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Revitalizing Indigenous Agricultural Knowledge and Practices: *Manugal* as an Environmentally Sustainable Farming Method in Dayak Ngaju, Indonesia

Elly Diah Praptanti[1], Andi Alfian[2]✉
Universitas Gadjah Mada, Indonesia. (1)
Sekolah Anak Muda, Indonesia (2)
DOI: 10.31004/aulad.vxix.xx

✉ Corresponding author:
andialfianx@gmail.com

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Abstrak

Selama ribuan tahun, masyarakat Dayak Ngaju di Kalimantan Tengah telah mempraktikkan sistem penanaman padi tradisional yang disebut *Manugal*, yang berarti menanam padi langsung di atas tanah tanpa pupuk atau pestisida buatan. Metode ini mengandalkan air hujan dan bahan-bahan alami, serta berpedoman pada ajaran sistem kepercayaan Kaharingan, yang menganggap padi sebagai manifestasi ilahi, dan mengikuti kalender tradisional. Namun, Revolusi Hijau dan globalisasi produksi pangan modern, yang dimulai pada akhir 1960-an, memperkenalkan pertanian intensif, input kimia, dan varietas tanaman unggul. Modernisasi ini meminggirkan tradisi lokal, termasuk *Manugal* di Kalimantan Tengah. Studi kasus deskriptif kualitatif ini mengkaji latar belakang Revolusi Hijau dan dampaknya terhadap *Manugal*, konsekuensi ekologis dari modernisasi pertanian, dan perbandingan antara *Manugal* dan sistem pertanian monokultur modern. Studi ini bertujuan untuk mengusulkan strategi untuk mempertahankan tradisi *Manugal* dan mencapai keberlanjutan ekologis.

Keywords:
Manugal;
Kaharingan;
Indigenous Knowledge;
Indigenous Farming;
Environmentally Sustainable Method.

Abstract

For thousands of years, the Dayak Ngaju people in Central Kalimantan have practiced a traditional rice cultivation system called *Manugal*, which involves planting rice directly on the ground without artificial fertilizers or pesticides. This method relies on rainwater and natural materials, and it is guided by the teachings of the Kaharingan belief system, recognizing rice as a divine manifestation, and adhering to the traditional calendar. However, the Green Revolution and the globalization of modern food production, initiated in the late 1960s, introduced intensive agriculture, chemical inputs, and high-yielding crop varieties. This modernization marginalized local traditions, including *Manugal*, in Central Kalimantan. This qualitative descriptive case study examines the background of the Green Revolution and its impact on *Manugal*, the ecological consequences of agricultural modernization, and the comparison between *Manugal* and modern monoculture farming systems. The study aims to propose strategies for maintaining the *Manugal* tradition and achieving ecological sustainability.

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INTRODUCTION

Rice, as a staple food, has played a crucial role in sustaining numerous ethnic groups worldwide, including the Dayak Ngaju people of Central Kalimantan. For generations, these traditional communities have relied on their own cultivation methods to meet their rice needs. Among these methods, *Manugal*, deeply rooted in the indigenous Kaharingan belief system, has emerged as a central practice for sustainable natural management, maintaining a delicate balance with the environment. The temporal aspects of rice planting not only influence human-nature relationships but also dictate the careful utilization of natural resources without causing harm.

Prior to the advent of the Green Revolution, which introduced modern agricultural practices in Central Kalimantan, a harmonious order prevailed, allowing for ecological sustainability. This system intricately followed the rhythms of nature, orchestrating the division of labor among individuals and synchronizing their activities with ecological elements. However, the ironic outcome of the Green Revolution was that its modern methods, designed to yield abundant harvests, inadvertently led to ecological challenges (Alfian, 2023e; Also see Bagir, 2015; Emery & Trist, 1973; Latour, 1993). Traditional cultivation systems had long fostered food self-sufficiency, yet the pursuit of mass production resulted in food scarcity and the depletion of local food sources.

The transition from traditional rice cultivation methods to modern agricultural practices in Central Kalimantan has presented significant ecological and cultural challenges. However, recognizing the value of indigenous knowledge, particularly the Kaharingan belief system, is vital in addressing these challenges. Indigenous knowledge represents a wealth of wisdom accumulated over generations, providing insights into sustainable practices and the intricate relationships between humans and nature. *Manugal*, deeply rooted in the Kaharingan belief system, offers a holistic understanding of the environment and provides guidance for harmonious coexistence with natural ecosystems.

