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Adaptation strategy of farming communities in Renah Kayu Embun Village, Kumun Debai District, Sungai Penuh City

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ABSTRACT

The farming community in Renah Kayu Embun Village utilizes land for farming to meet their daily needs. However, they face several obstacles, including weather conditions, land slopes, limited equipment, and long distances to market. This requires the community to adapt to the conditions it faces. This study aims to describe and explain the adaptation strategies employed by the farming community to survive the conditions they face. Data collection methods included interviews, observation, and documentation.The research results show that there are several adaptation strategies carried out by farming communities: First, adaptation strategies to the natural environment; (1) Digging a well, (2) making a water reservoir, (3) carrying out the tradition of sending rain. (4) Convert sloping land into steps. Second, adaptation strategies to tool limitations include (1) making sungkaik and coffee grinders and (2) Usoh as a traditional means of transportation. Some of the adaptation strategies carried out by farming communities are in the form of ideas, knowledge, and culture that are formed as a result of long interactions with the natural and social environment.

Keywords: Adaptation strategy; farming community

1. INTRODUCTION

Renah Kayu Embun Village is located in Kumun Debai District in the Kerinci highlands, a landscape shaped by the Bukit Barisan mountain chain and closely connected to the wider Kerinci Seblat region. Village administrative profiles describe an elevation range of roughly 1,500–2,500 meters above sea level and a mosaic of relatively flat pockets mixed with undulating hills and steeper slopes—physical conditions that strongly influence what farmers can plant, how they cultivate, and how they cope with the risk. In Kerinci, smallholder livelihoods commonly rely on diversified agroforestry and mixed farming systems that integrate perennial and annual crops as a practical response to market uncertainties and environmental variability (Aumeeruddy & Sansonnens, 1994; Widiono et al., 2024). Field observations in Renah Kayu Embun similarly indicate that households depend on farming as a primary livelihood, supported by access to land, with common crops including cassiavera/cinnamon (Cinnamomum burmannii), coffee, chilies, citrus (oranges), and assorted vegetables. This pattern aligns with broader Kerinci smallholder production, where cinnamon and coffee are not only livelihood pillars but also commodities shaped by value chain dynamics and quality differentiation (Menggala Susanto et al., 2019; Menggala Susanto et al., 2021).

Despite this livelihood base, farming in upland environments is rarely "business as usual." Farmers are increasingly experiencing climate variability and extreme events, such as shifting seasons, less predictable rainfall, and longer dry spells, which affect soil moisture, cropping calendars, and pest pressure. Evidence from Indonesia shows that climate-related risks can meaningfully alter farmer behavior and willingness to invest in adaptation and that community-level resources—such as trust, participation, and networks—can increase the likelihood that farmers coordinate or contribute to adaptation actions (Saptutyningsih et al., 2020). For crops sensitive to temperature and rainfall thresholds, the challenge is sharper: modeling work on Arabica coffee in Indonesia indicates that climatic suitability can shift across space and time, meaning farmers may face changing productivity even when practices remain constant (Schroth et al., 2015). In a village context like Renah Kayu Embun, where livelihoods depend on climate-sensitive perennials (coffee and cinnamon) and short-cycle horticulture, weather uncertainty becomes a direct threat to both daily consumption needs and cash income, pushing households to continuously adjust labor allocation, planting decisions, and harvesting strategies (Rahn et al., 2014; Saptutyningsih et al., 2020).

The topography intensifies these pressures. Sloping land increases the risk of rainfall becoming runoff rather than stored soil water, and accelerates the loss of fertile topsoil when protective cover is limited. Globally, soil erosion on arable land remains a major and unresolved threat to soil function and long-term food security, particularly in areas where cultivation occurs on exposed or disturbed slopes (Quinton & Fiener, 2024). In the tropical highlands of Kerinci, land-use change linked to plantation expansion can also reduce soil carbon stocks, weakening soil structure and resilience—an outcome that is important for productivity in the medium term and for ecological sustainability in the long term (Antony et al., 2024). For households farming on mixed slope classes, these biophysical processes translate into practical constraints, including higher weeding and maintenance costs, greater vulnerability of annual crops to heavy rains, and a narrower set of feasible technologies for land preparation (Quinton & Fiener, 2024; Antony et al., 2024).

Technological limitations add another layer of complexity. Mechanization and appropriate tools can reduce drudgery, improve the timeliness of field operations, and potentially raise efficiency; however, adoption is uneven when capital costs are high, service markets are thin, and terrain is difficult. Recent evidence from Indonesia specifically highlights disparities in mechanization uptake across regions and emphasizes that context-specific pathways are needed to make mechanization inclusive and sustainable (Winarno et al., 2025). In hilly villages, the "technology gap" is not just about owning machines; it is also about whether tools are suitable for slope conditions, whether maintenance and fuel are accessible, and whether cooperative sharing arrangements exist (Winarno et al., 2025). When farmers cannot afford equipment such as small tillers, brush cutters, or pest control tools, they often compensate through more labor time, delayed operations, or reliance on informal borrowing—choices that can reduce yields or increase their vulnerability during peak seasons (Winarno et al., 2025).

