



Research Article

Local Community Wisdom in Maintaining the Balance of Dryland Agricultural Ecosystems (Case Study of the Tolaki Community in Southeast Sulawesi, Indonesia)

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Abstract | Local wisdom plays a crucial role in maintaining the ecological balance of dryland farming ecosystems, particularly in the remote areas of Southeast Sulawesi, Indonesia. This study aims to explore the application of local wisdom by the Tolaki people, with a focus on sustainable agricultural practices in the context of dryland farming. The research examines how traditional knowledge systems, such as shifting cultivation, agroforestry, crop rotation, organic fertilization, and water management, contribute to ecosystem balance and agricultural productivity. The research employs a mixed-method approach, gathering qualitative data through in-depth interviews, focus group discussions (FGD), participatory observation, as well as quantitative data through field surveys and soil productivity measurements. The findings indicate that practices such as soil conservation, crop rotation, agroforestry, and the use of organic fertilizers significantly contribute to the balance of dryland ecosystems, enhance soil fertility, and reduce erosion. The study highlights that strengthening institutions, creating supportive regulations, and establishing partnerships between farmers and policymakers are essential for preserving these practices. The research concludes that the local wisdom of the Tolaki people offers a valuable model for developing sustainable agriculture that aligns with environmental conservation and cultural heritage preservation.

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Introduction

Local wisdom is an integral part of the cultural identity of a community, passed down through generations. In the context of the Tolaki indigenous people living in the inland regions of Southeast Sulawesi Province, local wisdom plays a crucial role in various aspects of life, one of which is in maintaining

generations. In the context of the Tolaki indigenous people living in the inland regions of Southeast Sulawesi Province, local wisdom plays a crucial role in various aspects of life, one of which is in maintaining

the balance of the dryland agricultural ecosystem. This wisdom is formed through the community's process of adapting to natural environmental conditions, as well as the ongoing dynamics of social, economic, and cultural changes. Indigenous communities in different regions continue to use traditional methods that support the sustainability of their ecosystems. As stated by [Hosen *et al.* \(2020\)](#); [Daniel *et al.* \(2022\)](#); [Dalyan *et al.* \(2024\)](#); [Rosmalah *et al.* \(2025\)](#) and [Alwi *et al.* \(2025\)](#) traditional practices and the traditional ecological knowledge systems of indigenous peoples contribute to the sustainability of their ecosystems. One such group that still upholds local wisdom in the management of natural resources, particularly in dryland agriculture, is the Tolaki community in the inland regions of Southeast Sulawesi Province.

Dryland agriculture plays a significant role in meeting the food needs of communities, especially in areas with limited access to water supplies. There are several challenges in managing drylands, including land degradation, low soil fertility, and threats from climate change. All of these phenomena impact the declining productivity of agriculture ([Ahmed *et al.* 2022](#); [Arneth *et al.* 2021](#); [Jellason *et al.* 2021](#); [Pravalie *et al.* 2021](#)). In addressing these issues, the Tolaki community in the inland regions of Southeast Sulawesi Province has developed several forms of local wisdom, such as the shifting cultivation system, agroforestry practices, crop rotation patterns, the use of organic fertilizers, soil conservation, and traditional water management. These forms of local wisdom are efforts to maintain the balance of the dryland agricultural ecosystem.

The local wisdom practiced by the Tolaki community not only serves to increase agricultural productivity but also maintains ecological balance. For example, the land rotation system and the use of local plants that are adaptive to dryland conditions help preserve soil fertility and reduce the risk of erosion. Additionally, the cultural values of the Tolaki community guide the wise utilization of natural resources. Therefore, the local wisdom of the Tolaki community can support environmental sustainability and the welfare of the local people.

However, in recent decades, the advancement of agricultural technology, changes in social structures, and land use conversion have shifted traditional agricultural practices. Agricultural modernization that does not align with local ecological conditions has

the potential to decrease the sustainability of dryland agricultural ecosystems ([Ahmed *et al.* 2022](#); [Ngongo *et al.* 2022](#)). Thus, it is essential to evaluate how the implementation of the Tolaki community's local wisdom still plays a strategic role in maintaining the balance of agricultural ecosystems, as well as to find the best strategies for preserving traditional wisdom practices within modern agricultural applications.

This study aims to examine the impact of the Tolaki community's local wisdom on the balance of dryland agricultural ecosystems in the inland regions of Southeast Sulawesi Province. By understanding the relationship between local wisdom and ecosystem balance, it is hoped that the study can provide recommendations for the government, academics, and the community in formulating policies that support the sustainability of agriculture based on local wisdom. Furthermore, this research may serve as a foundation for developing agricultural models that are not only productive but also environmentally friendly and in harmony with the local culture.

Materials and Methods

To achieve the research objectives, the methods used in this study include a combination of qualitative and quantitative approaches (mixed method). This approach aims to provide a comprehensive understanding of the local wisdom of the Tolaki community in the dryland agricultural production system.

