Traditional Measurement Units of the Dayak Desa in Rice and Paddy Transactions: Conversion to the Modern Metric System

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ABSTRAK

This study examines the traditional measurement system used by the Dayak Desa community in rice and paddy transactions, with a focus on its cultural significance and conversion into modern metric units. In this community, rice is not only a staple commodity but also functions as a socio-economic instrument embedded in cultural practices, including barter systems, customary obligations, and daily exchanges. The persistence of traditional measurement units—gatang, mok, and kulak—reflects the integration of economic activities with local knowledge and cultural values. This research employs a qualitative descriptive approach supported by simple quantitative analysis. Data were collected through in-depth interviews, participant observation, and documentation involving customary leaders, farmers, and local traders in Sintang Regency, West Kalimantan. Quantitative measurements were conducted using digital scales to determine the conversion of traditional units into kilograms and liters. Data analysis was carried out using the interactive model of Miles and Huberman, combined with empirical averaging techniques for measurement conversion. The findings reveal that the traditional measurement system is structured hierarchically according to transaction scale, where gatang is used for small quantities, mok for medium transactions, and kulak for large volumes. Empirical results indicate that one gatang is equivalent to approximately 0.20 kilograms (0.25 liters), one mok to 0.25 kilograms (0.30 liters), and one kulak to 2.5 kilograms (3 liters). These results demonstrate that traditional measurement practices possess internal consistency and can be reliably converted into standardized metric units. The study contributes to the literature by integrating ethnometrology and economic perspectives, highlighting how traditional measurement systems can coexist with modern standards. Practically, the conversion framework reduces information asymmetry and enhances fairness in market transactions. The study concludes that preserving traditional measurement systems while enabling their compatibility with modern metrics is essential for sustaining cultural identity and improving economic integration in rural communities.

INTRODUCTION

For the Dayak Desa community, rice and paddy are not merely agricultural commodities but constitute an integral part of cultural identity and spiritual life. In local folklore, particularly the story of *Bui Nasi*, rice symbolizes sacrifice, continuity, and sustenance, reflecting deep-

rooted beliefs about the relationship between humans and nature. This symbolic meaning positions rice not only as a source of livelihood but also as a cultural artifact embedded in social values, rituals, and intergenerational traditions. Consequently, the Dayak Desa community relies heavily on rice across multiple dimensions of life, including subsistence, customary practices, and symbolic representation.

This cultural significance is reflected in everyday practices, where rice plays a central role in production, consumption, and ritual activities. Beyond its function as a staple food, rice serves as a medium for social exchange, ceremonial offerings, and markers of social status. Such multifunctionality illustrates that rice operates simultaneously within economic and cultural spheres, reinforcing its importance as both a material resource and a symbolic asset. This dual role highlights the inseparability of economic practices and cultural values in traditional societies.

Historically, before the widespread adoption of modern monetary systems in rural Kalimantan, the Dayak Desa community relied on barter mechanisms for economic transactions. Within this system, rice and paddy functioned as *commodity money*, serving as widely accepted mediums of exchange. They were used to trade goods, compensate labor, and fulfill customary obligations. This practice demonstrates that rice was not only a consumption good but also a foundational element of the traditional economic system, enabling exchange and value determination within the community.

In supporting these transactions, the community developed traditional measurement systems based on locally available tools such as *dulang*, *takar*, and *bakul*, typically made from bamboo or rattan. These measurement units emerged from practical needs and were shaped by local knowledge and craftsmanship. However, due to their manual production, these tools often vary in size, resulting in relative and non-standardized measurements. Despite this variability, such systems have been widely accepted and maintained through generational transmission, reflecting strong cultural legitimacy.

To this day, traditional measurement units remain prevalent in local markets and daily transactions. Community members often perceive these units as more trustworthy and equitable, as they are grounded in shared norms and collective understanding. However, challenges arise when transactions extend beyond the local context, particularly in formal markets that require standardized units such as kilograms and liters. This dual system creates difficulties for farmers and traders, especially those unfamiliar with metric conversions, potentially leading to inefficiencies and unequal exchange.

The process of agricultural modernization has further intensified these challenges. The introduction of digital scales and standardized measurement systems through formal trade and government policies has gradually shifted practices toward metric units. Nevertheless, traditional systems persist in informal settings, creating a coexistence of dual measurement frameworks. This transition also poses generational challenges, as younger individuals become more accustomed to modern systems, increasing the risk that traditional knowledge may diminish without proper documentation and adaptation.