Market access constraints further shape the adaptation space. In Renah Kayu Embun, the marketing center is described as being approximately 27 km away in Sungai Penuh City, and poor road quality can make transport costly and uncertain, particularly for perishable produce. A large empirical literature shows that distance to markets and rural road quality materially affect household-level economic returns and the benefits farmers receive from production because transport constraints act like a "shadow tax" on output and a barrier to modern inputs (Jacoby, 2000). In practice, this means farmers may choose hardier crops over higher-value but more perishable ones, sell to intermediaries at the farm gate at lower prices, or reduce the frequency of market trips—each of which becomes an adaptation strategy shaped as much by infrastructure as by climate (Jacoby, 2000).

Taken together, these interacting stressors—climate uncertainty, slope-driven land degradation risks, limited access to appropriate tools, and distance to markets—help explain why upland farming households rely on a portfolio of adaptation strategies rather than a single "solution." Diversification is a widely observed response: by combining perennials and annuals, households spread risk across harvest times, price cycles, and climate sensitivities (McCord et al., 2015). In Indonesia, diversification can also function explicitly as a risk-management behavior linked to farmer perceptions and motivations, not merely as a tradition (Mutaqin & Usami, 2020). Commodity-specific management choices are important. Cinnamon-based systems can provide cash income but may carry environmental trade-offs if harvesting practices drive forest pressure or land degradation; therefore, sustainability in management and harvesting is central to long-term livelihood security (Menggala Susanto et al., 2019; Antony et al., 2024). These realities suggest that adaptation in Renah Kayu Embun should be understood as a lived process of balancing ecological constraints, livelihood needs, and social capacities, rather than as a purely technical matter (Saptutyningsih et al., 2020; Winarno et al., 2025).

This study is positioned within Julian H. Steward's cultural ecology perspective emphasizes how culture and livelihood organization are shaped through practical adaptation to specific environments (Steward, 1949). Contemporary cultural ecology scholarship extends this approach by treating human–environment relations as dynamic, multi-scalar, and mediated by institutions, knowledge, and everyday practices, which is particularly relevant in rural communities facing simultaneous ecological and economic pressures. Empirically, a relevant comparison comes from research on adaptation to the Mount Kerinci eruption in Gunung Labu Village (Kayu Aro Barat), where community responses included housing adjustments, protective behavior, food strategies, and crop decisions tied to environmental cues (Yulisar et al., 2019). While that case focuses on volcanic hazards, it is directly informative for the present research because it demonstrates how local knowledge, risk perception, and practical constraints combine into adaptation "packages" rather than isolated actions (Yulisar et al., 2019). The key difference is that the present study focuses on chronic and recurring livelihood difficulties in farming—weather variability, slope constraints, technology access, and market distance—so the analytical emphasis is on everyday adaptation strategies that enable households to persist and meet basic needs over time (Quinton & Fiener, 2024; Winarno et al., 2025).

Accordingly, the core aim of this research is to examine the forms of adaptation strategies implemented by the farming community in Renah Kayu Embun Village in response to difficult farming conditions in the area. By grounding the analysis in cultural ecology, this study seeks to explain not only *the* strategies farmers use (e.g., crop diversification, labor reorganization, technology substitution, and market channel choices), but also *why* these strategies emerge as rational responses within the village's specific environmental setting and livelihood structure (Steward, 1949).

2. METHOD

This study used a qualitative approach with descriptive research. The study was conducted in Renah Kayu Embun Village, Kumun Debai District, and Sungai Penuh City. The selection of informants in this study was carried out by purposive sampling, in which the researcher deliberately determined the informants. The informant criteria that the researcher determined were (1) Community members who live and farm in Renah Kayu Embun Village, namely, 10 informants. (2) Community leaders of Renah Kayu

Embun Village: three informants (3) Regional Government of Kumun Debai District: two informants. The techniques used to obtain data were observation, interviews, and documentation studies. Data processing was carried out using an interactive analysis model consisting of three flows: data reduction, data presentation, and drawing conclusions.