Research approach

The research methodology used in this study consists of two methods: qualitative and quantitative. The qualitative method is used to explore and deeply understand the meaning of the local wisdom of the Tolaki community. Qualitative data will be collected through in-depth interviews, focus group discussions (FGD), and participatory observation. On the other hand, the quantitative method is used to measure the impact of local wisdom on productivity, sustainability, and ecosystem balance in the dryland agricultural production system. Quantitative data will be obtained through field surveys, land productivity measurements, and the collection of statistical data.

Location and subject of research

The research was conducted in the inland regions of Southeast Sulawesi, which is the primary area of

the Tolaki community. The location was purposively selected based on specific criteria, such as regions that still practice local wisdom in the management of drylands. The research subjects include farmers, community leaders, indigenous leaders, and policymakers involved in the management of drylands.

Population and sample

The population in this study consists of the entire Tolaki community residing throughout the Southeast Sulawesi peninsula. The sample for this research is divided into two groups: first, 141 farmers who fully apply local wisdom in agricultural production, and second, farmers and stakeholders involved in the preservation of local wisdom systems, including community leaders, indigenous leaders, and policymakers engaged in the management of dryland agriculture.

Data collection technique

The data collection techniques used in this research consist of the following:

- In-depth interviews, The research was conducted with community leaders, farmers, and policymakers to gather information about the local wisdom applied in dryland management.
- Focus Group Discussion (FGD), which conducted to explore the collective perceptions of Tolaki farmers about the dryland agricultural management system.
- Participatory observation, where the researcher will directly engage in the activities of the Tolaki community to firsthand understand the local wisdom practices that are applied.
- Field surveys, which conducted to collect quantitative data on land productivity, types of crops, and planting patterns implemented in the region.

Data analysis techniques

The data analysis used in this study consists of both qualitative and quantitative analysis.

- Qualitative analysis employed a thematic analysis approach, where the data be categorized into themes based on the key issues related to the application of local wisdom in dryland agricultural practices.
- Quantitative analysis will be used to determine the impact of local wisdom systems on the balance of dryland agricultural ecosystems. This done using Logit Regression Analysis, with the following formulation:

$$\text{logit}(P) = \ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4$$

Information

Logit (P) logit of probability of influence P

ln: natural logarithm (base e)

$$\frac{P}{1-P} : \text{opportunity (odds) incident } Y = 1$$

In determining the key indicators for strengthening local wisdom in the management of dryland agriculture, the analysis can be carried out using a reliability matrix with Interpretative Structural Modelling (ISM). The ISM matrix is presented in Table 1.

Table 1. ISM matrix of key driving factors in the application of local wisdom in dry land agricultural management

The i-th parameter which is the driving factor	The j-th parameter which is the driving factor						
	1	2	3	4	5	6	n
1							
2							
3							
4							
5							
6							
N							

The criteria for constructing the ISM matrix are as follows:

- Rows: If parameter i has a relationship with parameter j, then it is marked as 1; if not, it is marked as 0.
- Columns: If parameter i has a relationship with parameter j, then it is marked as 1; if not, it is marked as 0.
- According to Chaerul & Mardiyah, (2019), the score is set to 1 for both rows and columns if more than half of the respondents indicate that parameter i has a contextual relationship with parameter j. If this is not the case, the score is set to 0.

Results and Discussion

Forms of Local Wisdom of the Tolaki Community in the Dry Land Agricultural Production System.

Anthropologically, the Tolaki community possesses several forms of local wisdom in maintaining the sustainability and balance of the dryland agricultural ecosystem, including:

Agroforestry practice, where the Tolaki community applies an agroforestry system that combines food crops with trees or protective plants in the same land. The purpose of this technique is to bind the soil with tree roots, protecting it from erosion, improving soil fertility through leaf litter, and creating a more balanced ecosystem. Agroforestry uses natural vegetation that also functions as windbreaks and regulates soil moisture.

Crop rotation and mixed cropping patterns

Some forms of local wisdom still in use are crop rotation systems and mixed cropping patterns. Crop rotation is done by changing the type of crop each planting season to prevent soil exhaustion and reduce the risk of pest and disease attacks. Mixed cropping involves planting several types of crops simultaneously in one land, aimed at increasing land productivity and strengthening household food security.

Soil fertility management using organic materials

The Tolaki community utilizes organic materials, such as leaves, rice husks, straw, and other crop residues, as natural fertilizers. This practice aims to improve soil structure, enhance fertility, and retain moisture in the soil. The use of organic fertilizers aligns with the principles of sustainable farming that avoids the use of synthetic chemical fertilizers.

Traditional water management

Local wisdom in water management is reflected in the use of reservoirs (rainwater harvesting ponds) and simple irrigation systems relying on natural water sources. The Tolaki community also adopts rainwater management practices by creating small channels around the land to capture rainwater, which is then used during the dry season. This method is effective in overcoming water limitations in dryland areas.