By integrating indigenous knowledge into modern approaches, we can tap into the rich heritage of the Dayak Ngaju people and their profound connection to the land. Indigenous knowledge offers alternative perspectives and innovative solutions for ecological sustainability (Alfian, 2022; Maarif, 2015, 2019, 2021). It provides a nuanced understanding of the local environment, including the interdependencies of various species, the cyclical patterns of natural resources, and the long-term impacts of human actions.

Embracing indigenous knowledge not only fosters cultural resilience and pride within the Dayak Ngaju community but also promotes the preservation of traditional practices that have proven to be sustainable and resilient over centuries. By valuing and incorporating indigenous knowledge into contemporary agricultural strategies and development (Alfian, 2023c, 2023a), we empower local communities while promoting cultural diversity and social justice (Alfian, 2021, 2023b, 2023d).

In light of the ecological and cultural challenges posed by modern agricultural practices in Central Kalimantan, this study recognizes the significance of indigenous knowledge, particularly the Kaharingan belief system. Through an integration of traditional wisdom or religious belief with modern approaches, we can develop sustainable methods that harmonize human activities with the natural environment (Nasr, 1968; Northcott, 2015; White, 1967). This approach offers not only ecological benefits but also the preservation of cultural heritage and the promotion of social justice.

METHOD

This qualitative descriptive case study utilizes various research methods, including literature study, interviews, and direct observation. The study involves interviewing key individuals to gather valuable insights. Among the interviewees are Yuyi Veriani from Barito Utara, Central Kalimantan, Migraliette Purbaranti and John Samson from Palangkaraya, Central Kalimantan, and Cucu Dhamayanti from Pulang Pisau, Central Kalimantan.

By incorporating the perspectives of these individuals, the research aims to answer several essential questions. Firstly, it delves into the historical background of the Green Revolution and the Globalization of Modern Food Production. Secondly, it explores the impact of food production globalization and modernization on the survival of the *Manugal* tradition in Central Kalimantan. Thirdly, it investigates the ecological consequences of agricultural modernization on the natural environment of Central Kalimantan.

Moreover, the study compares the traditional rice cultivation methods of *Manugal* with modern monoculture farming systems, focusing on the interplay between nature and human practices. Finally, it aims to identify strategies to preserve the *Manugal* tradition for ecological sustainability. By encompassing these various aspects and incorporating the interviewees' perspectives, this study aims to comprehensively understand the complex relationship between food production practices, cultural traditions, and ecological considerations in Central Kalimantan.

RESULT AND DISCUSSION

The Sacred Bond of Rice Cultivation and Manugal in Dayak Ngaju Tradition

Rice is considered as the most important element in Kaharingan religious rituals, therefore every ceremony uses rice as an element of their prayer. The Dayak people believe that rice is a manifestation of the presence and power of the gods, so that in the rice planting cycle is considered as a sacred activity that will affect all aspects of their lives. The sacred myth of Kaharingan belief says that rice was deliberately created by *Ranying Hatalla Langit*, the main God, for the survival of *King Bunu* who later became the ancestor of mankind in this world. The Kaharingan people who are descendants of *King Bunu* believe that the rice contains the power of *Ranying Hatalla Langit*, so that it can be a means to connect humans with *Ranying Hatalla Langit*. When the ritual of spreading rice is carried out, this formula is said,

> *"Balang bitim jadi isi, hampuli balitam jadi daha, dia balang bitim injamku akan duhung luang rawei Pantai Danum Kalunen, isen hampuli balitam bunu bamban panyaruhan tisui Luwuk Kampungan Bunu,"* which means: rice is not only for human survival, but also as an intermediary between humans and the Almighty: *Ranying Hatalla Langit*, as well as intermediaries between humans and their ancestors.

They carry out this belief from generation to generation as a way of inheriting the responsibility to protect the nature in which they live. This is in line with Fikret Berkes that traditional ecological knowledge can be defined as a cumulative body of knowledge, practice, belief about the relationship of living beings with one another and with their environment, evolving by adaptive processes and handed down to generations by cultural transmission (Bauman, Bohannon, & O'Brien, 2017; Berkes, 2012).