In addition to generational shifts, inconsistencies in traditional measurement units across different localities create further complications. For instance, the size of a *dulang* may vary between villages, leading to ambiguity in inter-community transactions. This highlights

the need for empirical studies that systematically document and convert traditional units into standardized metrics. Such conversion not only enhances measurement accuracy but also ensures fairness in broader market interactions without eroding cultural meaning.

From a theoretical perspective, this study is grounded in ethnometrology, which examines measurement systems as cultural constructs shaped by social practices rather than purely technical instruments. Previous studies (Zain et al., 2021) indicate that Dayak communities continue to use body-based and container-based measurements because they align with daily practices and cultural norms. This suggests that traditional measurement systems retain strong cultural legitimacy despite the presence of modern alternatives.

Additionally, the perspective of ethnomathematics emphasizes the importance of integrating local knowledge into formal systems. Putri and Widodo (2020) argue that documenting and converting traditional measurement units can serve as an educational bridge between cultural heritage and global standards. Such integration not only preserves local wisdom but also enhances the capacity of communities to participate in modern economic systems.

Empirical studies also reveal that traditional measurement systems exhibit a high degree of flexibility, adapting to different contexts such as household consumption and ceremonial use (Kalsum & Nurhamsyah, 2019). While this flexibility reflects dynamic local adaptation, it also presents challenges for standardization. Therefore, conversion into fixed units such as kilograms is essential to bridge the gap between cultural flexibility and market requirements.

From an economic perspective, the use of rice as a medium of exchange aligns with the concept of *commodity money* (Scott, 2017), where goods with intrinsic value serve as a basis for transactions. Furthermore, standardization of measurement systems has been shown to improve market efficiency and strengthen farmers' bargaining positions (Marzuki, 2022). This underscores the practical importance of converting traditional units into standardized metrics to reduce information asymmetry and facilitate broader market integration.

Methodologically, this study adopts an ethnoscience approach to understand local knowledge systems as practiced within the community. In this framework, traditional measurement units are viewed as part of a broader knowledge system shaped by interactions between humans, culture, and the environment. Documentation and conversion thus serve not only academic purposes but also practical functions in ensuring the continued relevance of traditional systems.

Given this background, traditional measurement units used by the Dayak Desa community play a crucial role across cultural, social, and economic dimensions. However, the demands of modern trade necessitate their conversion into standardized metric systems. This study aims to provide both theoretical and practical contributions by bridging traditional knowledge with modern measurement standards, thereby supporting cultural preservation while enhancing economic efficiency.

LITERATURE REVIEW

Commodity Money Theory

Commodity money theory explains that certain goods can function as a medium of exchange when they possess intrinsic value and are widely accepted within a community (Scott, 2017). In agrarian societies, staple commodities such as rice often fulfill this role due to their essential function in daily life and their stable demand. Rice, therefore, is not only consumed but also used as a standard of value in economic transactions. This dual function allows rice to operate as both a consumption good and a monetary instrument. Such characteristics make rice a central element in traditional economic systems.

In the context of the Dayak Desa community, rice and paddy serve as commodity money within a barter-based economy. These commodities are commonly used to exchange goods, compensate labor, and fulfill social obligations (Scott, 2017). Their acceptance is based on shared cultural and economic understanding, which ensures their stability as a medium of exchange. This practice reflects the absence of formal monetary institutions in traditional settings. As a result, rice becomes the foundation of economic interactions and value determination.

The economic value of rice in such systems is closely linked to the measurement units used in transactions. Traditional measurement systems determine how value is quantified and exchanged within the community. However, variability in these units can lead to inconsistencies in valuation, particularly in inter-community trade. This creates potential inefficiencies and misunderstandings in exchange processes. Therefore, the role of measurement systems becomes crucial in maintaining the function of commodity money.

Furthermore, the use of rice as commodity money highlights the integration of economic and cultural dimensions in traditional societies. Economic transactions are not purely driven by market logic but are embedded within social norms and cultural practices (Zain et al., 2021). This embeddedness strengthens trust and reduces transaction costs within the community. However, it also limits scalability when interacting with external markets. Thus, understanding commodity money in this context requires both economic and anthropological perspectives.

Market Efficiency and Measurement Standardization

From the perspective of agricultural economics, standardized measurement systems play a critical role in improving market efficiency. Standardization ensures that goods are measured consistently, allowing for transparent pricing and fair exchange (Marzuki, 2022). In the absence of standard units, market transactions may suffer from information asymmetry and valuation discrepancies. This condition can disadvantage producers, particularly small-scale farmers. Therefore, measurement standardization is essential for efficient market functioning.