Storage and management of local seeds. One of the enduring practices is the independent management of seeds. The Tolaki farmers select and store the best seeds from previous harvests for use in the next planting season. The selection of seeds is based on the plants' resistance to pests, diseases, and specific environmental conditions. This local seed management allows farmers to have greater resilience

against crop failure risks.

Mutual cooperation system in the production process

The Tolaki community practices a system of mutual cooperation or collaboration in the agricultural production process. This practice is applied during land clearing, planting, and harvesting. In addition to strengthening social solidarity, mutual cooperation accelerates the work process, reduces production costs, and addresses labor shortages at the household level.

Natural pest control

The Tolaki community utilizes natural pest control methods, such as the use of repellent plants and natural predators. For example, certain plants with strong scents are planted around agricultural land to repel pests. This approach is more environmentally friendly compared to the use of chemical pesticides.

Traditional planting season calendar

The Tolaki community has traditional knowledge regarding the best times for planting and harvesting based on the seasonal calendar. This knowledge is acquired from observations of natural signs, such as wind direction changes, rainfall patterns, and the appearance of certain animal species. This traditional calendar allows farmers to schedule planting and harvesting times to align with climatic and environmental conditions.

The influence of the application of local wisdom on the balance of dryland agricultural ecosystems

The application of local wisdom can support sustainable agricultural development as it plays a strategic role in maintaining ecosystem balance, especially in drylands with limited natural resources. The local wisdom passed down by the Tolaki community from one generation to the next demonstrates their adaptation strategies to environmental conditions, including soil conservation techniques, water management, and the selection of crops suited to the local ecosystem. Research on the impact of local wisdom application on the balance of dryland agricultural ecosystems is highly relevant in addressing the challenges of climate change and land degradation. It is hoped that ecosystem balance will be maintained through the continuous application of local wisdom, allowing agricultural productivity to increase sustainably as well. According to research findings, the implementation of the Tolaki community's local wisdom significantly affects the balance of dryland agricultural ecosystems in the inland regions of Southeast Sulawesi Province.

Table 2. *The influence of the application of local wisdom on the balance of dryland agricultural ecosystems.*

Variable	Koefisien (β)	Standar error	Wald test (Z-statistic)	P-value	Odd ratio (OR)
Intercept	-1.242	0.891	-4.32	0.000	-
Soil conservation (X_1)	1.121	0.342	2.88	0.003	2.442
Crop rotation (X_2)	0.012	0.014	3.00	0.000	1.007
Application of agroforestry (X_4)	0.986	0.284	2.22	0.026	1.976
Use of organic fertilizer (X_3)	0.845	0.645	3.90	0.045	2.081

The data in Table 2 shows that the local wisdom of the Tolaki community through the application of soil conservation, crop rotation, agroforestry, and the use of organic fertilizers has a significant impact on the balance of dryland agricultural ecosystems in the inland regions of Southeast Sulawesi Province. The results of the logit regression analysis, as shown in Table 2, indicate that the odds ratio for the application of local wisdom through soil conservation is 2.442. This suggests that if soil conservation practices are continued, the balance of dryland agricultural ecosystems will increase 2.442 times. This aligns with the findings of Ngongo *et al.* (2022) and Partasasmitha *et al.* (2020), who explained that implementing local wisdom through soil conservation can improve the balance of dryland agricultural ecosystems. Soil conservation methods such as terracing and the use of natural vegetation prevent erosion and the loss of fertile topsoil. These methods help maintain soil ecosystem balance and allow natural regeneration of drylands. By managing the land wisely, the soil can better absorb rainwater, reduce the risk of flooding, and ensure adequate water reserves for crops. This has implications for the sustainability of ecosystems, particularly dryland agricultural ecosystems in the inland regions of Southeast Sulawesi Province.

Similarly, the application of local wisdom through crop rotation systems can increase the balance of dryland agricultural ecosystems in the inland regions of Southeast Sulawesi Province by 1.007 times. This is consistent with the research by Dalyan *et al.* (2024), which explains that the traditional ecological knowledge system of the Kaluppini indigenous community, including crop rotation and other sustainable agricultural practices, can help maintain ecosystem balance. This is also supported by Murhaini and Achmadi, (2021), who mention that the agricultural management system of the Dayak community in Kalimantan, Indonesia, based on local wisdom and cultural values, promotes ecosystem

balance, one of which is the shifting cultivation system. Furthermore, the application of local wisdom through agroforestry systems can increase the balance of dryland agricultural ecosystems by 1.976 times. This is in line with Fahad *et al.* (2022), who state that agroforestry systems improve soil quality and health, reduce erosion and soil runoff, and enhance soil microbial activity, thereby improving nutrient cycling and availability while reducing agricultural chemical pollution by acting as a safeguard and enhancing hydrological functions. Marques *et al.* (2022) explain that agroforestry systems can improve soil fertility and reduce soil erosion. Manaye *et al.* (2021) mention that agroforestry systems with mixed cropping patterns create a more complex ecosystem with higher tree diversity and carbon reserves on dryland areas. Budiastuti *et al.* (2021) state that agroforestry is the best vegetation management approach to address forest degradation in Indonesia, as this system has the ability to regulate rainwater, absorb carbon, and support microclimates and crop production.