Since thousands of years ago, the Dayak Ngaju people in Central Kalimantan and its surroundings have applied a traditional rice cultivation method called *Manugal*. *Manugal* is planting rice on the ground instead of wet rice fields which is done manually without the help of modern agricultural equipment, with irrigation that only relies on rainwater, and without the use of fertilizers and chemical pesticides. *Manugal* is performed in the sixth month according to the Dayaknese calendar based on the Kaharingan belief, which is a series of interrelated months. Through a series of processes, starting from cutting down trees, burning the remnants of the felling of the trees, depositing the ashes from burning trees, planting rice seeds in the soil by making holes in them with long logs, repelling pests, planting trees in between growing rice plants, to harvesting rice, this method requires a period of one year from the beginning of its preparation to harvest time.

Manugal is carried out in mutual cooperation in turn by involving villagers and the families of the field owners, including parents and children. In this activity, adult men make holes for inserting rice (*manugal*) using round wood with a pointed end so that when plugged into the ground small holes form, while women, children and teenagers insert rice seeds into the holes. *Manugal* is performed in one day, starting from sunrise and must be completed before sunset. This unconscious knowledge that passed down from generation to generation shows the practice of cultivation that is still dependent on the environment and natural materials as inputs. Rice growth relies on soil fertility which has been provided by burning remaining plants on the fields prior to planting. Fertilizers are occasionally added in the form of certain foods that are sown in certain months according to the traditional calendar. No artificial irrigation system is used, as this rice plant relies entirely on the natural conditions of the soil and the rainwater. The same goes for pest control. Pests and animal disturbances are overcome naturally by clearing the fields of grass and bushes where rats nest during planting age then starting a fire by burning the remaining twigs and grass on the edge of the field so that it creates smoke which makes animals such as monkeys afraid to approach. In addition to planting rice, vegetables are also planted, perennials in the form of rubber trees or palm trees so that after harvesting the fields will turn into plantations. The land that had been turned into a plantation was no longer planted with rice for the next few years, and the rice cultivation moved to new land. The harvests of this traditional rice cultivation, although only held once a year, can meet food needs until the next harvest.

Cultural Significance of Rice Cultivation in Dayak Ngaju's Tagalan Oloh Malan Calendar

The Dayak Ngaju people have a traditional calendar called *Tagalan Oloh Malan* which means the division of time working in the fields, because one year in the Dayak Ngaju calendar system is the same as the time needed to work or cultivate rice fields from field opening to harvest time. The planting schedule is held by observing the position of the moon in the sky. The cycle of rice cultivation or the calendar of the farming seasons becomes a liturgical year circle for the Dayaknese people. The *Pakanan Batu* or *Stone Feeding* ritual which is the culmination of the completion of the stages of work in the fields as the harvest feast, is considered as the first month. The stages of land cultivation are called months one to months twelve. Each month describes the harmonious interrelated relationship between humans and all elements of nature as follows:

1. *Pahareman*, which is considered the first month of the sky. *Pahareman* means "the beginning" or "to begin" or "the first day". The month of *Pahareman* is a month of rest, when no one is working. At this time the ritual of *Pakanan Batu* which means the purification of farming tools is carried out, and the rice has been placed in the rice storage called *Karangking* or *Lusuk*. The month of *Pahareman* falls in May in the Gregorian calendar. This month is also known as *New Year* or *Nyelo Taheta* for the Dayak people.

2. *Mantejek Petak* is the second month. *Mantejek Petak* means “putting something into the ground”. In this month, the villagers, led by the village leader, walk into the forest around the village to look for land for farming. When the land has been found, each person will stick a sign called a *Sariang* or *Salugi*, a pointy-tipped wood on the ground. The process of finding and distributing land takes one month. This month is also called the month of *Karak Karayan*, because usually this month comes very heavy rain and strong winds that destroy (*mangarak*) the hut as the place to separate the rice grains from the called *Karayan*.

3. The month of *Kakis Galang Batu* is the third month. *Kakis Galang Batu* means “removing sturdy foundation wood”. In this month, objects in the form of large logs, which can be used as foundations or scaffolding for houses around the riverbank, are washed away due to flooding due to heavy rains in the month of *Mantejek Petak* or *Karak Karayan*. The abundant water creates a swift current that is able to get rid of logs that are on the banks of the river even though they are solid and strong like stones.

4. The month of *Dirik-Teweng* is the fourth month. *Dirik-Teweng* means “slashing and copping down”. In this month people cut down the woods in the fields that have been selected in the month of *Mantejek Petak*.

5. *Kekei-Rewa* is the fifth month. *Kekei-Rewa* means “drying up wood that has been cut down”. In this month people let the wood that has been cut and felled dry by the heat of the sun to be easily burned.

