following the Rice Year: Adat Gawai, Past and Present. In The Christianity of Culture: Conversion, Ethnic Citizenship, and the Matter of Religion in Malaysian Borneo* (pp. 57-79). New York: Palgrave Macmillan US. https://doi.org/10.1057/9781137012722_3
- Coombe, R. J. 2005. Protecting cultural industries to promote cultural diversity: Dilemmas for international policy-making posed by the recognition of traditional knowledge. *International Public Goods and Transfer of Technology Under a Globalized Intellectual Property Regime*. Cambridge: Cambridge University Press. pp, 559-614. Available at SSRN: <https://ssrn.com/abstract=2463891>
- de Pinho, R. C., Pequeno, P. A. C. L., Alfaia, S. S., Barbosa, R. I., & Lincoln, N. K. 2023. Soil fertility in indigenous swidden fields and fallows in northern Amazonia, Brazil. *Soil Use and Management*, 39(4), 1517-1531.
- Dorairaj, D., & Govender, N. T. 2023. Rice and paddy industry in Malaysia: Governance and policies, research trends, technology adoption and resilience. *Frontiers in Sustainable Food Systems*, 7, 1093605.
- Echoh, D. U., Nor, N. M., Gapor, S. A., & Masron, T. 2017. Issues and problems faced by rural farmers in paddy cultivation: A case study of the Iban paddy cultivation in Kuala Tatau, Sarawak. *Journal of Regional and Rural Development Planning, Jurnal Perencanaan Pembangunan Wilayah dan Perdesaan*, 1(2), 174-182. <https://doi.org/10.29244/jp2wd.2017.1.2.174-182>
- Godfrey, K. M., Nasser, K., & Joseph, E. 2025. Exploring the Feasibility of Growing Upland Rice in Flooded Paddy Ecosystems. *Journal of Experimental Agriculture International*, 47(5), 24-38.
- Gurr, G. M., Lu, Z., Zheng, X., Xu, H., Zhu, P., Chen, G., ... & Heong, K. L. 2016. Multi-country evidence that crop diversification promotes ecological intensification of agriculture. *Nature Plants*, 2(3), 1-4.

- Huijun, G., Padoch, C., Coffey, K., Aiguo, C., & Yongneng, F. 2002. Economic development, land use and biodiversity change in the tropical mountains of Xishuangbanna, Yunnan, Southwest China. *Environmental Science & Policy*, 5(6), 471-479.
- Imang, N., Mariati, R., Naomi, N., & Widuri, N. 2022. Study of local knowledge on the practices of swidden agriculture to increase productivity and sustainable land: Case study on the Kenyah and Bahau Dayak in East Kalimantan, Indonesia. *The International Journal of Humanities & Social Studies*, 10(5).
- Juo, A. S., & Manu, A. 1996. Chemical dynamics in slash-and-burn agriculture. *Agriculture, Ecosystems & Environment*, 58(1), 49-60.
- Kahneman, D. 2003. Maps of bounded rationality: Psychology for behavioral economics. *American Economic Review*, 93(5), 1449-1475. <https://doi.org/10.1257/000282803322655392>
- Ketterings, Q. M., & Bigham, J. M. 2000. Soil color as an indicator of slash-and-burn fire severity and soil fertility in Sumatra, Indonesia. *Soil Science Society of America Journal*, 64(5), 1826-1833.
- Kleinman, P. J., Bryant, R. B., & Pimentel, D. 1996. Assessing ecological sustainability of slash-and-burn agriculture through soil fertility indicators. *Agronomy Journal*, 88(2), 122-127.
- Liau, J., & Ahmad, S. S. W. 2022. Social interaction amid COVID-19 and responses to the pandemik in Sarawak. *e-BANGI*, 19(3), 162-178.
- Lin, B. B. 2011. Resilience in agriculture through crop diversification: adaptive management for environmental change. *BioScience*, 61(3), 183-193. <https://doi.org/10.1525/bio.2011.61.3.4>
- Mary, E., & Uda, S. 2025. Christian education perspective of Senguyun tradition in Dayak Kenyah Bakung tribe. *Didache: Journal of Christian Education*, 6(1), 64-79.
