

Baliling: An Exploratory Study of Indigenous Farming in Mountain Province

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ABSTRACT

This study explores the Baliling farming practice in Barangay Bayyo, Bontoc, Mountain Province, highlighting its processes, cultural importance, challenges, and revival efforts. Using a descriptive qualitative approach, data was gathered through participation, informal conversations, and interviews with five key informants, and analyzed thematically. Baliling involves overturning soil after rice harvest to improve drainage and soil health, enabling secondary cropping. It includes cleaning fields, creating raised beds, and shaping them manually or with a shovel. The practice faces decline due to cultural shifts, migration, modernization, labor shortages, and ecological issues. The Baliling Festival aims to revive interest, preserve intergenerational knowledge, and strengthen cultural and ecological resilience. The findings emphasize indigenous practices' role in sustainable agriculture, community bonding, and adaptation, advocating for their documentation and integration into policies.

INTRODUCTION

Globally, there is increasing recognition of indigenous and traditional agricultural knowledge systems as vital contributors to sustainable development, biodiversity conservation, and climate resilience. International organizations such as the Food and Agriculture Organization (FAO) and UNESCO emphasize that indigenous farming practices embody centuries of ecological adaptation and offer valuable insights for addressing contemporary challenges, including climate change, land degradation, and food insecurity (FAO, 2019). Traditional farming systems across Asia, Africa, and Latin America demonstrate how indigenous communities sustainably manage fragile environments through techniques such as terracing, crop diversification, agroforestry, and organic soil management.

In Native African farming, practices such as polyculture and intercropping are used to improve soil health and reduce synthetic fertilizer use (Toker et al., 2024). In sub-Saharan Africa, Indigenous knowledge increases food production and environmental conservation. Polyculture and multi-crop agroforestry improve soil fertility, water retention, and biodiversity. These techniques can replace conventional farming, which depletes soil and output. In Latin America, Indigenous wisdom helps smallholder farmers endure tough weather (File & Nhamo, 2023). Ancient methods can improve long-term agricultural output, environmental sustainability, and chemical input control when paired with modern farming technologies. In climate-vulnerable areas, indigenous knowledge and modern technologies can combat food hunger and biodiversity (Muhie, 2022). Indigenous knowledge ensures local food security by making agriculture climate resilient. This strategy improves sustainability, agricultural output, and social and environmental stability (Abdikafi Hassan Abdi et al., 2024). These practices are not merely technical solutions but are embedded in cultural values, social institutions, and spiritual beliefs that regulate human–environment interactions. As modern industrial agriculture increasingly contributes to environmental degradation, ancestral farming systems are now being revisited as models of ecological sustainability and resilience.

In the Philippines, indigenous farming systems play a crucial role in sustaining upland and highland communities, particularly in regions characterized by steep terrain, limited arable land, and climatic vulnerability. The country is home to numerous Indigenous Peoples (IPs) whose agricultural practices reflect deep ecological knowledge and cultural traditions shaped by their local environments (Macandog & Ocampo, 2008). In the Cordillera Administrative Region (CAR, Indigenous knowledge-based sustainable farming has long strengthened agriculture. It is often cited as a national example of sustainable indigenous agriculture, particularly through systems such as the Ifugao rice terraces, which have gained international recognition as a UNESCO World Heritage Site. These systems demonstrate the integration of forest management (*muyong*), water governance, and communal labor arrangements that have sustained agricultural productivity for centuries (Camacho et al., 2015).

In Mountain Province, residents are deeply connected to their land. The communities use farming methods founded in their culture and communal life

to address agricultural challenges. Local farmers possess detailed knowledge of crop varieties and soil conditions that support long-term productivity. In irrigated areas, rice, camote, and vegetables are cultivated in rotation to maximize land use and food security (Provincial Government of Mountain Province, 2019). Traditional farming methods, developed over thousands of years, are still important in the region (Singh & Singh, 2017). Locally adjusted crop rotation, intercropping, and irrigation systems are examples (Hamadani et al., 2021). Some communities plant rice once a year and turn rice fields into gardens with other crops to maximize land use (Del Rosario-Afidchao, 2023). Traditional practices support local livelihoods, biodiversity, and the resilience of agricultural communities. These strategies preserve agricultural output and reduce climate variability. Rotation and soil upkeep make farms productive year after year. These strategies demonstrate modern indigenous wisdom and sustainable agriculture (Camacho et al., 2015).

National studies emphasize that indigenous farming practices contribute significantly to food security, biodiversity conservation, and cultural continuity, especially in upland areas where conventional agricultural technologies are less effective. Practices such as terracing, swidden farming, mixed cropping, and seed conservation have enabled communities to thrive in marginal environments with minimal external inputs (Macandog & Ocampo, 2008). Indigenous farming traditions in the region demonstrate how traditional knowledge can address agricultural challenges, especially as environmental and economic constraints intensify (Paing et al., 2022).

Despite their importance, indigenous farming systems in the Philippines face several challenges. Scholars argue that limited documentation and undervaluation of indigenous knowledge contribute to its gradual erosion. Thus, there is a growing need for localized, community-based studies that foreground indigenous perspectives and lived experiences in farming practices. This study explores the indigenous farming system known as *Baliling*, as practiced in Barangay Bayyo, Bontoc, Mountain Province; the challenges faced by farmers; and the strategies employed by the community to preserve, adapt, and ensure the continuity of *Baliling* farming.