6. *Tagalan* is the sixth month in the sky. *Tagalan* means “planting rice seeds”. In this month people plant rice seeds (*manugal*) but before that the dried wood is burned first. This month is in October or November at the latest in the Gregorian calendar.

7. The month of *Bawau* is the seventh month. *Bawau* means “cleaning from the grass”. In this month, people pull the grass that grows on the ground, which is to clean the nuisance grass that grows around the rice plants that are starting to grow and left in between the rice as compost.

8. *Bulan Balik* is the eighth month. *Balik* means “to turn over”. People again clean the field from the grass that has been cleaned previously by turning it upside down.

9. *Tihin Parei* is the ninth month. *Tihin parei* means “pregnancy of rice”. In this month, rice begins to contain just like pregnant people. This month is also called *the Month of Kidam Parei* or *the Month of Rice Cravings*, because in this month people make chili sauce (*rujak*) for rice such as *Lampesu* fruit and bananas which are mixed with salt and then sprinkled all over the rice plants for good results. People also make an imitation of a rhino’s waist made of *Kajang* leaves. The leaves are woven in a round shape about the size of the waist of a rhinoceros and then hung on a wooden stump in the field. This object is made to avoid unfavorable interference that can interfere with rice. In addition, it aims to make the rice full and pithy.

10. *Lining Mata* is the tenth month. *Lining mata* means “glittering eye”. In this month the rice already looks full but not yet yellow.

11. *Bulan Gantung Sendok* is the eleventh month. In this month the rice is ripe, yellow, pithy, dense, full, so that it hangs down like a spoon.

12. *Getem* is the twelfth month. This is the harvesting time.

For the Dayak people, all of nature is an eternal resource, nurtured through centuries of carefully directed rice cultivation cycles, a harmonious relationship between humans and nature. Effective cooperation in nature management through the rice growing cycle connects thousands of growers together in productive relationships that span across the region. Sustainable agriculture contains a moral invitation to make policies on resources by considering environmental awareness, namely that the agricultural cultivation system must not deviate from the existing ecological system. Balance is an indicator of the harmonization of ecological systems whose mechanisms are controlled by natural systems.

The Green Revolution: Boosting Food Production, but at What Cost?

The Green Revolution program initiated agricultural intensification through various practices in the late 1960s and early 1970s (Parayil, 1992; Subramanyachary, 2012; Swer, 2021). These included using synthetic fertilizers, introducing high-yielding rice cultivars, adopting agricultural processing machines, monoculture cultivation, controlling weeds, pests, and diseases using synthetic pesticides, land expansion, and establishing irrigation networks. The term *Green Revolution* unofficially describes a significant transformation in agricultural cultivation techniques, primarily led by developing countries, particularly those in Asia, from the 1950s to the 1980s (Conway, 1987; Hidayat, Iskandar, Gunawan, & Partasasmita, 2020). This non-traditional approach has considerably multiplied food crop yields, enabling the possibility of planting rice up to three times per year in specific regions, a feat that was previously unattainable. The United Nations Food and Agriculture Organization (FAO) actively promotes the Green Revolution worldwide, facilitating the globalization of food production methods (Calicioglu, Flammini, Bracco, Bellù, & Sims, 2019). Notably, Norman Borlaug awarded the Nobel Peace Prize in 1970, played a crucial role in shaping the Green Revolution. However, it is important to acknowledge that Ford and the Rockefeller Foundations initiated the agricultural revolution, successfully developing wheat in Mexico in 1950 and rice in the Philippines in 1960. The Green Revolution represents an endeavor to enhance the availability of primary food sources, particularly rice, and wheat, in developing nations by leveraging novel, high-yielding crop varieties. Agricultural intensification is achieved by increasing the frequency of rice and secondary crop planting to two or three times per year on a single plot of land. The revolutionary efforts have yielded remarkable outcomes, including food self-sufficiency in countries like Indonesia.