3. RESULT AND DISCUSSION

Farming communities have implemented several adaptation strategies to overcome the difficult conditions they face, including:

3.1 Adaptation Strategies to The Natural Environment

3.1.1 Digging a well

A dug well is created by digging the ground until it reaches the groundwater layer. Based on observations and interviews in the field, dug wells are an alternative for farming communities to overcome difficult weather conditions and water shortages. This has been done since ancient times when people began to farm. During the long dry season, farming communities dig wells. The benefits of dug wells for farming communities include meeting their crop needs, as well as providing for family needs such as bathing and cooking. This is as conveyed by Julian H. Steward (in Poerwanto, 2006:68). Steward states that Cultural Ecology is a science that studies humans as living creatures adapting to a particular geographic environment. Communities that dig wells to obtain water are attempting to overcome the limited water resources in their environment. This shows that the physical environment, especially water availability, significantly influences their lifestyle.

3.1.2 Make a Water Storage Tank

In addition to digging wells, farming communities are seeking alternatives to cope with changing weather conditions, namely, by constructing water reservoirs. Observations indicate that water reservoirs are designed to store water during rainy seasons. Researchers observed a farmer collecting water from a well and watering his crops. This appears to be easy because water is readily accessible in the well. The wells are constructed near their lands and homes. Almost all farming communities have these reservoirs because they are easier to construct than dug wells and require less time.

In Julian Stewart's theory of Cultural Ecology, the construction of water reservoirs can be analyzed as a cultural adaptation strategy to limited water resources in a given physical environment. Through water storage technologies and social cooperation, communities strive to survive and manage water efficiently to meet their subsistence needs, whether for agriculture, domestic consumption, or other purposes.

c. Carrying out the *Nuhauh Ahai* tradition

Nuhauh Ahai is the indigenous language of the Renah Kayu Embun Village, meaning a ritual to ask the Creator for rain. This ritual is a belief held by the people of Renah Kayu Embun Village and has been passed down through generations. When the community experiences a water shortage and a prolonged dry season, the farming community performs the Nuhauh Ahai ritual, hoping for rain to suffice and their crops to hydrate. This ritual is a cultural practice inherent in the farming community.

In Julian Steward's theory of Cultural Ecology, water rituals can be seen as cultural adaptation strategies that evolved to address environmental challenges related to limited water resources. Although not material in nature, these rituals serve as social and symbolic mechanisms to regulate human relations with nature, strengthen social solidarity, and ensure the sustainability of community subsistence. These rituals also reflect how communities can adapt in diverse ways depending on environmental conditions and their cultural beliefs.

3.1.3 Making Sloping Land into Stairs or *Jenjea Tatah*

Based on field observations and interviews, it appears that farmers also employ adaptation strategies for sloping land. They continue to utilize sloping land by creating ladders. This is done to grow crops such as chilies, potatoes, onions, and tomatoes. The ladders are designed to ensure effective fertilizer application, maintain plant stability, and prevent erosion by water during the rainy season. The choice of crop types reflects their knowledge system.

3.2 Adaptation Strategies to Technological Limitations

3.2.1 Making *Sungkaik* and Coffee Grinders for Harvesting

Based on field observations and interviews, researchers observed that traditional farming tools were used. Furthermore, farming communities have developed adaptation strategies by utilizing natural materials, such as cinnamon bark wood, for *Sungkaik* and coffee grinders (*Panggiluih)*. *Sungkaik* is used by farming communities to scrape off the cinnamon bark to clean it and sell it for a higher price. Meanwhile, coffee grinders can be used to clean the coffee husks before drying. Both tools are very useful for improving the quality of their crops.

3.2.2 *Usoh* as Traditional Transportation for Carrying Harvest Results

The long distance to the harvest marketing area means that people will adapt to the existing conditions. The adaptation strategy that farming communities use is using *Usoh*. This *usoh* is made by farmers themselves and is used as a means of transportation to transport goods or crops. This tool is made from cinnamon wood which consists of approximately 10 (ten) cinnamon bark sticks with a length of 2 meters. Then the wood is arranged and made into a basket to place the items in, after which the cow is used as a puller. For farmers, this tool is a traditional means of transportation used to transport harvests if there are no transport cars passing by.

4. CONCLUSION

The majority of people in Renah Kayu Embun Village work as farmers, which is their primary source of income. However, the farming community faces several challenging conditions. The community has implemented several adaptation strategies to survive these challenging conditions, ensuring that farming activities continue. Given these conditions, government action is also needed to address the limitations faced by the farming community. This will enable them to carry out farming activities more efficiently and achieve maximum yields, thus improving their well-being.

Ethical Approval
This study does not require special ethics

Informed Consent Statement
Informed Consent StatementPreviously, all selected informants were aware of the purpose of this study, and they agreed to be informants for evaluation purposes without mentioning their names

Disclosure Statement
No potential conflict of interest was reported by the authors

Data Availability Statement
All the data used in this study were obtained from publicly available scholarly databases and government documents

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Notes on Contributors

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Agustin Wela Sasih is a lecturer at the University of Jambi. His research focuses on social and cultural issues. He has published several studies on topics such as social interaction patterns and culture.

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