While studies have examined indigenous farming strategies in other parts of the Cordillera, there is limited research focusing specifically on *Baliling* farming in Barangay Bayyo. This gap underscores the need for an exploratory, community-based investigation that documents local farming practices. By foregrounding local perspectives, this study contributes to broader discussions on indigenous knowledge systems, sustainable agriculture, and cultural continuity.

THEORETICAL REVIEW

The Social-Ecological Systems (SES) Framework serves as a foundation for exploring the *Baliling* agricultural practice in Mountain Province. Social-Ecological Systems (SES) conceptualizes resilience as the capacity of an interconnected social-ecological system to absorb disturbances while maintaining core functions, structures, and relationships (Berkes, Colding, &

Folke, 2003). This framework is pertinent for studying traditional agricultural systems like *Baliling*, which relies on interactions between social factors (e.g., cultural knowledge, community norms) and ecological components (e.g., soil health, water availability) to sustain productivity and adaptability (Ostrom, 2009). Within this context, the Social Ecological System allows the examination of *Baliling* as an adaptive system where social and ecological subsystems interact dynamically to foster resilience. By framing *Baliling* within SES, this study situates the practice within a resilient, community-driven agricultural model that integrates ecological stewardship with cultural heritage. The SES Framework allows for an exploration of how traditional agricultural practices contribute not only to environmental sustainability but also to social resilience, underscoring the relevance of indigenous knowledge in the face of modern agricultural challenges (Folke, 2006). This theoretical foundation shows how the interdependence between social and ecological systems enables a sustainable and adaptive approach to farming in Mountain Province.

METHODOLOGY

Research design

This study employed a descriptive qualitative research approach to explore the indigenous farming practice known as *Baliling*. Descriptive qualitative research was suitable for this study, as it enabled the systematic documentation and interpretation of participants' experiences, practices, and knowledge. Through detailed narratives and observations, the study explored how farmers performed *Baliling*, the challenges they encountered, and the strategies the community employed to preserve, adapt, and ensure the continuity of this traditional agricultural practice.

Participants and Locale of the Study

The study was conducted in Barangay Bayyo, one of the sixteen barangays of the municipality of Bontoc in Mountain Province. According to the Barangay Development Plan (2025-2026), the barangay has a population of 598 individuals, comprising 129 households and 137 families. Of these, 312 individuals are primarily engaged in farming, which serves as their main source of income. Fieldwork was conducted from November 1 to 3, 2024, during the *Baliling* Festival, a celebration showcasing the *Baliling* farming. The timing of the fieldwork enabled direct observation of *Baliling* practices in their cultural and agricultural context.

A total of five participants were involved in the study. Participants included farmers, community members, and youth who actively engaged in *Baliling*. Inclusion criteria required participants to be adults (18 years or older), longtime residents of the Barangay, and to have experience practicing *Baliling* for several years, ensuring that the data reflected both practical expertise and local knowledge of the farming system.

Data collection

Data was collected through a combination of key informant interviews, participant observation, and informal conversations. Semi-structured interviews

enabled participants to share detailed narratives about their farming practices, knowledge of soil management and crop varieties, and community strategies for sustaining Baliling. Participant observation enabled firsthand documentation of farming techniques, tools, and procedures, while informal conversations provided additional contextual information and insights into farming. Through detailed narratives and observations, the study explores how Baliling was performed, the challenges farmers faced, and the strategies the community employed to preserve, adapt, and ensure the continuity of this traditional practice.

Data Analysis

The data gathered from key informant interviews, participant observation, and informal conversations were organized, analyzed, and interpreted in accordance with the research objectives. The study used thematic analysis, as proposed by Braun and Clarke (2006), to process and interpret the data, identifying recurring themes and patterns that reflect the participants' perspectives and experiences. This approach facilitated the systematic identification, coding, and interpretation of recurring patterns and themes, including procedural steps, challenges, adaptive strategies, and cultural significance of Baliling. The data analyzed were presented through narrative descriptions and thematic discussions, supported by direct quotations from participants to preserve their authentic voices. Triangulation of interview, observation, and document analysis ensured credibility and depth of understanding in capturing both the practical and socio-cultural dimensions of the practice.

RESULTS and DISCUSSION

Baliling farming practice

Baliling as a Post-Harvest Farming

Barangay Bayyo maintains a predominantly agrarian economy, with agriculture as the primary source of livelihood for most households. Rice cultivation in the rice terraces (*payew*) forms the backbone of the community's subsistence economy, supplemented by swidden farming and livestock raising such as swine and poultry. The reliance on rice terraces reflects the long-standing agricultural traditions of Cordillera communities, where farming systems have evolved to adapt to mountainous terrain and limited arable land.

From a Socio-Ecological Systems (SES) perspective, this agricultural system represents the close interdependence between the community (social system) and the rice terrace environment (ecological system). The *payew* is not merely a production space but a managed ecosystem shaped by generations of indigenous knowledge, labor practices, and environmental adaptation.

The agricultural calendar in Barangay Bayyo follows seasonal rhythms that guide farming activities throughout the year. The preparation of rice fields (*hamor*) typically begins from January to February. This is followed by rice planting (*tuned*) from February to March, while harvesting (*ani*) takes place between June and July. After the harvest season, farmers continue to use the same

rice fields to cultivate secondary crops through the traditional practice known locally as *baliling* or *panagbabaliling*.

Within the SES framework, this cyclical agricultural calendar demonstrates how ecological processes (such as rainfall patterns and soil conditions) are synchronized with social practices (labor organization, traditional knowledge, and timing of activities). The integration of *baliling* into the farming cycle reflects the community's adaptive management of resources to maintain both productivity and ecological balance.