Agroforestry practices with mixed cropping patterns create a more complex ecosystem on dryland areas. Agroforestry systems support plant and organism diversity, which can improve resilience against pests and diseases. This biodiversity also provides habitats for various organisms, such as insects, birds, and soil microorganisms. On the other hand, planting various crops reduces the risk of crop failure due to pests or climate change. This has implications for reducing dependence on the use of inorganic materials that could disrupt ecosystem balance. Ngongo *et al.* (2022) state that traditional agricultural practices such as local agroforestry in West Timor can maintain soil fertility and promote sustainable agriculture in semi-arid marginal areas.

The application of local wisdom through the use of organic fertilizers can increase the balance of dryland agricultural ecosystems by 2.081 times.

The management of organic waste also prevents the accumulation of waste around agricultural land, keeping the surrounding ecosystem clean and healthy. This aligns with the views of [Tobing *et al.* \(2024\)](#), who explain that the use of organic fertilizers and soil amendments such as biochar and compost can improve growth and harvest yields on drylands. [Bonanomi *et al.* \(2020\)](#) also state that the use of organic fertilizers improves soil fertility, increases crop yields, and enhances beneficial soil microbiota compared to conventional management practices.

Key Indicators for Strengthening Local Wisdom in the Dry Land Agricultural Production Process in the Land Area of Southeast Sulawesi Province

Local wisdom can play a significant role in the dryland agricultural production process; therefore, it is essential to first determine the key indicators to assess its success. This is in line with the view of Marimin and Magfiroh (2013), who state that the success of a program is due to the management of its determining factors. Thus, for local wisdom to succeed in the agricultural production process, its determining factors or indicators must be identified.

Based on the results of the focus group discussion, there are 10 (ten) key indicators that can guarantee the success of implementing local wisdom in the dryland agricultural production process in the inland regions of Southeast Sulawesi Province. The 10 (ten) determining factors or key indicators are presented in [Table 3](#).

In accordance with the Interpretative Structural Modeling (ISM) analysis, the main key indicators that strengthen local wisdom in the dry land agricultural production process in the mainland area of Southeast Sulawesi Province can be presented in [Figure 1](#), namely the Driver Power-Dependence matrix, with a model structure as in [Figure 2](#).

In [Figure 1](#) above and [Figure 2](#) below, it is shown that the key indicators driving the application of local wisdom in the dryland agricultural production process in the inland regions of Southeast Sulawesi Province are as follows. The indicators located in Cluster IV (Independent) are: (1) strengthening existing institutions; (2) availability of regulations or local government regulations on land allocation based on

Table 3. *Key Indicators of Strengthening Local Wisdom in the Agricultural Production Process Dry Land in the Land Area of Southeast Sulawesi Province*

No.	Key Indicators	Information
1.	Regional regulations on the application of local wisdom	Regulations made by local governments (provinces, districts, or cities) to protect, preserve, and integrate local values, traditions, customs, and practices into government policies.
2.	Regional regulations on land determination based on local wisdom	Legal regulations made by local governments to regulate the management, use and protection of land by taking into account local values, traditions and customary practices.
3.	Formation of farmer groups	The process of organizing farmers into formal or informal groups with the aim of increasing the effectiveness of agricultural activities, strengthening farmers' bargaining position, and facilitating access to assistance, training, technology and markets.
4.	Mentoring and supervision	Efforts made by the government, traditional institutions, or related parties to ensure that local wisdom values, traditions, and practices are implemented effectively and sustainably.
5.	Strengthening customary institutions	Efforts to strengthen the role, function and capacity of traditional institutions in pre-serving, managing and integrating local wisdom values into community life and regional development policies
6.	Partnership formation	Farmer partner institutions to facilitate the marketing process of the resulting production
7.	Increasing farm productivity	Efforts to increase agricultural production per unit area of land, labor, or other production inputs.
8.	The role of extension workers	Extension workers' efforts to connect farmers with market information and government policies related to the application of local wisdom in the agricultural sector.
9.	Environmental conservation	Efforts to maintain, protect and manage the natural environment so that it remains sustainable, healthy and continuous for human life and other living creatures.
10.	Socio-cultural preservation	Efforts to maintain, preserve, and develop values, traditions, customs, and social norms that are passed down from generation to generation.