In traditional communities, the use of non-standardized measurement units can create significant barriers to market integration. Variations in local units, such as differences in container size, lead to inconsistent interpretations of quantity. This inconsistency becomes problematic when products are traded beyond local markets. External buyers may impose standardized measures that differ from local practices. Consequently, farmers may experience unequal bargaining positions due to measurement differences.

The concept of market efficiency is closely linked to the reduction of transaction costs and information asymmetry. Standardized units such as kilograms and liters provide a common reference that facilitates comparison and negotiation (Putri & Widodo, 2020). This reduces uncertainty and enhances trust between market participants. In addition, standardization enables integration into broader market systems, including regional and national trade networks. As a result, farmers can access wider markets and potentially obtain better prices.

Empirical studies indicate that converting traditional measurement systems into standardized units can significantly improve farmers' economic outcomes (Marzuki, 2022). Standardization enhances price transparency and strengthens bargaining power in transactions. It also minimizes the risk of exploitation due to ambiguous measurement practices. However, this process must be implemented carefully to avoid undermining local knowledge systems. Therefore, measurement conversion should aim to balance economic efficiency with cultural preservation.

Cultural Persistence and Traditional Measurement Systems

The persistence of traditional measurement systems can be explained through the theory of cultural persistence, which emphasizes the role of cultural legitimacy in sustaining practices over time. Traditional systems are maintained not only because of their functionality but also because they are embedded in social norms and collective beliefs (Zain et al., 2021). In many indigenous communities, measurement practices are closely tied to identity and tradition. This cultural attachment reinforces their continued use despite the availability of modern alternatives. As a result, traditional systems remain relevant in everyday life.

In the Dayak Desa community, traditional measurement units are perceived as fair and trustworthy because they are based on shared understanding. Transactions conducted using these units rely on mutual trust rather than formal verification mechanisms. For example, borrowing and returning goods using the same traditional measure reflects a socially accepted notion of fairness (Kalsum & Nurhamsyah, 2019). This demonstrates that measurement systems function not only as technical tools but also as social institutions. Such systems help maintain social cohesion and economic stability within the community.

However, the coexistence of traditional and modern measurement systems creates a dual structure that can lead to inconsistencies. While traditional units dominate local transactions, modern metric systems are required in formal markets. This dualism can result in confusion and inefficiencies, particularly when converting between systems. Differences in measurement standards may lead to unequal exchanges and disputes. Therefore, the lack of standardized conversion mechanisms becomes a critical issue.

From a development economics perspective, integrating traditional knowledge with modern systems is essential to ensure inclusive economic growth. The documentation and conversion of traditional measurement units can bridge the gap between local practices and global standards (Putri & Widodo, 2020). This integration allows communities to maintain their cultural identity while participating in modern economic systems. It also supports rural development by improving market access and reducing structural disadvantages. Ultimately,

balancing cultural persistence with standardization is key to achieving sustainable economic development.

RESEARCH METHODOLOGY

This study employs a qualitative descriptive approach supported by simple quantitative analysis to provide a comprehensive understanding of both cultural and economic dimensions. The qualitative approach is used to explore the cultural meanings of rice and paddy within the Dayak Desa community, while the quantitative component is applied to calculate the conversion of traditional measurement units into the metric system (kilograms). This mixed approach allows the study to integrate ethnographic insights with empirical measurement, thereby enhancing the robustness of the findings.

The research was conducted in the Dayak Desa settlements in Sintang Regency, West Kalimantan, Indonesia. This location was selected due to the persistence of traditional measurement practices in rice and paddy transactions. The research subjects consist of members of the Dayak Desa community who actively use traditional measurement units in their daily economic activities. Informants were selected using purposive sampling, focusing on individuals with in-depth knowledge of traditional practices, including customary leaders, farmers, local traders, and community figures.

Data were collected through in-depth interviews, participant observation, documentation, and literature review. The researcher served as the primary instrument (human instrument), supported by interview guidelines, observation sheets, and field notes to ensure systematic data collection. For the quantitative component, a digital scale was utilized to accurately measure the weight of traditional units and convert them into kilograms. This combination of qualitative and quantitative instruments ensures both contextual understanding and measurement accuracy.