The practice of maximizing rice terrace productivity beyond the primary cropping season reflects adaptive strategies commonly observed in indigenous agricultural systems in the Cordillera region. Indigenous farmers have historically developed farming practices that optimize land use and sustain productivity despite environmental constraints such as steep slopes, fragile soils, and variable water availability (Camacho et al., 2012). The farming system observed in Barangay Bayyo, therefore, reflects the continuation of these indigenous agricultural traditions.

During the fieldwork, the community members refer to Baliling as the process of preparing rice fields for secondary cropping after the rice harvest. In this practice, farmers drain the rice fields after harvesting, turn over the soil, and reshape the land into raised garden beds where crops such as sweet potato (camote) and peanuts are planted. According to the participants interviewed during the fieldwork, baliling improves soil aeration and prepares the soil for the cultivation of root crops.

This process highlights the interaction between ecological functions and human management within the SES. Soil aeration, nutrient cycling, and moisture control represent ecological processes, while the farmers' practices of draining, tilling, and reshaping the land demonstrate human intervention guided by indigenous knowledge.

Through baliling, farmers are able to extend the productivity of the rice terraces and ensure continuous land use throughout the year. Instead of leaving the land fallow after harvesting rice, the terraces are converted into productive garden plots that support additional crop production. This strategy reflects a practical approach to land management that maximizes agricultural output while maintaining soil fertility. From the SES perspective, this demonstrates adaptive resilience, where the system is able to reorganize and sustain productivity despite seasonal transitions.

Previous studies provide similar descriptions of the practice. The Second Cordillera Highland Agricultural Resource Management Project (CHARMP2) identifies baliling as a traditional farming method primarily employed for soil aeration and crop rotation in the rice terraces (Department of Agriculture, 2010). Magcale-Macandog and Ocampo (2004) also describe baliling as the formation of raised beds within rice fields where sweet potato (*tugi*) is planted after rice harvest. According to their study, this practice contributes to soil fertility management and improves land productivity in upland farming systems. These findings further support the SES view that indigenous practices enhance both ecological sustainability and community livelihood.

Baliling begins from the last week of August to the first week of September, typically completed by October. By January, the *baliling* crops planted will be harvested, afterward the rice field will be leveled and prepared for rice planting. In central Bontoc, Del Rosario-Afidcaho (2023) notes that this practice, locally referred to as “faliling,” derives from the root words “enfaliling” and “finaliling,” which mean to plant camote, beans, or even corn.

The findings of this study confirm that baliling remains an important agricultural practice in Barangay Bayyo. While previous studies have provided general descriptions of the practice, the present study offers a more detailed understanding of the processes involved and the role of indigenous knowledge in sustaining the farming system. Viewed through the Socio-Ecological Systems framework, *baliling* is not only a farming technique but a dynamic interaction between human activity and ecological processes, demonstrating how indigenous communities sustain productivity, resilience, and environmental balance over time.

Farming Techniques and Indigenous Knowledge

The fieldwork revealed that baliling farming relies primarily on manual labor and traditional farming tools. Farmers begin the process once the rice fields have dried after harvest. The first step involves clearing the field by removing leftover plants using a sickle locally called kato. This step prepares the land for the next stage of soil preparation. Once the field is cleared, farmers use a hoe, locally called *eh-wang*, to loosen, lift, and turn over the soil to form raised garden beds. This practice, which is common in traditional cultivation, helps eliminate pests such as the golden kuhol and improve soil aeration. The soil is formed into raised garden beds. Farmers use either their bare hands (kagopkop) or shovels to shape these beds. Farmers carefully shape the beds and place surrounding soil on top, creating small canals between adjacent beds.

From a Socio-Ecological Systems (SES) perspective, these farming techniques illustrate the direct interaction between human practices (social system) and ecological processes (soil structure, pest control, and water management). The use of manual tools and labor-intensive methods reflects a low-external-input system where farmers actively manage ecological conditions through indigenous knowledge rather than relying on mechanized or chemical-based interventions.

Organic materials, such as sunflowers and weeds, are incorporated into the soil as natural fertilizers. The use of organic matter enhances soil fertility and reduces dependence on chemical inputs. Within the SES framework, this practice demonstrates how ecological functions such as nutrient cycling and soil regeneration are sustained through locally developed knowledge systems. Once the beds are prepared, farmers plant root crops, with camote (sweet potato) being the most commonly grown during the Baliling season.

This reflects the principles of crop diversification commonly observed in agroecological farming systems. By rotating crops and incorporating root crops after rice harvest, farmers improve nutrient cycling and maintain soil productivity. Research on upland agriculture in the Philippines supports this

observation. Nelson et al. (1997) found that diversified cropping systems in upland farming environments help reduce soil erosion and enhance long-term land productivity. These findings suggest that baliling farming practice functions as a locally adopted system of crop diversification that contributes to sustainable land management. From the SES perspective, crop diversification serves as an adaptive strategy that strengthens the resilience of the farming system by reducing ecological risks and ensuring continued productivity.

Baliling farming demonstrates the deep ecological knowledge of indigenous farmers in the community. Indigenous agricultural knowledge systems are developed through generations of interaction with local environments and often incorporate sustainable techniques that support soil health and biodiversity (Melash et al., 2023). In Barangay Bayyo, farmers use locally available resources and traditional techniques to maintain soil fertility and sustain agricultural production.

Within the SES framework, this body of knowledge represents the social component of the system such as knowledge, skills, and practices, that enables effective management of ecological resources. This highlights how indigenous knowledge functions as a critical link between human activity and environmental sustainability.

