**Understanding supply chain management in local wisdom-based hydroponic businesses**

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**Abstract**

This study aims to analyze the implementation of local wisdom-based supply chain management in hydroponic businesses. This study intensively focuses on practice using qualitative case study methods. The findings of this study indicate that the values ​​of brotherhood, asah - asih - asuh, trust, and the principle of mutual benefit in the supply chain of a business can be factors that support the sustainability of the hydroponic business supply chain. These findings contribute to developing existing supply chain management theories related to triple-A (Agility, Adaptability, Alignment). These findings can also contribute to practice in hydroponic businesses and other businesses.

**Keywords:** agriculture, innovation, social innovation, cultural supply chain, production management

**JEL Classification:** Q1;O31;O350;Z10;M11

**Introduction**

Supply chain management is one of the essential aspects in the success of a business, especially in the agricultural sector, such as hydroponics(Quaralia, 2022; Timisela et al., 2017; Waluyo, 2023). In the era of globalization and technology, the concept of supply chain management has developed with modern approaches such as Triple A (Agility, Adaptability, Alignment) (Lee, 2004). However, local and contextual approaches are often overlooked, even though they have significant potential in creating a sustainable supply chain. As part of society's culture, local wisdom contains values ​​that can support the sustainability of business relationships, increase efficiency, and create mutually beneficial relationships in the supply chain (Amofa et al., 2023; Shekarian et al., 2022).

The hydroponic business, which is increasingly popular as an alternative to sustainable agriculture, faces various challenges in its supply chain management(Sousa et al., 2024). As a business that relies on close relationships between farmers, distributors, and consumers, an approach is needed that is not only technically efficient but also able to build strong relationships based on cultural values(Ogden, 2014). This study aims to fill the knowledge gap by exploring the implementation of local wisdom-based supply chain management in hydroponic businesses.

This study seeks to answer the central question: How can local wisdom values ​​be applied in supply chain management and support the sustainability of hydroponic businesses?

Businesses can create sustainable competitive advantages by integrating local wisdom values ​​into supply chain management practices. Therefore, this study contributes academically and practically, addressing the need for a more inclusive and contextual supply chain approach.

**Literature review**

A literature review is a scientific article's theoretical core, providing a basis and motivation for research objectives and hypotheses to be built(Nakano & Muniz, 2018) .Through literature review, researchers can "re-view" what other researchers have done on a particular topic (Western Sydney University, 2017). This provides in-depth insight into relevant theories, models, and approaches.

**Supply Chain Management: Theoretical Perspective**

Supply chain management has developed into a dynamic and multidimensional field. One of the main approaches is the Triple-A concept (Agility, Adaptability, Alignment), which emphasizes flexibility, adaptability, and alignment between supply chain actors (Fauji, Pratikto, et al., 2022; Fauji, Sudarmiatin, et al., 2022; Lee, 2004). However, criticism of this approach has emerged regarding the lack of attention to contextual elements such as local culture (Ogden, 2014).

In addition, traditional approaches, such as the push and pull models in the supply chain, continue to be evaluated to improve efficiency and responsiveness (Patsavellas et al., 2021). The literature shows the need to combine modern principles with local wisdom to be more relevant in specific contexts, such as the hydroponic business that relies on close collaboration between actors (Quaralia, 2022; Waluyo, 2023).

The literature shows a gap in understanding how local cultural values ​​can be integrated into supply chain management. For example, many studies ignore the importance of trust and brotherhood values ​​in supporting long-term relationships (Tzeng et al., 2020). The literature synthesis shows that a local-based approach can complement modern theories in supply chain management. As an illustration, the values ​​of local wisdom can strengthen collaboration between supply chain actors, while the principle of mutual benefit creates sustainable stability (Fauji et al., 2024b, 2024a; Ogden, 2014).

This literature review emphasizes integrating modern theory and local cultural values ​​in supply chain management. Further research is needed to develop a more inclusive model, especially in the context of hydroponic business. By addressing this theoretical gap, supply chains are hoped to become more effective and relevant in various sectors.