Since the 1980s, the Indonesian government has enforced rice cultivation following the Green Revolution, incorporating imported seeds, chemical fertilizers, pesticides, and machinery (Gultom & Harianto, 2021; Kurniawan et al., 2021). Additionally, through the transmigration program, Central Kalimantan's peatlands have been converted into agricultural land and plantations by deploying a large-scale workforce. Previously utilized for plantations, these areas transformed monoculture agricultural land, employing agricultural intensification alongside the widespread use of chemical fertilizers and pesticides. In the 1990s, the Indonesian government claimed success in achieving rice self-sufficiency. However, farmers began encountering pest infestations during the same period and experienced declining land fertility. Furthermore, the effectiveness of fertilizers and pesticides diminished, and the government's regulation of grain prices led to disparities between farmers and consumers. Applying agricultural chemicals caused structural, chemical, and biological harm to the soil. Once successful in augmenting agricultural production, pesticides damaged ecosystems and disrupted habitats that provided natural predators for pests. Moreover, pesticides induce immunity in certain pests (Sharma et al., 2019; Tudi et al., 2021). Consequently, ecological damage became increasingly inevitable, decreasing food production and agricultural costs. Despite its achievements in increasing rice production in Indonesia, the Green Revolution also brought about adverse consequences, including the destruction of soil-fertilizing organisms, reduced soil fertility, barrenness, pesticide residue in the soil, the presence of chemical pesticides in agricultural products, damaged and imbalanced ecosystems, and outbreaks of pests and diseases (Patel, 2013; van Etten, 2022). Furthermore, the Green Revolution transformed the nature of farming, as farmers shifted from developing a sustainable cultivation culture that harmonized with nature to mass production-oriented farming practices.

The Green Revolution significantly changed agricultural practices in Indonesia, aiming to increase food production and achieve self-sufficiency. However, implementing intensive farming techniques and relying on chemical inputs had unintended consequences. The conversion of land for monoculture agriculture, chemical fertilizers, and pesticides led to ecological damage and declining soil fertility. Pest attacks became prevalent, and the effectiveness of chemical inputs diminished over time. Additionally, government regulations on grain prices created disparities between farmers and consumers. While successful in increasing rice production, the Green Revolution resulted in the destruction of soil-fertilizing organisms, imbalanced ecosystems, and outbreaks of pests and diseases. The transformation of farming practices from a sustainable, nature-centric approach to mass production profoundly affected the peasantry. These observations highlight the importance of considering agricultural initiatives' long-term sustainability and ecological impacts.

CONCLUSION

Based on the analysis of *Manugal* as a traditional system rooted in the teachings of the Kaharingan belief and its comparison with modern agricultural methods, several conclusions can be drawn:

Firstly, the Green Revolution, although initiated to address food shortages in developing countries, has been implemented without thoroughly considering its ecological, social, and cultural impacts. This global movement has spread without regard for the specific conditions of each region, leading to long-term consequences that were not adequately foreseen.

Secondly, the widespread conversion of land into agricultural areas and monoculture plantations has significantly reduced the practice of *Manugal*, limiting it to a small number of individuals in a restricted geographical area. In Indonesia, the government's promotion of rice cultivation since the 1980s, along with the adoption of imported seeds, chemical fertilizers, pesticides, and machinery, has contributed to the decline of traditional farming practices. The forced conversion of peatlands in Central Kalimantan has also contributed to the loss of land traditionally used for agriculture. Consequently, the *Manugal* system has mainly been replaced by modern monoculture farming methods to achieve mass production.

Thirdly, the globalization of modern food production has had detrimental ecological impacts on Central Kalimantan. This includes destroying soil-fertilizing organisms, decreasing soil fertility, contamination from pesticide residues, chemical pesticides in agricultural products, imbalanced and damaged ecosystems, increased pest and disease outbreaks, and the extinction of local wildlife and food crops.

Fourthly, *Manugal*, in contrast, is an environmentally friendly approach that relies on human labor, utilizes small land areas, and avoids using chemicals. It follows a polyculture system rather than a monoculture. Traditional farming methods meet people's needs and maintain ecological balance and nature conservation. In contrast, modern farming systems driven by mass production goals introduce new environmental and health concerns.

Lastly, amidst the destruction caused by modern agricultural practices, there is a growing recognition of the value of traditional farming methods that have been practiced for generations. These methods offer a harmonious way to meet human needs while preserving nature. It is crucial for the Dayak people, who uphold ecological sustainability, to receive protection from the state. This entails imposing restrictions and stringent requirements on commercial monoculture plantations and forest exploitation, particularly on indigenous lands, to mitigate environmental pollution and the impact of climate change.

In conclusion, the analysis underscores the importance of considering the ecological, social, and cultural dimensions when implementing agricultural practices. It highlights the need to protect and preserve traditional farming methods, like *Manugal*, which offer sustainable solutions and maintain the delicate balance between human needs and the environment.

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