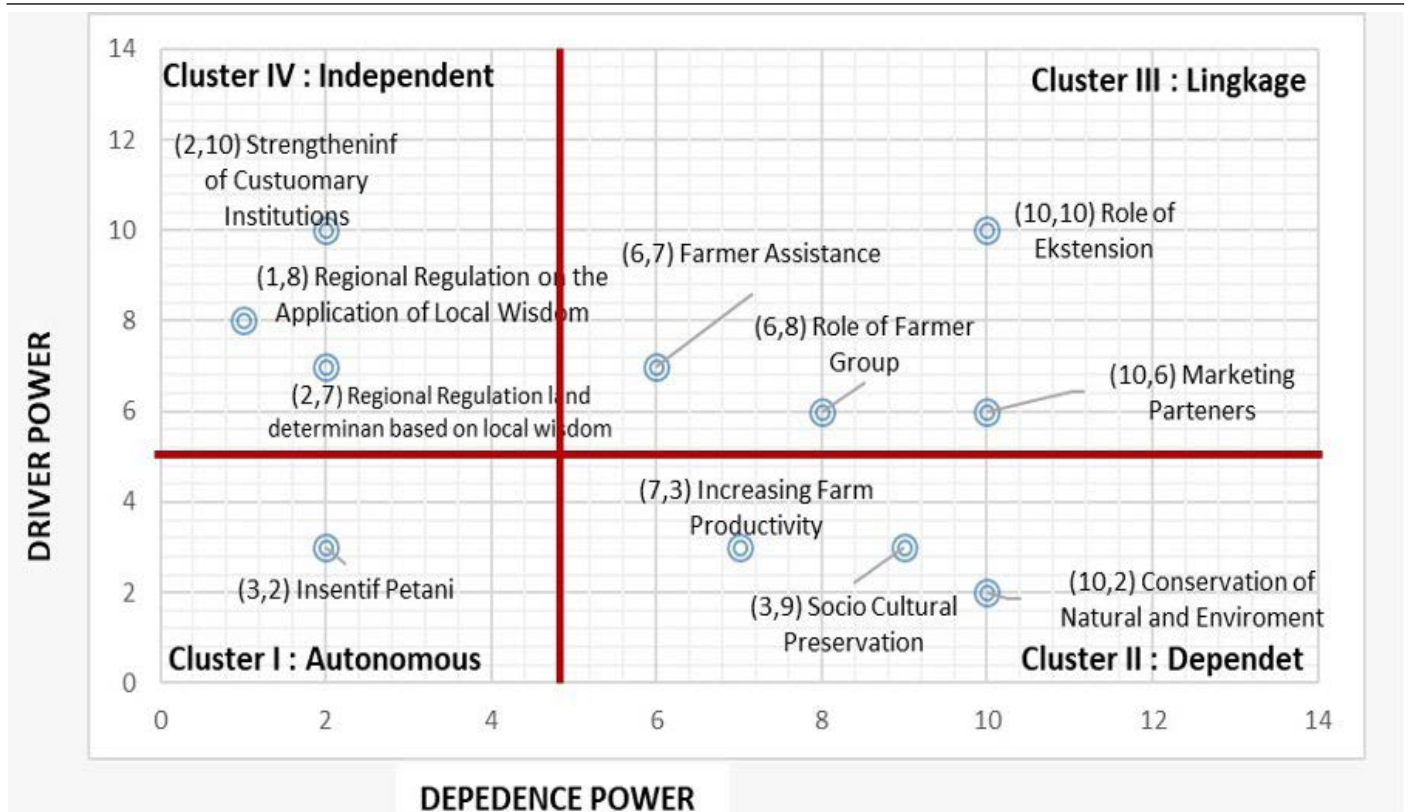


Figure 1. Driver power-dependence power matrix in the key to strengthening local wisdom in the dry land agricultural production process in the land area of Southeast Sulawesi Province.