Data analysis was conducted in two stages. First, qualitative data were analyzed using the interactive model of Miles and Huberman (2014), which includes data reduction, data display, and conclusion drawing. Second, quantitative analysis was applied to calculate the average conversion values of traditional measurement units into kilograms. For example, a unit such as *dulang* was repeatedly measured using a digital scale, and the results were averaged to establish a reliable conversion standard. To ensure data validity and reliability, this study employed triangulation techniques. Source triangulation was conducted by comparing information obtained from different informants, while method triangulation was achieved by integrating findings from interviews, observations, and documentation.

ANALYSIS AND DISCUSSION

In the traditional agricultural and trading practices of the Dayak Desa community, measurement systems for rice and paddy are deeply embedded in daily life. These systems are not merely technical tools but represent a combination of practical knowledge, cultural values, and economic functions. Three primary traditional measurement units are commonly used, namely *gatang*, *mok*, and *kulak*. Each unit has distinct characteristics, functions, and symbolic

meanings, yet they collectively form a coherent and hierarchical measurement system. This system is applied not only in market transactions but also in harvest distribution, customary payments, and contributions to traditional ceremonies.

The *gatang* is a small measurement tool made from hardened coconut shell, selected for its durability, availability, and ease of shaping. It typically resembles a small bowl with smooth edges to facilitate practical use. Empirical findings indicate that one *gatang* is approximately equivalent to 0.20 kilograms or 200 grams of rice, and about 0.25 liters in volume. Due to its relatively small capacity, the *gatang* is commonly used for daily household needs and small-scale transactions among community members. It is also frequently utilized in traditional cooking practices, particularly by women, as a standardized unit in local recipes. This demonstrates that *gatang* functions both as an economic and domestic measurement tool.

Field observations further reveal that four *gatang* units are equivalent to approximately one liter of rice. This conversion is derived from repeated empirical measurements using digital scales and volume comparisons. The equivalence between traditional and metric systems highlights the implicit precision embedded in local knowledge systems. Such conversion is particularly important in facilitating transactions with external markets that rely on standardized units. At the same time, it allows the community to maintain the cultural significance of *gatang* while adapting to modern economic practices.

The *mok* represents a medium-scale measurement unit, typically made from recycled metal containers such as condensed milk cans. Its use reflects adaptive local innovation, where readily available materials are repurposed into functional measurement tools. One *mok* is approximately equivalent to 0.25 kilograms or 250 grams of rice, and around 0.30 liters in volume. Compared to *gatang*, *mok* is more commonly used in traditional markets where quick and practical measurement is required. Its lightweight and durable nature make it suitable for frequent trading activities.

Empirical analysis indicates that approximately 3¼ *mok* units are equivalent to one liter of rice. This finding confirms that the traditional measurement system possesses a consistent internal logic that can be translated into modern units. The ability to convert *mok* into metric measurements enhances its relevance in broader market contexts. Furthermore, it demonstrates that local measurement practices are not arbitrary but are based on accumulated experiential knowledge. This reinforces the argument that traditional systems can coexist with modern standards.

The *kulak* is the largest measurement unit used by the Dayak Desa community and is typically made from carved wood in the shape of a basin. Its production involves skilled craftsmanship and adherence to inherited size standards passed down through generations. One *kulak* has a capacity of approximately 2.5 kilograms or around 3 liters of rice. Due to its large size, it is primarily used in bulk transactions, harvest storage, and contributions to customary events. In addition to its practical function, *kulak* also carries symbolic meaning, often representing generosity and social contribution.

The equivalence of one *kulak* to approximately three liters demonstrates that traditional measurement systems can achieve a high level of consistency and accuracy. This challenges the assumption that non-standardized systems are inherently imprecise. Instead, it suggests that traditional knowledge systems have developed their own forms of

standardization based on communal agreement and repeated practice. The use of *kulak* in large-scale transactions further highlights its importance in both economic and social contexts. Thus, *kulak* serves as both a measurement instrument and a cultural symbol.

Collectively, the three measurement units—*gatang*, *mok*, and *kulak*—form a tiered and flexible system that accommodates different scales of transactions. This hierarchical structure allows the community to conduct economic activities efficiently without relying on modern measuring instruments. Moreover, the system facilitates price adjustments based on agreed quantities, ensuring fairness in exchange. Such practices reflect the integration of economic rationality with social norms, reinforcing trust within the community.