**Methods**

This study uses a qualitative method with a case study approach(Aisyah et al., 2021; Creswell, 2019). Informants in this study were selected purposively to ensure their relevance to the topic being studied. Informants consisted of farmers and hydroponic entrepreneurs operating for at least two years. Sampling was conducted in areas with significant levels of hydroponic business development, such as Kediri Raya. The unit of analysis in this study was individuals and organizations involved in the hydroponic business supply chain.

Data were collected through in-depth interviews and direct observations. Interviews were conducted with a semi-structured guide to explore informants' experiences and views regarding applying local wisdom in the supply chain. Observations were conducted to understand real practices and interactions between supply chain actors. In addition, documents such as operational reports and business records were also analyzed to support data validity.

This study used data triangulation to ensure the reliability and validity of the findings. Data from interviews, observations, and document analysis were compared to identify congruences and inconsistencies. Data analysis was carried out thematically using qualitative analysis software to identify patterns and themes relevant to the focus of the study. Each finding is evaluated by referring to relevant theories, such as Triple A in supply chain management and the concept of local wisdom. With this approach, it is hoped that this study can provide an in-depth and valid picture of how local wisdom can be integrated into supply chain management to support the sustainability of the hydroponic business.

**Results**

Q: Can you tell us how you plan the hydroponic business process?

Informant 1: The operation of this hydroponic business is easy - easy to difficult because the tendency of this area is a lowland area. So, starting from the nursery, you choose seeds suitable for the lowlands. For the greenhouse, you adjust it (to the weather) too. Before planting, I also adjust it to market demand; for example, I plant lettuce if there is much demand for lettuce. Then, I also plant something relatively stable, namely mint leaves. Mint leaves can be harvested several times, so maintenance is more straightforward.

Informant 2: Before planting, I studied first... I am one of those who use the NFT (Nutrient Film Technique) method. I have previously used the drip method. So, whether I like it or not, I must learn and plan to build a greenhouse and choose the type of seeds. At first, I planted watermelon, but melons seemed good. As a farmer, I also have to think about how to harvest quickly and with good quality.

Q: How do you apply environmentally friendly principles in every stage of the hydroponic business operation?

Informant 1: For me, what is said to be environmentally friendly is that I made the greenhouse on the roof and next to the house, sis, then under the shelf for hydroponics I put catfish... So in my opinion, environmentally friendly means that hydroponic farming does not leave any waste.

Informant 2: Lek Kula applies environmentally friendly principles by saving water usage, reducing chemical pesticides, and optimizing energy resources. The NFT hydroponic system requires efficient water circulation, and, compared to rice fields, hydroponics saves water usage by up to 90% compared to conventional farming. The environment in the greenhouse is controlled, and the need for pesticides is also minimized, reducing environmental pollution.

Then, the location of the greenhouse coincidentally lies in the rice fields themselves, quite far from the housing complex.

Q: How about procuring raw materials, both seeds and nutrients, for NFT?

Informant 1: To procure raw materials such as seeds and nutrients for the hydroponic NFT system, I work with trusted local suppliers to ensure consistent quality and availability. Plant seeds are selected from superior varieties that are suitable for hydroponic conditions, while special hydroponic nutrients are obtained from producers who are experienced in providing optimal nutrient formulas for plant growth in the NFT system. By partnering with local suppliers, I can ensure that raw materials are always available on time, supporting operational sustainability and harvest quality.

Informant 2: For raw materials, I already have acquaintances, sis. I have to choose seeds that are widely known. For example, if it is Intanon melon, it can clearly enter any market... it has been really accepted, proven to be strong against pests and others.

Q: How much production is produced? Is it sufficient for your consumer demand?

Informant 1: Sampun, sis... because my harvest is enough to meet the demand of the catering - catering that I have subscribed to and also for me to send to friends who are submitted to supermarkets - ngoten supermarkets.

Informant 2: Thank God it is enough because we also have partners. In addition, the buyers come from our regular customers, and we also have educational tours. Our regular customers already know the harvest schedule, so when they buy, they have to calculate how much they will finish daily and how many melons they need for 2 months. Melons are durable; they can last more than a month after harvest. Then, when there are educational tours, I usually have an entrance fee, and those who visit will get melons worth around 25,000, so I take it from my partners... I weigh each melon.

Q: How do you manage the distribution and logistics for the harvest?

Informant 1: For the distribution and logistics of the harvest, usually the consumers and our resellers take it directly.