Similar observations have been reported in studies of indigenous farming systems in the Cordillera. Camacho et al. (2012) emphasize that traditional agricultural knowledge in the region integrates ecological principles, cultural practices, and community cooperation. These systems enable communities to manage natural resources sustainably while ensuring food security. From an SES standpoint, this integration reflects the interconnectedness of social institutions, cultural values, and ecological processes in sustaining agricultural systems.

In addition to its agricultural significance, baliling farming also reflects cultural and aesthetic values embedded in indigenous farming traditions. During fieldwork, the farmers' creativity is also prominently displayed. Raised garden beds on the rice fields are often shaped into various forms, including letters, words, and geometric designs, with circular shapes being the most common. When Baliling is applied across the entire rice field, these designs create a visually striking landscape.

This creative aspect of baliling demonstrates that farming practices are not only economic activities but also expressions of cultural identity. Within the SES framework, this highlights the role of cultural values and social meaning in shaping interactions with the environment. The landscape itself becomes a product of both ecological processes and cultural expression, reinforcing the idea that socio-ecological systems are co-produced by nature and society.

From an agroecological perspective, the traditional practice of baliling farming reflects the scientific and ecological knowledge of indigenous farmers in the barangay. It can also be viewed as a form of indigenous agroecology, in which ecological principles are applied through traditional knowledge and local practices. Agroecology emphasizes sustainable farming systems that integrate biodiversity, soil health, and community knowledge (Altieri & Nicholls, 2017).

The practice of baliling demonstrates several key principles of agroecology. These include crop diversification, organic soil fertilization, efficient land use, and reliance on local ecological knowledge. By incorporating organic materials into the soil and rotating crops after rice harvest, farmers maintain soil fertility and support long-term agricultural productivity. Furthermore, the reliance on manual labor and locally available resources reduces the dependence on external agricultural inputs.

From the SES perspective, these practices collectively contribute to the resilience and sustainability of the farming system. The continuous interaction between indigenous knowledge (social system) and ecological processes (soil health, biodiversity, and resource cycles) enables the community to adapt to environmental conditions while maintaining productivity.

This body of knowledge constitutes a rich cultural practice that has been transmitted across generations. These farming practices draw on indigenous knowledge systems, local biodiversity, and strong community collaboration, all of which contribute to the development of a resilient and sustainable agricultural system (Aguilar & Ocampo, 2019). Overall, *baliling* farming exemplifies a functioning socio-ecological system where human knowledge, cultural values, and environmental processes are deeply interconnected, ensuring both agricultural sustainability and cultural continuity.

The Evolving Landscape and Challenges of Baliling Farming Practice

In Barangay Bayyo, rice is the primary crop, grown through monocropping with a single annual harvest, typically spanning 7 to 8 months. To diversify production and extend land productivity, farmers practice of baliling farming, a post-harvest farming system in which rice fields are converted into raised beds for secondary crops such as sweet potato. Despite the significance of both rice and camote, rice production alone is insufficient for year-round consumption. The reliance on monocropping and swidden agriculture reflects a traditional farming system deeply adapted to the local environment. However, the findings indicate that while this system has long been adapted to local conditions, it now faces mounting socio-economic and ecological pressures. This pattern is consistent with broader research on Philippine agriculture, which shows that traditional farming communities continue to rely on locally adapted systems, yet these systems are increasingly constrained by low farm incomes, declining agricultural labor, and environmental stressors (Briones, 2021; Magcale-Macandog & Ocampo, 2008).

Cultural Shift

Findings show that Baliling farming in Barangay Bayyo is gradually declining due to cultural shifts, technological changes, and evolving economic priorities. Participants explained that many residents, especially younger individuals, now prefer wage labor, temporary employment, or other livelihood options that are less physically demanding and provide quicker financial returns. This illustrates that agricultural labor has been shrinking due to low relative

incomes in farming, shrinking farm sizes, and workers moving to sectors with higher returns.

Within the SES framework, this reflects a transformation in the social **subsystem**, particularly in labor availability, values, and livelihood choices. A Philippine Institute for Development Studies review notes that labor in agriculture has declined in both relative and absolute terms, and that better-educated workers increasingly move out of agriculture to realize higher returns on education and labor outside the farm sector (Briones, 2021).

Similarly, research on rural Filipino youth outmigration found that intentions to migrate are high in agricultural communities, even when young people still feel attached to family farms, because migration is shaped by perceptions of farming, family expectations, and better nonfarm opportunities (Manalo & van de Fliert, 2013). These studies help explain why Baliling, which is labor-intensive and time-sensitive, is becoming less attractive to younger generations.

The population of Barangay Bayyo has fluctuated during the COVID-19 pandemic as residents returned from urban areas. However, over time, many began relocating in search of better economic opportunities. This pattern of migration, driven by the pursuit of higher-paying and less physically demanding employment, has contributed to the decline of Baliling farming, as fewer individuals remain to participate in traditional agricultural practices. A young male farmer participant explained that the process of doing Baliling is physically demanding, which is why many people choose to seek alternative employment that offers higher pay (*“han ligat ay minbaliling eha di ya sympre adwan-i maid et time ay umalian minbaliling ta han tagu adwan-i et layden da et ay umey makilagbu tay mas mahal han da-da swelduen han ergew*). Another participant noted that many people no longer prefer agricultural work; instead, they take advantage of TUPAD or Tulong Panghanapbuhay sa Ating Disadvantaged/Displaced Workers, a Department of Labor and Employment (DOLE) program in the Philippines providing temporary, community-based emergency employment for informal sector workers, the underemployed, and those affected by crises or economic shocks, offering short-term work for a period of 10 to 30 days. Additionally, men were observed choosing logging activities because they offer higher income. (*Adi da et layden tay wada garud han TUPAD et eyda makilagbu laengen, elam han lanaraki et eyda laengen mangaiw tay wadan hiping*). These sentiments underscore a pragmatic shift in priorities, with many people opting for wage labor. The immediate financial rewards of employment are preferred.