Table 1. Conversion of Dayak Desa Traditional Measurement Units into Metric System

Traditional Unit	Weight Capacity (kg)	Volume Capacity (L)	Description
1 Gatang	± 0.20 kg	± 0.25 L	Coconut shell; used for small or daily measurements
1 Mok	± 0.25 kg	± 0.30 L	Small metal container; used in market transactions
1 Kulak	± 2.50 kg	± 3.00 L	Wooden basin; used for large quantities
4 Gatang	± 0.80 kg	± 1.00 L	Equivalent to 1 liter
3¼ Mok	± 0.80 kg	± 1.00 L	Equivalent to 1 liter
1 Kulak	± 2.50 kg	± 3.00 L	Equivalent to 3 liters

The conversion presented above provides a practical bridge between traditional and modern measurement systems. By establishing clear equivalences, the community can engage in transactions with external parties without compromising their cultural identity. This conversion also reduces ambiguity and enhances fairness in trade, particularly in inter-regional exchanges.

Despite the increasing availability of modern measuring tools such as digital scales and standardized containers, traditional units remain widely used in daily life. Their persistence can be attributed to their practicality, familiarity, and cultural significance. These tools are not merely instruments of measurement but also represent shared values such as cooperation, trust, and respect for tradition. As such, their continued use reflects cultural resilience in the face of modernization.

In customary ceremonies, the use of *kulak* often carries symbolic meaning beyond its quantitative value. For instance, contributing one *kulak* of rice is interpreted not only in terms of volume but also as an expression of sincerity and social commitment. This illustrates that traditional measurement units embody qualitative meanings that cannot be fully captured by metric systems. Therefore, replacing them entirely with standardized units may lead to the loss of important cultural dimensions.

The documentation and conversion of these traditional units are increasingly important as younger generations become more accustomed to modern measurement systems. Without systematic preservation efforts, knowledge of *gatang*, *mok*, and *kulak* may gradually decline. This highlights the need for integrating traditional knowledge into formal systems through

documentation and education. Such efforts can ensure that cultural heritage remains relevant in contemporary contexts.

Overall, the findings demonstrate that the traditional measurement system of the Dayak Desa community is not only functional but also deeply embedded in cultural and economic practices. The conversion into metric units enables broader applicability in modern trade while preserving local identity. This dual approach supports both cultural sustainability and economic integration. Therefore, the coexistence of traditional and modern systems should be viewed as complementary rather than contradictory.

CONCLUSION AND IMPLICATIONS

This study demonstrates that the Dayak Desa community possesses a well-established traditional measurement system for rice and paddy transactions, utilizing three primary units: *gatang*, *mok*, and *kulak*. These units function hierarchically according to the scale of transactions, ranging from daily household needs to large-scale customary activities. The empirical conversion results indicate that one *gatang* is approximately equivalent to 0.20 kilograms, one *mok* to 0.25 kilograms, and one *kulak* to 2.5 kilograms. These findings confirm that traditional measurement systems are not arbitrary but exhibit a consistent internal logic that can be translated into modern metric standards. Consequently, the study highlights that traditional knowledge systems remain both functionally relevant and adaptable within contemporary economic contexts.

Beyond its empirical contribution, this study provides important theoretical and practical implications. From a theoretical perspective, it reinforces the relevance of ethnometrology and cultural persistence in understanding how local measurement systems operate within socio-economic frameworks. From a practical standpoint, the conversion of traditional units into metric standards offers a bridge between local practices and modern market systems, thereby reducing information asymmetry and improving transaction fairness. This integration enables traditional communities to participate more effectively in broader economic networks without losing their cultural identity.

However, this study is subject to several limitations. First, it focuses only on three primary measurement units (*gatang*, *mok*, and *kulak*) and their application in rice and paddy transactions. It does not explore other commodities or potential variations in measurement practices across different subgroups of the Dayak Desa community. Second, the quantitative conversion relies on field-based measurements and observations, which, while practical, may require further validation through controlled measurement techniques or standardized calibration methods.

Future research is recommended to expand the scope of analysis by examining traditional measurement systems applied to other commodities, such as maize, vegetables, or non-timber forest products. Comparative studies across different ethnic groups in Kalimantan would also provide deeper insights into the diversity and commonalities of traditional measurement practices. From a policy perspective, local governments and customary institutions are encouraged to support the preservation of this knowledge through educational integration, cultural exhibitions, and the development of standardized conversion guidelines.

Such efforts would ensure that traditional measurement systems remain relevant, functional, and sustainable within the context of modern economic development.

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