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Integration of Local Wisdom in the Conservation of Seaweed (Kappaphycus alvarezii) in Tanjung Village, Pamekasan, Madura

[1*]Siska Ayu Wulandari, [2]Isdiantoni
[1]Science Education Study Program, Faculty of Teacher Training and Education, Universitas Islam Lamongan
[2]Agribusiness Study Program, Faculty of Agriculture, Universitas Wiraraja
Email Correspondence: siskaayu@unisla.ac.id

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Abstract

Integration of Local Wisdom in the Conservation of Seaweed (Kappaphycus alvarezii) in Tanjung Village, Pamekasan, Madura. *Seaweed cultivation (Kappaphycus alvarezii) is the primary source of livelihood for the coastal communities of Tanjung Village, Pamekasan, Madura. This study aims to examine the role of local wisdom in seaweed conservation, including traditional practices that support the coastal ecosystem. The research employed a qualitative approach using semi-structured interviews conducted with 15 key informants, including seaweed farmers, traditional leaders, and village officials. This was followed by a Focus Group Discussion (FGD) with 10 participants from seaweed farmer groups to confirm data and collectively discuss conservation and local wisdom issues. The collected data were analyzed using thematic analysis techniques to establish the relationship between traditional practices and the sustainability of seaweed. The study indicates that the local wisdom practiced by the Tanjung Village community, such as sasi rules (a traditional prohibition system) and traditional planting methods, contributes significantly to the conservation of Kappaphycus alvarezii seaweed. This local wisdom not only preserves the availability of seaweed resources but also strengthens social cohesion within the community. The integration of local wisdom with modern technology has the potential to enhance the effectiveness of conservation and seaweed productivity. Recommendations for advancing the cultivation of Kappaphycus alvarezii in Tanjung Village include: Collaboration between modern science and traditional practices is necessary to develop environmentally friendly and productive cultivation techniques, and the development of a community-based conservation model involving traditional leaders, farmers, and village officials is crucial for sustainable seaweed resource management.*

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INTRODUCTION

Kappaphycus alvarezii is a leading commodity in Indonesia's aquaculture sector, including in the coastal areas of Madura (Mahmud, 2019; Wulandari, 2020). Seaweed cultivation not only plays a vital role in the economy of coastal communities but also significantly contributes to food security and the supply of raw materials for the carrageenan industry (Cinner, 2010; Wulandari, 2016). However, the sustainability of seaweed cultivation faces various challenges, such as declining marine environmental quality, overexploitation, and changing current patterns that affect the growth of this marine plant (McHugh, 2006).

Amidst these dynamics, coastal communities in Madura, particularly in Tanjung Village, have developed cultivation practices based on local wisdom passed down through generations. Cultural values and customary regulations, such as sasi (temporary harvest bans), are believed to be able to sustainably preserve seaweed resources and coastal ecosystems (Widiastuti, 2018). This local wisdom has the potential to be an effective solution to support seaweed conservation, especially when integrated with modern scientific approaches (Sumintarsih, 2005).

Several studies have examined seaweed cultivation in Indonesia and the benefits of local wisdom in natural resource management. However, research specifically exploring the integration of local wisdom with modern technology in the conservation of *Kappaphycus alvarezii* seaweed in the coastal areas of Madura, particularly Tanjung Village, remains very limited. Furthermore, a thorough understanding of how cultural values and traditional practices contribute to the sustainability of seaweed cultivation at the local community level is also under-documented.

So in this study, the author takes the title of Integration of Local Wisdom in Seaweed Conservation *Kappaphycus alvarezii* on the Coast of Madura: Case Study of Tanjung Village, Pamekasan. This study aims to identify and document local wisdom applied in the cultivation of seaweed *Kappaphycus alvarezii* in Tanjung Village, Pamekasan. It analyzes the role of local wisdom in seaweed conservation and preservation of coastal ecosystems, and explores the potential integration between local wisdom practices with modern science to support the sustainability of seaweed cultivation in Madura.

METHODS

Place and Time of Research

The research was conducted in Tanjung Village, Pamekasan District, Madura, from May to August 2025. Tanjung Village is a center for Kappaphycus alvarezii cultivation with a strong tradition of seaweed management. The location map of Tanjung Village can be seen in Figure 1.