The same trend is reflected in the role of education and changing aspirations. The findings indicate that younger residents often move to areas with better access to schools and universities, and many do not return regularly enough to participate in Baliling. This shows that youth participation in agriculture is closely linked to their perceptions of the sector, socially and economically. In a study on Filipino youth and agriculture, positive social participation supported youth interest in agriculture, but negative economic perceptions reduced their intention to engage in the sector (Mercado & Osbahr, 2023). In other words, when agriculture is seen as difficult, low-paying, and physically exhausting, younger people are more likely to prioritize education

and off-farm employment over traditional farming. In Bayyo, this shift has direct consequences because Baliling depends on the availability of labor at a specific point in the agricultural calendar. From an SES perspective, this reflects how changing social values and aspirations reshape human-environment interactions, reducing engagement in traditional ecological practices.

The findings also reveal mechanization as an important contradiction. The use of *kuliglig* (motorized hand tractors) and other mechanized tools has streamlined agricultural tasks like land preparation, making them faster and less physically demanding. While this enhances efficiency, it also contributes to the decline of cultural practices embedded in baliling farming. One of these practices is *Ob-obbo*, a traditional labor exchange in the barangay. During farming periods, households or group members assist one another with agricultural tasks, with the expectation that the favor will be reciprocated in their own fields. This practice not only fosters cooperation and social cohesion but also reinforces cultural knowledge and communal responsibility within the community.

At the National Level, the Philippine Center for Postharvest Development and Mechanization (PhilMech) reports that farm mechanization in the Philippines has increased, with the country's mechanization level rising from 2.31 horsepower per hectare in 2013 to 2.679 hp/ha in 2023, reflecting the growing reach of mechanized farm operations (PHilMech, 2023). At the same time, reciprocal labor practices remain socially important in Mountain Province; official reports from the Philippine Information Agency describe *ob-obbo* as a local form of *bayanihan* that strengthens cooperation and community recovery (Philippine Information Agency, 2024). Read against this literature, the Bayyo findings suggest that mechanization does not simply replace labor; it also alters the social organization of farming by weakening opportunities for intergenerational learning, mutual obligation, and shared work that traditionally sustained Baliling.

In addition, technology in the context of leisure has affected people's interest in participating in agricultural practices. A middle-aged female farmer in the community expressed that some individuals show limited engagement to farm work due to the excessive use of mobile devices (*adi da et layden ay bomoknag tay kenda da rumerendek ay da inselpon*). This highlights how modern technology can shift attention away from traditional livelihoods and reduce engagement in community-based farming activities.

These competing economic opportunities, combined with migration and the pursuit of higher paying, less physically demanding work, have created significant challenges for Baliling farming. Younger residents, in particular, are drawn to wage labor and urban employment, reducing the number of people available to engage in traditional agricultural practices. This trend reflects broader socio-economic shifts that prioritize immediate financial rewards over the maintenance of cultural and ecological traditions.

Ecological Stressors: Soil Degradation, Pest and Disease Pressure, and Climate Variability

The findings of the study further show that farmers in Barangay Bayyo face significant challenges in sustaining baliling, particularly due to ecological stressors such as soil degradation, pest and disease problems, and increasingly unpredictable weather. From a Socio-Ecological Systems (SES) perspective, these challenges represent disruptions in the ecological subsystem that directly affect farming practices and community livelihoods. According to the young male farmer participant, crops like sweet potatoes are increasingly failing due to environmental factors they have experienced in the past years, this highlights the vulnerability of traditional agriculture to environmental changes. He explained that the decline is closely tied to the condition of the crops themselves, noting that during planting, the crops will initially grow but later eventually will die (*nu eha-ehaen, pag dating sa crops, handey crops mismo, handey maitanim ta ken da ya matey, pag ung kamote eyka itanim et kenda tumubo ngem kenda matey metlang*).

This finding is consistent with research on climate-resilient agriculture in the Cordillera Administrative Region, which found that many municipalities in Benguet were classified as having high to very high vulnerability to climate change because of crop sensitivity to temperature, precipitation, and hazards such as drought and irregular rainfall (Supangco et al., 2022). Although Bayyo is in Mountain Province, the study is highly relevant because it highlights the wider vulnerability of highland farming systems in the Cordillera to changing climatic conditions, further emphasizing how ecological disturbances within the SES affect agricultural stability.

Another experience shared by a middle-aged public-school teacher participant, in which she recounted her first arrival in the barangay and her attempt at baliling farming. However, she became dismayed as the crops repeatedly failed. Although they initially grew, they later turned brown, then yellow, and eventually died. As a result, she stopped practicing baliling, because it felt useless (*hak-en, inbalbaliling ak ngem han nadismayaak ay minbaliling et handey matey nandey lutud, hitud-i han problema, tumubo man ngem awni yah minbrown, awni yah minyellow ya maid et...manipod hid-I adi ak et inbalbaliling tay useless...*). This frustration reflects the broader ecological challenges farmers face, particularly regarding soil degradation, pest outbreaks, and unpredictable weather, which in the SES framework illustrate how ecological stressors influence human decisions and participation in farming practices.