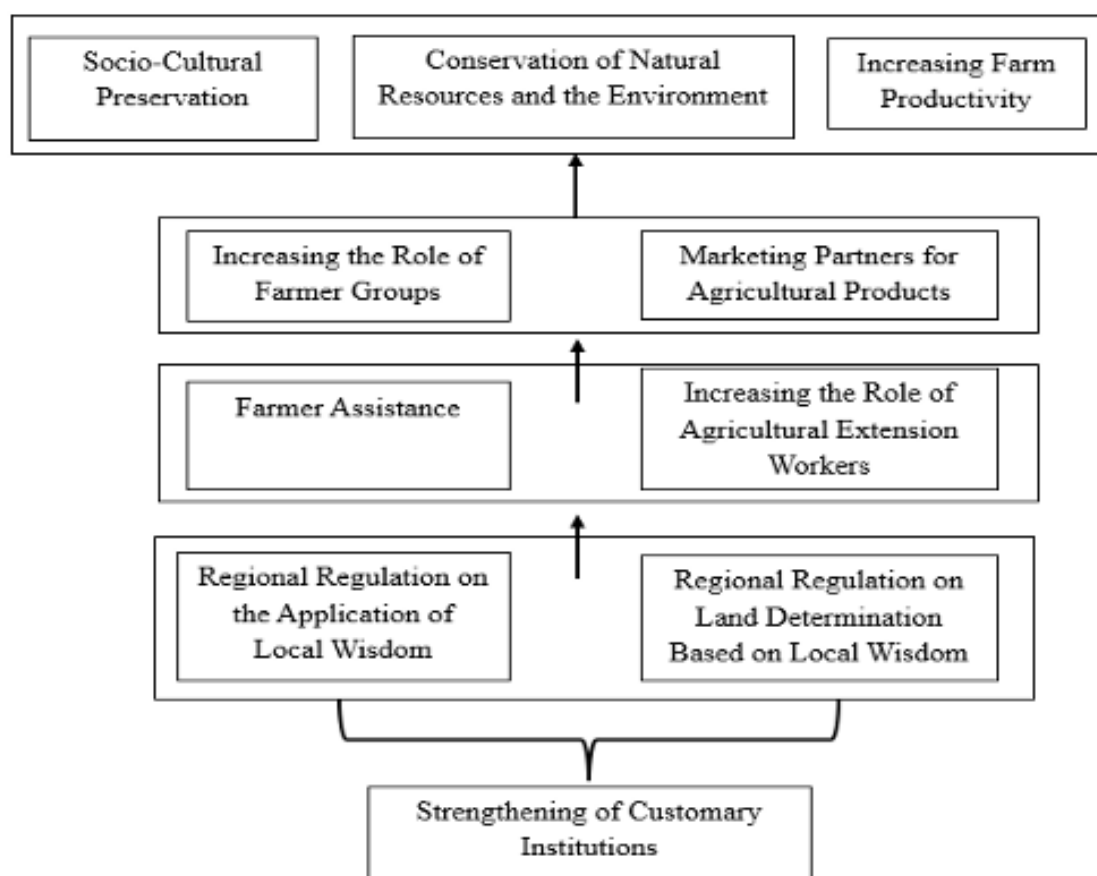


Figure 2. ISM model diagram of local wisdom strengthening indicators in the dry land agricultural production process in the mainland area of Southeast Sulawesi Province.

local wisdom; and (3) availability and strengthening of regulations/local government regulations on the application of local wisdom. These three indicators are considered independent variables, meaning they have a significant driver power in the dryland agricultural production process in the inland regions of Southeast Sulawesi Province.

The strengthening of existing institutions, the availability of regulations or local government regulations on land allocation based on local wisdom, and the strengthening of local regulations are key factors in maintaining the balance of dryland agricultural ecosystems. A strong institution ensures that policy implementation is effective, while regulations based on local wisdom guarantee the sustainable management of land in line with local cultural values. These customary institutions can regulate the use of land, water, and forests based on ancestral rules passed down through generations, such as the Mondau tradition in Southeast Sulawesi, as well as the shifting and sustainable agricultural systems. Furthermore, strengthening local regulations becomes a major driving force in ecosystem preservation, ensuring that dryland farming practices remain productive and in harmony with environmental sustainability principles.

This aligns with the explanations provided by [Kurnia et al. \(2022\)](#); [Handayani and Suparno, \(2023\)](#); [Astarika et al. \(2024\)](#); and [Yaqin et al. \(2024\)](#), who emphasize that the integration of customary law and positive law, along with local wisdom, reinforced by local governments, plays a crucial role in maintaining the agricultural sector and balancing agricultural needs with environmental conservation. In fact, customary institutions can regulate the preservation of local crops and environmentally friendly organic farming methods. With the establishment of regional regulations, which serve as significant legal forces, the protection, conservation, and optimization of local wisdom-based agricultural practices are ensured. The Tolaki community has a traditional farming system known as nggaho, which involves rotational land management. With such a regional regulation in place, this system can be protected by establishing land management rules that align with the principles of crop rotation, thus preventing land degradation and maintaining soil fertility. This is consistent with the views of [Rejekiningrum et al. \(2022\)](#); [Indrianti et al. \(2023\)](#); and [Dalyan et al. \(2024\)](#), who state that regulations, laws, traditional institutions, ethical

land management, and respect for nature support sustainable dryland farming and environmental harmony.

The presence of strong institutions and regulations, such as local government regulations on local wisdom, will positively impact the indicators listed in Cluster III (Linkage), where farmer support will become more optimal through training programs and technical assistance. Likewise, the role of farmer groups will become more active in managing and sustaining the locally-based sustainable agricultural systems. Additionally, agricultural extension workers can work more effectively in disseminating innovations and best practices to farmers. Meanwhile, marketing partners can easily get involved in the distribution chain of agricultural products, ensuring broader and more sustainable market access for farmers. Proper assistance helps farmers apply more efficient and sustainable farming practices. Effective farmer groups encourage cooperation and joint innovation, while active extension workers ensure the dissemination of relevant information and technology. Good marketing partners open up wider market access, thus improving the welfare of farmers. Consequently, productivity increases, ecosystems remain balanced, the environment is preserved, and socio-cultural values are maintained, as illustrated in Quadrant II (Dependent).