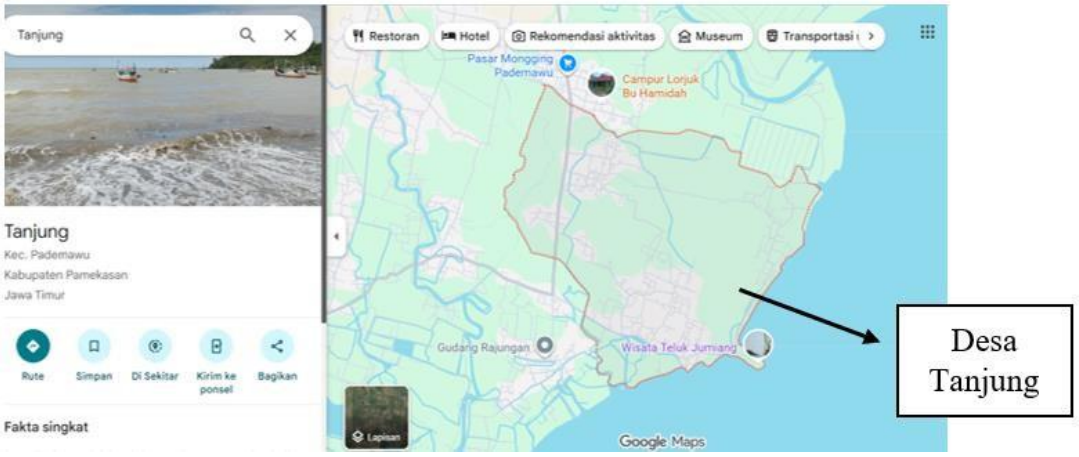

Figure 1. Tanjung village location map

Data Collection Techniques

1. Participatory Observation
   Researchers participated in seaweed cultivation activities, encompassing planting, maintenance, and harvesting. This observation aimed to gain a direct understanding of the cultivation and conservation practices carried out by the community.

2. In-Depth Interviews
   Semi-structured interviews were conducted with 15 key informants, including seaweed farmers, traditional leaders, and village officials. The interviews focused on traditional knowledge, customary rules related to cultivation, and environmental conservation practices.
3. Focus Group Discussion (FGD)
   One FGD session was conducted with 10 participants from the seaweed farmer group to confirm data and collectively discuss conservation issues and local wisdom.
4. Documentation
   Data was collected in the form of photographs of cultivation activities, field notes, and interview recordings to support the analysis.

Data Analysis Techniques

The collected data were analyzed using thematic analysis techniques using the following steps: transcription of interviews and discussions, coding of data to identify key themes related to local wisdom and conservation, and interpreting the results to understand the relationship between traditional practices and seaweed sustainability.

RESULTS AND DISCUSSION

Local Wisdom Practices in Seaweed (Kappaphycus alvarezii) Cultivation

The Tanjung Village community implements customary rules that prohibit seaweed harvesting during certain periods to allow for natural regeneration. Furthermore, seaweed planting and maintenance methods follow traditional practices that maintain the quality of the surrounding marine environment (Kaya, 2015).

Based on interviews in Tanjung Village, most farmers mentioned traditional rules governing seaweed harvest times. These rules are known as "sasi," which refers to a harvesting ban of several weeks to months to allow the seaweed to regrow optimally.

Table 1. The kind of "Sasi" that applies in Tanjung Village

No.	The Kind of "Sasi"	Function "Sasi"	Type of "Sasi"
1.	Sea "Sasi"	This "Sasi" includes the sea and coastal area in the village. The "Sasi" system applies to the entire marine products worth economically important.	♣ Fish "Sasi" ♣ Sea cucumber "Sasi" ♣ Molusca "Sasi" *(Trochus niloticus)* ♣ Sands and coral "Sasi"
2.	River "Sasi"	This "Sasi" set about the things that cannot be done at a river.	♣ Prohibitive to launder at a river ♣ Prohibitive to cut down the tree at the banks of the river
3.	Forest "Sasi"	This "Sasi" includes a variety of plants in the mainland. Usually, the "Sasi" is a plant, either planted by the community or growing in the wild. The plants are plantations that are usually used to meet daily needs and will be harvested when the The results have a maximum	♣ Coconut "Sasi" ♣ Clove "Sasi" ♣ Rattan "Sasi" ♣ Fruits "Sasi"

No.	The Kind of "Sasi"	Function "Sasi"	Type of "Sasi"
4.	Personal "Sasi"	This "Sasi" was imposed by a person on something to her and reported to the village government. Personal Sasi, this only applies to the forest "Sasi"	♣ Coconut "Sasi" ♣ Clove "Sasi" ♣ Rattan "Sasi" ♣ Fruits "Sasi"
5.	Religion "Sasi"	This "Sasi" was set by religious leaders. "Sasi" is also called spiritual "Sasi" or belief "Sasi". It relates to religious beliefs or native people living in society when they have not adhered to the official religion, such as Muslims and Christians. "Sasi" trust closely related to the public trust in the power of spirits of ancestors and the power of the universe in the past.	♣ "Sasi" at the coastal area for 1 – 2 months when someone dies due to drowning. ♣ "Sasi" in the forest area for 1 – 2 months when someone dies in the forest.

The Closed "Sasi". The closed "Sasi" process begins with the agreement of the parties involved, i.e., the village head, customs figures, religious figures, seaweed cultivator, and the community. Agreement in the determination of the "Sasi" is the closure of the seaweed cultivation at the time for 40-45 planting days. During the process of closure, "Sasi" people were banned from doing the activity that disrupted the cultivation. The Open "Sasi". The implementation of open "Sasi" is carried out by the parties as a cover. The process of open "Sasi" is the process of harvesting seaweed at the time the results have reached the point of optimal. The sanction for those who violate the rules of "Sasi" is given in accordance with the level or type of violations committed. The sanctions given, such as fines and isolation within the community (Suminttarsih, 2005).