The ecological difficulties observed in Bayyo also align with broader agroecological literature. Altieri and Nicholls argue that traditional farming systems are resilient precisely because they often maintain high levels of biodiversity and locally adapted ecological practices, but they also note that extreme climatic events can still disrupt production and expose vulnerable smallholder systems (Altieri & Nicholls, 2013). Similarly, Mijatović et al. emphasize that agricultural biodiversity and traditional knowledge contribute to climate resilience through diversification, soil and water conservation, ecosystem management, and adjustments in cultivation practices (Mijatović et al., 2013). In relation to Baliling, this literature supports the view that the practice itself is an adaptive strategy because it diversifies land use after the rice harvest. However,

it also suggests that when rainfall becomes more erratic or soils become less fertile, even resilient indigenous practices may begin to fail unless they are supported by broader adaptation measures, highlighting the limits of resilience within the SES when ecological pressures intensify.

Pest and disease pressure further worsens these difficulties, directly impacting crop yields. The findings show that farmers continue to manage golden kuhol, rats, and rice birds through traps, scarecrows, manual snail removal, and occasional use of poisons or chemical inputs. Baliling itself is practiced partly because turning over the soil helps reduce pest carryover after the rice harvest. While effective, these methods are time-consuming. This is consistent with research from the Cordillera showing that the continued use of pesticides and fertilizers can leave residues in soil, contribute to nitrate buildup, and pose risks to water quality and ecosystem health (Ngidlo, 2013).

The implication for Bayyo is significant: as ecological stress increases and labor becomes scarce, the temptation to rely on quick chemical solutions grows, which may further weaken the long-term sustainability of the farming system. Thus, the decline of Baliling is not only a social issue but also part of a feedback loop between pest pressure, labor shortages, and environmental degradation.

During the fieldwork, it was observed that several rice fields were left untouched after the harvesting season, with grass growing uncontrollably. This shows that baliling farming is no longer being practiced by many farmers. The community follows an agricultural calendar in which baliling must be completed shortly after the rice harvest to prepare the land for the next rice-planting season. However, participants reported that persistent rains and overly wet soil delayed or prevented tilling, leaving some fields overgrown and unused.

Delays in baliling disrupt this schedule, leading to challenges in the subsequent planting cycle. As the middle-aged farmer shared, only a few people did the baliling on their rice fields because the rain made the land too wet. Eventually, due to the rain, they did not do the baliling since it will be the preparation for the rice planting season, which will begin after a few months (*akit han inbaliling gapu han bagyo, syempre da omoda-odan maid et nahabrek han pitek enggana maid et adi da et ta handey timeline, manu et nalang ay months yan panaghahamor et*). In the study by Supagco et al. (2022), irregular rainfall is identified as a major source of vulnerability for upland farmers, while Altieri and Nicholls emphasize that climatic instability can delay field preparation and lower productivity in traditional smallholder systems (Altieri & Nicholls, 2013).

In Bayyo, this problem is especially serious because Baliling is seasonal and sequential: once the post-harvest window is missing, the opportunity for secondary cropping narrows, and the next rice planting cycle is also affected. As a result, climate variability does not simply reduce yields; it disrupts the whole agricultural calendar that organizes both labor and knowledge transmission highlighting the systemic impact of ecological disturbances on the overall functioning and stability of the socio-ecological system.

Revival Efforts through the Baliling Festival

Baliling farming is a cultural heritage handed down through generations in the community. It has been practiced for many years, showcasing the creativity and ingenuity of farmers in managing their rice fields. However, the practice has gradually declined over time due to various social, environmental, and economic challenges, which, from a Socio-Ecological Systems (SES) perspective, reflect disruptions in the interaction between cultural practices, community structures, and ecological conditions.

To address the decline, the community launched the Baliling Festival as a community-led initiative to revive and promote the traditional practice of baliling, demonstrating a collective social response within the SES to restore both cultural and ecological functions.

First introduced in 2023, the festival emerged as a collective response to the diminishing practice, with the goal of reviving baliling as both a cultural and agricultural tradition. This also aims to encourage younger generations to participate in sustaining this ancestral practice thereby strengthening the transmission of knowledge and practices across generations within the social subsystem of the Socio-Ecological System (SES). Initiated by a native of Bayyo but now residing overseas, the initiative began with a pledged donation that supported the creation of a Baliling contest. Over time, the festival gained broader community support, raising nearly ₱40,000, and evolved into a fully-fledged event, highlighting the role of social networks, resource mobilization, and collective action in reinforcing system resilience. The festival featured various activities, including a Baliling Vlogging Contest, a creative Baliling contest, and on-the-spot Baliling demonstrations. These events serve multiple purposes, such as raising awareness among younger generations, fostering collective pride in the community's agricultural heritage, and providing opportunities for the intergenerational sharing of traditional farming knowledge which are key processes that sustain the adaptive capacity of the Socio-Ecological System (SES).

Beyond celebrating the cultural significance of baliling, the festival also emphasizes the interconnectedness of cultural traditions, community resilience, and ecological sustainability. In the interview, a young female community member who facilitated the baliling festival emphasized that the purpose of the event is to bring back the old culture that we gained from our forefathers that they passed through generations, to return the glory of the baliling days and ensure that this practice is passed on to future generations. She also noted that this effort is particularly important because baliling had nearly disappeared for several years. (*Han mi layden hin-a baliling festival, ihubli mi handey dati ay culture na minana ng mga ninuno natin, that they passed through generations, kaya ibabalik ung glory ng baliling days, ta kag mepasa kanayon handey next generations to come, tapno mabuhay kasi nawala talaga, there were years na nawala talaga ung baliling.*)

The Baliling Festival underscores the dynamic relationship between ecological systems and human societies. By reviving baliling farming practices through the festival, the festival strengthens cultural identity and community cohesion while addressing ecological aspects, such as the sustainable use of terraced farms. This aligns with the notion of adaptive capacity, where the

community leverages traditional ecological knowledge (TEK) and collective action to cope with changing environmental and social conditions (Folke, 2010). Furthermore, the integration of modern elements, such as vlogging contests, with traditional farming demonstrations demonstrates the community's innovative approach to bridging generational and cultural gaps, thereby fostering resilience in the face of declining agricultural traditions.