Conclusions and Recommendations

The conclusion of this study shows that the local wisdom applied by the Tolaki community, such as agroforestry practices, crop rotation, the use of organic fertilizers, and soil conservation, has a significant impact on the balance of dryland agricultural ecosystems in Southeast Sulawesi. These practices not only contribute to soil fertility but also reduce erosion and support the sustainability of agricultural productivity. The results of the logit regression analysis indicate that soil conservation and the use of organic fertilizers can enhance ecosystem balance by more than two times, while agroforestry systems and crop rotation also have a significant positive effect. Therefore, strengthening institutions, creating supportive regulations, and forming partnerships between farmers and policymakers are essential to preserving this local wisdom in sustainable agricultural management.

Novelty Statement

This study highlights the importance of strengthening institutions, establishing supportive regulations, and fostering strong partnerships between farmers and policymakers to preserve the sustainability of local wisdom practices in agricultural management Tolaki Community in Southeast Sulawesi, Indonesia

Author's Contribution

R. Marsuki Iswandi, La Ode Alwi, La Ode Arfan Dedu, La Ode Muh Munadi, Akhmad Kadir and Suharno Suharno, Muhammad Luqman: The study was conceptualized and designed, with samples collected and examinations carried out.

All authors participated in drafting and revising the manuscript. Each author has read, reviewed and given their approval for the final version of the manuscript.

Conflict of interest

The authors declared no conflicts of interest.

References

- Ahmed, M., R. Hayat, M. Ahmad, M. ul-Hassan, A.M.S. Kheir, F. ul-Hassan, M.H. ur-Rehman, F.A. Shaheen, M.A. Raza and S. Ahmad. 2022. Impact of climate change on dryland agricultural systems: a review of current status, potentials, and further work need. *Int. J. Plant Prod.*, 16(3): 341–363. <https://doi.org/10.1007/s42106-022-00197-1>
- Alwi, L. O., R.M. Iswandi, A. Gafaruddin, L.O.K. Arif, L.O.A. Dedu, M. Abadi, and L.O.M. Munadi. 2025. The effectiveness of institutional governance in controlling agricultural and plantation land conversion in Kendari City, Southeast Sulawesi, Indonesia. *S. J. A.*, 41(2): 684–699. <https://doi.org/10.17582/journal.sja/2025/41.2.684.699>
- Arneth, A., L. Olsson, A. Cowie, K.H. Erb, M. Hurlbert, W.A. Kurz, A. Mirzabaev and M.D.A. Rounsevell. 2021. Restoring degraded lands. *Ann. Rev. Environ. Resour.*, 46: 569–599. <https://doi.org/10.1146/annurev-environ-012320-054809>
- Astarika, R., L.O.M. Munadi, M.A. Pagala, L.O. Nafiu and D. Zulkarnain. 2024. Competence of extension officers in increasing productivity Bali cattle in Kolaka Regency. *AIP Conf. Proceed.*, 3048(1): 020013. <https://doi.org/10.1063/5.0206144>
- Bonanomi, G., F.D. Filippis, M. Zotti, M. Idbella, G. Cesarano, S. Al-Rowaily and A. Abd-ElGawad. 2020. Repeated applications of organic amendments promote beneficial microbiota, improve soil fertility and increase crop yield. *Appl. Soil Ecol.*, 156: 103714. <https://doi.org/10.1016/j.apsoil.2020.103714>
- Budiastuti, T.S.M., D. Purnomo and D. Setyaningrum. 2021. Agroforestry system as the best vegetation management to face forest degradation in Indonesia. *Rev. Agric. Sci.*, 10: 14–23. https://doi.org/10.7831/ras.10.0_14
- Chaerul, M. and Y.Q. Mardiyah. 2019. Anaerobic digestion untuk pengolahan sampah organik: analisis multikriteria menggunakan metode analytic network process. *J. Seram Engin.*, 4(2): 488–497. <https://doi.org/10.32672/jse.v4i2.1326>
- Dalyan, M., Syarifuddin, Yulandari, Mastang, M. Suma, S. Sosrohadi and C. Andini. 2024. Harmony and sustainability: Traditional ecological knowledge systems of the kaluppini indigenous People. *Int. J. Relig.*, 5(6): 82–92. <https://doi.org/10.61707/tdyqck03>
- Daniel, D., S. Satriani, S.L. Zudi and A. Ekka. 2022. To what extent does indigenous local knowledge support the social ecological system? A case study of the Ammatoa Community, Indonesia. *Resour.*, 11(12): 1–16. <https://doi.org/10.3390/resources11120106>
- Fahad, S., S.B. Chavan, A.R. Chichaghare, A.R. Uthappa, M. Kumar, V. Kakade, A. Pradhan, D. Jinger, G. Rawale, D.K. Yadav, V. Kumar, T.H. Farooq, B. Ali, A.V. Sawant, S. Saud, S. Chen, and P. Pocza. 2022. Agroforestry systems for soil health improvement and maintenance. *Sustain.*, 14(22): 14877. <https://doi.org/10.3390/su142214877>
- Handayani, E. and Suparno. 2023. The role of customary law in the governance of sustainable agrarian culture in local communities. *Corpor. Law Gover. Rev.*, 5(1): 29–37.
- Hosen, N., H. Nakamura and A. Hamzah. 2020. Adaptation to climate change: Does traditional ecological knowledge hold the key? *Sustain.*, 12(2): 1–18. <https://doi.org/10.3390/su12020676>
- Indrianti, M.A., D. Rukmana, E.B. Demmallino and M.H. Jamil. 2023. Implementation of