Informant 2: Consumers come here directly, and so far, there have been no problems related to distribution. Moreover, we are partners with resellers; we still go to the reseller for the price, but if the intermediary takes it, we get a lower price. So it is better to distribute it to resellers. If it is to supermarkets, our money cannot circulate quickly, making it less attractive.

Q: How do you manage waste from this hydroponic system?

Informant 1: In managing waste from the hydroponic system, we apply a sustainable approach by reusing the remaining nutrient water through a closed recirculation system. The water used is filtered and re-enriched with the necessary nutrients before being returned to the plants.

Based on the interview, it can be seen that the implementation of supply chain management based on local wisdom includes local wisdom value practices, namely the **values ​​of brotherhood**, **caring for each other**, **trust**, and the principle of **mutual benefit**.

Distribution :

1. Dirrect
2. Indirrect (by reseller)

Consumer

Produsen

Value of brotherhood, caring for each other,Trust,

Mutual benefit

Value of brotherhood, caring for each other,Trust,

Mutual benefit

Produsen

**DISCUSSION**

This study aims to analyze how local wisdom values ​​can be applied in the supply chain management of hydroponic businesses. Based on interviews with informants, planning in hydroponic businesses involves selecting seeds suitable for local conditions, such as lowlands, and adjusting greenhouses to support plant growth. This strategy shows the importance of understanding the geographic context and market needs under the Triple-A theory of adaptability in the supply chain(Lee, 2004).

In terms of implementing environmentally friendly principles, this study found that practices such as water recirculation, reducing pesticides, and processing waste into compost or animal feed have been carried out. This aligns with previous literature that emphasizes resource efficiency as one component of sustainability in the agricultural supply chain (Ogden, 2014). The successful implementation of these environmentally friendly principles is also supported by technological innovations, such as using the NFT (Nutrient Film Technique) system, which can save up to 90% of water compared to conventional methods(Carrasco et al., 2024; Mohapatra et al., 2020).

Distribution of harvest results is another important aspect of the hydroponic supply chain. This study revealed that most of the harvest was distributed through local resellers and partners, thus minimizing logistics risks and ensuring the sustainability of business relationships. This approach reflects the importance of alignment in the supply chain, where all parties involved have the same goal to create shared value.

Local wisdom values, such as cooperation and good relationships with partners, are a strong foundation for maintaining business sustainability(Manik et al., 2024; Yasir et al., 2022). The spirit of cooperation is reflected in community cooperation to build hydroponic facilities, while good relationships with partners ensure the continuity of supply and distribution of raw materials and harvests. This finding expands the Triple-A concept by adding a cultural dimension relevant to the local context, as also proposed by Koentjaraningrat (Koentjaraningrat, 1993)

Sustainability strategies identified include improving production quality, strengthening partnerships, and implementing the principle of mutual benefit. In the long term, this provides stability and a competitive advantage for hydroponic businesses. However, this study also has limitations, such as limited geographical coverage and reliance on qualitative data, so further research is needed with a quantitative approach to strengthen the generalizability of the findings.

Overall, this study provides important contributions both theoretically and practically, by highlighting how local wisdom can enrich supply chain management theory and provide real solutions for the sustainability of hydroponic businesses.

**Conclusion**

This study shows that integrating local wisdom values ​​in supply chain management can support the sustainability of hydroponic businesses. Values ​​such as cooperation, as - asih - asuh, and the principle of mutual benefit have been proven to increase efficiency and create stability in relationships between supply chain actors. Strategies such as selecting seeds according to local conditions, implementing resource-saving technology, and sustainable waste management strengthen business operations while supporting environmentally friendly goals.

However, this study has limitations, especially in the limited geographical coverage and the use of qualitative data that may be difficult to generalize. Therefore, further research with a wider scope and quantitative approach is highly recommended to strengthen the results of this study.

For future researchers, it is recommended to explore how local wisdom can be integrated into various other business sectors, as well as develop a more inclusive supply chain management model. Thus, the academic and practical contributions of the local wisdom-based approach can be further strengthened and applied widely.

**LIMITATION**

This study has limitations, especially in the limited geographical coverage and the use of qualitative data that may be difficult to generalize. Therefore, further research with a wider scope and quantitative approach is highly recommended to strengthen the results of this study.

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