CONCLUSIONS AND RECOMMENDATIONS

Baliling farming in Barangay Bayyo represents a vital indigenous agricultural practice that embodies local ecological knowledge, cultural traditions, and community collaboration. This post-harvest farming system not only improves soil fertility and crop yields but also strengthens social cohesion and facilitates the intergenerational transfer of traditional knowledge. The study reveals that despite its ecological, cultural, and economic significance, Baliling faces ongoing challenges, including labor scarcity, youth disengagement, migration, modernization, and ecological stressors such as soil degradation, pest and disease pressure, and climate variability. These pressures threaten both the sustainability of agricultural production and the continuity of cultural heritage.

In response to these findings, the study highlights the importance of documenting Baliling practices and supporting their revitalization through community-led initiatives, education, and policy interventions. Programs such as the Baliling Festival demonstrate how cultural celebrations can encourage youth participation, foster pride in agricultural heritage, and facilitate knowledge sharing across generations, thereby strengthening the socio-ecological resilience of the community. Integrating appropriate modern agricultural techniques, such as mechanization or improved post-harvest methods, with traditional practices can enhance productivity while maintaining ecological sustainability.

The study recommends targeted strategies to preserve and sustain Baliling farming, including: supporting capacity-building programs that engage younger generations in traditional farming, providing incentives and technical support for sustainable land use, promoting intergenerational knowledge transfer through workshops and mentorship, and incorporating climate-adaptive practices to mitigate ecological stressors. Furthermore, expanding research to other upland communities can provide comparative insights into indigenous farming systems, inform broader policies for sustainable agriculture, and identify innovative ways to integrate local knowledge with contemporary farming practices. By addressing social, economic, and ecological dimensions in a holistic manner, these strategies can help ensure the continuity of Baliling as both a productive farming practice and a cultural legacy.

FURTHER STUDY

It is recommended that future research adopt a broader, longitudinal approach to further explore this topic and deepen the findings.

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REFERENCES

- Abdikafi Hassan Abdi, Abdisalan Aden Mohamed, & Farhia Hassan Mohamed. (2024). Enhancing food security in sub-Saharan Africa: Investigating the role of environmental degradation, food prices, and institutional quality. *Journal of Agriculture and Food Research*, 101241–101241. <https://doi.org/10.1016/j.jafr.2024.101241>
- Aguilar, F. J., & Ocampo, A. D. (2019). Indigenous knowledge and local biodiversity: Practices of Baliling in the Mountain Province. *Journal of Cultural Heritage Management and Sustainable Development*, 9(2), 125–140.
- Altieri, M. A., & Nicholls, C. I. (2013). The adaptation and mitigation potential of traditional agriculture in a changing climate. *Climatic Change*, 140(1), 33–45. <https://doi.org/10.1007/s10584-013-0909-y>
- Barangay Bayyo. (2025–2026). *Barangay development plan (2025–2026)* [Unpublished manuscript]. Barangay Bayyo Local Government Unit.
- Briones, R. M. (2021). Philippine agriculture: Current state, challenges, and ways forward (PIDS Policy Notes No. 2021-12). Philippine Institute for Development Studies. <https://pidswebs.pids.gov.ph/CDN/PUBLICATIONS/pidspn2112.pdf>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Camacho, L. D., Gevaña, D. T., Carandang, A. P., & Camacho, S. C. (2015). Indigenous knowledge and practices for the sustainable management of Ifugao forests in Cordillera, Philippines. *International Journal of Biodiversity Science, Ecosystem Services & Management*, 12(1-2), 1–9. <https://doi.org/10.1080/21513732.2015.1124453>
- Camacho, L. D., Combalicer, M. S., Carandang, A. P., Camacho, S. C., de Luna, C. C., Rebugio, L. L., & Youn, Y. C. (2012). Traditional forest conservation knowledge/technologies in the Cordillera, Northern Philippines. *Forest Policy and Economics*, 22, 3–8. <https://doi.org/10.1016/j.forpol.2010.06.001>
- Department of Agriculture. (2010). *Second Cordillera Highland Agricultural Resource Management Project (CHARMP2)* [Unpublished project report].
- Del rosario-Afidcaho, N. (2023, August 17). The “Faliling” culture of the i-Bayyo in Bontoc. Facebook. Retrieved October 24, 2024, from <https://www.facebook.com/novy.afidchao/posts/pfbid0MWrb7SGsPpDQyFStBb7hiidp7kodgfJQ2eixsmk1kcbEdwJyK95wKqc2sJarBpZ9l>
- Department of Agriculture – Special Area for Agricultural Development. (2025). Mountain Province overview: agriculture and community. Retrieved from <https://saad.da.gov.ph/phase-2/mountain-province/>
- Department of Agriculture – Special Area for Agricultural Development. (2025, October 31). “Binnadang” lives on: Cordillera farmers thrive on tradition