- sustainable food and feed agricultural land regulation in Gorontalo District: A review. *Adv. Ani. Veter. Sci.*, 12(1):9-14. <https://doi.org/10.17582/journal.aavs/2024/12.1.9.14>
- Jellason, N.P., J.S. Conway, R.N. Baines and C.C. Ogbaga. 2021. A review of farming challenges and resilience management in the Sudano-Sahelian drylands of Nigeria in an era of climate change. *J. Arid Environ.*, 186: 104398. <https://doi.org/10.1016/j.jaridenv.2020.104398>
- Kurnia, G., I. Setiawan, A.C. Tridakusumah, G. Jaelani, M.A. Heryanto and A. Nugraha. 2022. Local wisdom for ensuring agriculture sustainability: A case from Indonesia. *Sustain.*, 14(14): 1-13. <https://doi.org/10.3390/su14148823>
- Manaye, A., B. Tesfamariam, M. Tesfaye, A. Worku and Y. Gufi. 2021. Tree diversity and carbon stocks in agroforestry systems in northern Ethiopia. *Carb. Bal. Manag.*, 16(1): 14. <https://doi.org/10.1186/s13021-021-00174-7>
- Marques, M.A., L.H.C.D. Anjos and A.R.S. Delgado. 2022. Land recovery and soil management with agroforestry systems. *Span. J. Soil Sci.*, 12: 10457. <https://doi.org/10.3389/sjss.2022.10457>
- Murhaini, S. and Achmadi. 2021. The farming management of Dayak People's community based on local wisdom ecosystem in Kalimantan Indonesia. *Heliyon.*, 7(12): e08578. <https://doi.org/10.1016/j.heliyon.2021.e08578>
- Ngongo, Y., T. Basuki, B. Derosari, E.Y. Hosang, J. Nulik, H. Dasilva, D.K. Hau, A. Sitorus, N.R.E. Kotta, G.N. Njurumana, E. Pujiono, L. Ishaq, A.V. Simamora and Y.S. Mau. 2022. Local wisdom of west timorese farmers in land management. *Sustain.*, 14(10): 6023. <https://doi.org/10.3390/su14106023>
- Partasasmita, R., N.T. Cahyani and J. Iskandar. 2020. Local knowledge of the community in Cintaratu Village, Pangandaran, Indonesia on traditional landscapes for sustainable land management. *Biodiver. J. Biolog. Diver.*, 21(8): 3606-3616. <https://doi.org/10.13057/biodiv/d210825>
- Pravalie, R., C. Patriche, P. Borrelli, P. Panagos, B. Rosca, M. Dumitrascu, I.A. Nita, I. Ssvulescu, M.V. Birsan and G. Bandoc. 2021. Arable lands under the pressure of multiple land degradation processes. A global perspective. *Environ. Res.*, 194: 110697. <https://doi.org/10.1016/j.envres.2020.110697>
- Rejekiningrum, P., Y. Apriyana, Sutardi, W. Estiningtyas, H. Sosiawan, H.L. Susilawati, A. Hervani and A.D. Alifia. 2022. Optimising water management in drylands to increase crop productivity and anticipate climate change in Indonesia. *Sustain.*, 14(18): 1-24. <https://doi.org/10.3390/su141811672>
- Rosmalah, S., H. Hartati, H. Harianti, S.D. Rizki, R. Rustam, L.O.M. Munadi, R. Astarika, L. O. Jabuddin, A. Rizal, M.O. Kasmin and M. Amin. 2025. Implementation model of dryland rice business supporting food security Buton Utara, Indonesia. *S. J. Agric.*, 41(1): 184-197. <https://doi.org/10.17582/journal.sja/2025/41.1.184.197>
- Tobing, W. L., N.D.D. Ndua and D.F. Hanas. 2024. Verticulture cultivation fertigation system through wick: study of growth and yield of pakchoi in dry land. *Univers. J. Agric. Res.*, 12(1): 133-147. <https://doi.org/10.13189/ujar.2024.120113>
- Yaqin, M.A., M. Suyahmo, P. Hardati, H.T. Atmaja and N. Hamid. 2024. Sustainable "Gumuk" land management based on local wisdom in Jember, Indonesia. *Inter. J. Environ. Impac.*, 7(1): 65-74. <https://doi.org/10.18280/ije.070108>