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Based on the results of an interview conducted with Mr. Samiudin (48 years old), one of the farmers in Tanjung Village, before the regulation regarding "Sasi" or this harvest ban, many seaweed farmers harvested seaweed prematurely. This was often done by farmers due to economic demands, so they harvested earlier (less than 45 days) to sell. Seaweed that has not grown optimally is related to the carrageenan content in it and the quality of the seaweed so that the price in the market is low. After the implementation of "Sasi", farmers began to realize that optimal planting will produce good quality seaweed as well, thus increasing the selling price in the market.

This research shows that the local wisdom of the Tanjung Village community in cultivating Kappaphycus alvarezii plays a significant role in conserving seaweed resources and maintaining the sustainability of coastal ecosystems. The sasi regulation, a form of temporary harvest ban, for example, is similar to the concept of a restoration period applied in modern natural resource management, which aims to provide regeneration time for organisms to grow and develop.

The implementation of Sasi is not merely a technical regulation, but also contains social and cultural values that strengthen community discipline in preserving resources. The social sanctions imposed on violators demonstrate the effectiveness of community-based resource management rooted in local norms and traditions.

Traditional Planting Methods

Farmers use planting techniques passed down through generations, such as tying seaweed to ropes tied to bamboo or wooden stakes embedded in the seabed. This technique allows the seaweed to optimally access sunlight and marine nutrients.

Figure 2. Planting method using floating rafts in Tanjung Village

Local communities often use the floating raft method because the seaweed receives sufficient sunlight, which promotes better thallus growth and brighter color (Wulandari, 2022). Furthermore, the presence of currents maintains water quality. The advantage of marine cultivation is the presence of natural currents that help maintain water quality. This circulation ensures that the water used is constantly replaced, thus preventing potential water quality decline. Furthermore, currents are actually beneficial for the thallus, as they move the thallus, naturally removing any adhering dirt. The result is healthy, vibrantly colored seaweed growth (Wulandari, 2023).

Floating raft frames are much stronger than the longline method. Floating raft frames are designed to be more robust. A stronger frame should be able to support the ropes that serve as a growing platform for seaweed. This is why the people of Tanjung Village often use floating rafts for seaweed cultivation (Wulandari, 2023).

The Potential for Integrating Local Wisdom and Modern Science

This research found that local wisdom does not conflict with scientific approaches and can even complement each other. Examples of potential integration include:

Table 2. The Potential for Integrating Local Wisdom and Modern Science

No.	Local Wisdom Practices	Modern Science That Can Be Integrated	Potential for Integration
1.	Harvest prohibitions (sasi)	Monitoring growth and water parameters	Determining harvest times based on scientific data and customary practices
2.	Traditional planting methods (bamboo rope)	Use of superior seeds and efficient planting systems	Optimize growth without changing local culture

No.	Local Wisdom Practices	Modern Science That Can Be Integrated	Potential for Integration
3.	Community-based ocean cleanups	Education about waste and environmental quality	Environmental awareness campaigns based on local values
4.	Natural drying in sand	Solar dryer technology	More hygienic results without sacrificing tradition

Based on Table 2, the potential integration of local wisdom and modern science aligns with Ostrom's (2000) theory of Community-Based Resource Management (CBRM), which posits that effective resource management is highly dependent on local social structures, norms, and rules that exist within the community (Ask, 2002).

This integration of local and scientific approaches also supports a transdisciplinary paradigm in coastal management, where modern science is not only applied technocratically but also contextualized with local values (Berkes et al., 2000).

Thus, local wisdom is not a barrier to innovation, but rather a gateway to more sustainable conservation strategies and seaweed cultivation management.

CONCLUSION

This research shows that local wisdom practiced by the people of Tanjung Village, Pamekasan, Madura, such as sasi regulations and traditional planting methods, significantly contributes to the conservation of Kappaphycus alvarezii seaweed. This local wisdom not only maintains the sustainability of seaweed resources but also strengthens social cohesion within the community. Integrating local wisdom with modern technology has the potential to increase the effectiveness of seaweed conservation and productivity.

SUGGESTION

Recommendations for the sustainability of seaweed (Kappaphycus alvarezii) cultivation in Tanjung Village are as follows:

1. The local government and relevant institutions should support the preservation of local wisdom through educational programs and the empowerment of coastal communities.
2. Collaboration between modern science and traditional practices is needed to develop environmentally friendly and productive cultivation techniques.
3. Development of a community-based conservation model involving traditional leaders, farmers, and village officials is essential for sustainable seaweed resource management.
4. Further research is recommended to explore the socio-economic aspects of seaweed conservation and the effectiveness of integrating new technologies in coastal communities.

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