- of cooperation. Retrieved from <https://saad.da.gov.ph/binnadang-lives-on-cordillera-farmers-thrive-on-tradition-of-cooperation/>
- Food and Agriculture Organization of the United Nations. (2019). *The state of the world's biodiversity for food and agriculture* (SoW-BFA Report). FAO. <https://aims.fao.org/zh/news/state-world%E2%80%99s-biodiversity-food-and-agriculture-fao-2019-based-data> AI
- File, D. J. M-Buu., & Nhamo, G. (2023). Farmers' choice for indigenous practices and implications for climate-smart agriculture in northern Ghana. <https://doi.org/10.1016/j.heliyon.2023.e22162>
- Folke, C. (2006). Resilience: The emergence of a perspective for social-ecological systems analyses. *Global Environmental Change*, 16(3), 253–267.
- Hamadani, H., Rashid, S. M., Parrah, J. D., Khan, A. A., Dar, K. A., Ganie, A. A., Gazal, A., Dar, R. A., & Ali, A. (2021). Traditional farming practices and its consequences. In Springer eBooks (pp. 119–128). https://doi.org/10.1007/978-3-030-61010-4_6
- Macandog, D. B., & Ocampo, L. J. M. (2008). Indigenous strategies of sustainable farming systems in the highlands of northern Philippines. *Journal of Sustainable Agriculture*, 26(2), 117–138. <https://www.ukdr.uplb.edu.ph/journal-articles/6019>
- Manalo, J. A., IV, & van de Fliert, E. (2013). Push and pull factors in rural Filipino youth's outmigration from agricultural communities. *Asian Journal of Agriculture and Development*, 10(2), 1–15. <https://ideas.repec.org/a/ags/phajad/199418.html>
- Mercado, K. M. P., & Osbahr, H. (2023). Feeding the future: Knowledge and perceptions of the Filipino youth toward agriculture. *Asian Journal of Agriculture and Development*, 20(2), 31–50. <https://ajad.searca.org/article?p=2217>
- Melash, A. A., Bogale, A. A., Migbaru, A. T., Chakilu, G. G., Percze, A., Ábrahám, É. B., & Mengistu, D. K. (2023). Indigenous agricultural knowledge: A neglected human-based resource for sustainable crop protection and production. *Heliyon*, 9(1), e12978. <https://doi.org/10.1016/j.heliyon.2023.e12978>
- Mijatović, M., et al. (2013). Indigenous agricultural practices and their vulnerability to climate change. *Journal of Agricultural and Environmental Sustainability*, 6(2), 1–13.
- Muhie, S. H. (2022). Novel approaches and practices to sustainable agriculture. *Journal of Agriculture and Food*. <https://doi.org/10.1016/j.jafr.2022.100446>
- Nelson, R. A., Cramb, R. A., Menz, K. M., & Mamicpic, M. A. (1997). Cost-benefit analysis of alternative forms of hedgerow intercropping in the Philippine uplands. *Agroforestry Systems*, 39, 241–262. <https://doi.org/10.1023/A:1005953032133>
- Ngidlo, R. T. (2013). Impacts of pesticides and fertilizers on soil, tail water and groundwater in three vegetable producing areas in the Cordillera Region, Northern Philippines. *Journal of Experimental Agriculture International*, 3(4), 780–793. <https://doi.org/10.9734/AJEA/2013/4696>

- Philippine Institute for Development Studies. (2024). PIDS: Agri growth stunted by shrinking farm size, low productivity. Retrieved from <https://pids.gov.ph>
- Philippine Center for Postharvest Development and Mechanization. (2023, June 16). PH mechanization level increases to 2.679 hp/ha – PHilMech. <https://www.philmech.gov.ph/?action=storyFullView&page=stories&recordID=202361643242PM56f67a&storyCateg=News&storyMonth=6&storyYear=2023>
- Philippine Information Agency. (2024, November 17). Cordilleran culture 'Ob-obbo' strengthens community ties in times of disasters. <https://pia.gov.ph/news/luzon/cordilleran-culture-ob-obbo-strengthens-community-ties-in-times-of-disasters/>
- Paing, J. N., van Bussel, L. G. J., Gomez, R. A., & Hein, L. G. (2022). Ecosystem services through the lens of indigenous people in the highlands of Cordillera Region, Northern Philippines. *Journal of Environmental Management*. <https://doi.org/10.1016/j.jenvman.2022.114597>
- Provincial Government of Mountain Province. (2019, January 18). Municipalities - Provincial Government of Mountain Province official website. <http://mountainprovince.gov.ph/theprovince/municipalities/>
- Singh, R., & Singh, G. S. (2017). Traditional agriculture: a climate-smart approach for sustainable food production. *Energy, Ecology and Environment*, 2(5), 296–316. <https://doi.org/10.1007/s40974-017-0074-7>
- Supangco, E. E., Pablo, J. P., Lumbres, R. I. C., Tolentino-Neric, C. M., Daipan, L. E. O., Inciong, G. K., & Gonzales, R. (2022). Climate-resilient agriculture assessment, targeting and prioritization for the adaptation and mitigation initiative in agriculture in the Cordillera Administrative Region, Philippines. In T. Ahamed (Ed.), *Remote sensing applications in agriculture and environment* (pp. 303–336). Springer. https://doi.org/10.1007/978-981-19-0213-0_11
- Toker, P., Huseyin Canci, Irfan Turhan, Asli Isci, Scherzinger, M., Mojtaba Kordrostami, & Engin Yol. (2024). The advantages of intercropping to improve productivity in food and forage production - a review. *Plant Production Science*, 27(3), 155–169. <https://doi.org/10.1080/1343943x.2024.2372878>