- McCartney, G., & Osti, L. 2007. From cultural events to sport events: A case study of cultural authenticity in the dragon boat races. *Journal of Sport Tourism*, 12(1), 25-40.
- Mishra, B. K., & Ramakrishnan, P. S. 1983. Slash and burn agriculture at higher elevations in north-eastern India. II. Soil fertility changes. *Agriculture, Ecosystems & Environment*, 9(1), 83-96. [https://doi.org/10.1016/0167-8809\(83\)90008-7](https://doi.org/10.1016/0167-8809(83)90008-7)
- Nayak, B. K., Mishra, M. K., & Upadhyay, V. P. 2023. Agroecosystem sustainability in forest dependent tribal villages in Odisha, eastern India. *Asian Journal of Environment & Ecology*, 22(3), 61-85.
- Omar, S.C., Teoh A.N., Khoo W. Y, and Nik Sharifulden N.S.A. 2022. *The paddy and rice industry of Sabah and Sarawak: Status and Potential*. Khazanah Research Institute.
- Rahman, R., & Upadhyaya, H. 2021. Aluminium toxicity and its tolerance in plant: A review. *Journal of Plant Biology*, 64, 101-121.

- Rerkasem, K., Lawrence, D., Padoch, C., Schmidt-Vogt, D., Ziegler, A. D., & Bruun, T. B. 2009. Consequences of swidden transitions for crop and fallow biodiversity in Southeast Asia. *Human Ecology*, 37, 347-360.
- Robin, T., Hung, K. J., Alan, R., Lepun, P., Daud, A., Rosli, A., Abang, A., Dayang, S., Ismail, Z. & Magiman, M. M. 2023. Traditional Hill Paddy Cultivation Practices Among the Kenyah Ethnic in Sarawak. *Journal of Academic Research in Business and Social Sciences*, 13 (11), 2075-2089.
- Sah, M. S. M., Othman, M. R., Abd Razak, M. S. F., Abdullah, A. H. G., & Abd Rahim, N. I. 2024. Kepelbagaian genetik padi bukit (*Oryza sativa* famili Poaceae) warisan suku kaum Kenyah di Sungai Asap, Belaga, Sarawak. *Buletin Teknologi MARDI Bil*, 42, 135-144.
- Saili, A. R., Saili, J., & Hamzah, N. M. 2018. Dissecting Factors Causing Active Behaviors Associated with Continuity of Youth Participation in Agro-Preneurship: A Qualitative Study on Youth Farmers in Sarawak. *Global Business and Management Research*, 10(2), 253-262.
- Sindju, H. B. 2003. Making a swidden: social and technological aspects of Leppo’Ké agricultural practices. *Social Science Research and Conservation Management in the Interior Borneo. WWF Indonesia, Bogor Barat*, 49-64.
- Slatter, P. E., & France, B. H. 2011. Central practitioners' developing legitimate peripheral participation in a community of practice for changing schools. In M. J. de Vries (Ed.), *Positioning technology education in the curriculum* (pp. 559–614). Springer.
- Ticsay, M. V. 2005. *Fragmentation of the Ifugao agroecological landscape. Conserving Nature in Culture: Case Studies from Southeast Asia*. Yale University Southeast Asia Studies (Monograph 54), New Haven, Connecticut.
- Yusop, Z., Abd Aziz, A. S., Saili, A. R., Nor, R. C. M., & Sahmat, S. S. 2021. Constraints of Paddy Production Among Smallholding Farmers. *International Journal of Service Management and Sustainability*, 6(1), 110-122.
- Zhang, Y., Zhang, W., Wu, M., Liu, G., Zhang, Z., & Yang, J. 2021. Effects of irrigation schedules and phosphorus fertilizer rates on grain yield and quality of upland rice and paddy rice. *Environmental and Experimental Botany*, 186, 104465.
- Ziegler, A. D., Bruun, T. B., Guardiola-Claramonte, M., Giambelluca, T. W., Lawrence, D., & Thanh Lam, N. 2009. Environmental consequences of the demise in swidden cultivation in montane mainland Southeast Asia: hydrology and geomorphology. *Human Ecology*, 37, 361-373.