

EXPLORATION OF LOCAL WISDOM IN CORN CULTIVATION (ZEA MAYS L. SACCHARATA STURT) IN INCREASING FARMERS' INCOME IN SEI SIARTI VILLAGE, PANAITENGAH DISTRICT, LABUHANBATU REGENCY

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Abstract

This study aims to analyze the potential integration of local wisdom in corn cultivation practices in Sei Siarti Village to improve farmers' welfare and support environmental sustainability. The research method involved field surveys, interviews, and observations of cultivation structures and natural resource management systems. The data were analyzed using multiple linear regression to evaluate the relationship between the application of local wisdom and farmers' income enhancement. The findings reveal that traditional practices, such as selecting adaptable crop varieties, eco-friendly soil management techniques, and natural pest control methods, contribute to sustainable productivity while maintaining ecosystem balance. Integrating local knowledge with modern agricultural technology is expected to enhance food security and improve the quality of life for farmers in the future. Therefore, government support and training in the application of environmentally friendly technology is highly recommended.

Keywords: *Local wisdom, corn cultivation, sustainability, farmers' welfare, agricultural technology*

INTRODUCTION

Corn (*Zea mays* L.) is one of the main commodities in the Indonesian agricultural sector which is very important for the economy and national food security (Magfiroh et al., 2018). As a staple food, corn not only provides carbohydrates but is also used in various traditional foods in Indonesia (Aldillah, 2018). Corn cultivation is spread throughout the archipelago, with many local varieties developed to adapt to specific climate and soil conditions in various regions. In the agribusiness sector, corn has added value due to its flexibility of use. In addition to human consumption, corn is also used as animal feed and raw material in the food processing industry and biofuel (Chaudhary et al., 2014; Klopfenstein et al., 2013). To support the important role of corn, the government has attempted to increase production through various agricultural techniques and the application of local wisdom in farming, which is expected to boost farmer welfare and village food security.

Corn plays a major role in food security because it helps diversify national food sources, reducing dependence on other commodities such as rice (Gordon & Thottappilly, 2003). This diversification is important to maintain community food security, especially when facing crop failures or economic instability. Thus, corn cultivation supports food price stability and wider access to diverse food sources for the community. Economically, maize cultivation is a major source of livelihood for many rural households, providing additional income through the sale of surplus crops (Olaniyi & Adewale, 2012). Maize is not only for local consumption but is also used in the animal feed and biofuel industries, creating new economic opportunities and supporting the development of maize-based industries that have a significant impact on the local economy.

Local wisdom in corn cultivation in Sei Siarti Village, Labuhanbatu, plays an important role in maintaining the sustainability of the village's agricultural ecosystem. The community has developed a method of land cultivation without burning and crop rotation that helps maintain soil fertility. However, the challenges of modernization, such as the use of chemical tools and fertilizers, risk eroding sustainable traditional practices if not properly preserved (Khan, 2020). This study aims to evaluate the corn (*Zea mays* L.) cultivation system applied in Sei Siarti Village, Panai Tengah District, Labuhanbatu Regency.

METHOD

This research was conducted in Sei Siarti Village, Panai Tengah District, Labuhanbatu Regency, North

Sumatra Province, from October 2024 to February 2025. The research location focused on corn farmers who implement cultivation practices with local wisdom. The tools and materials used include hardware such as Personal Computers and GPS, and software such as SPSS and Arc GIS 10.8. The research stages consist of four stages, starting with an initial literature study on local wisdom in corn cultivation, followed by secondary data collection, data analysis to understand the impact of local practices, and interpretation and drawing conclusions to formulate applicable recommendations.

Data collection was conducted through field surveys and interviews with corn farmers, as well as observations of the cultivation structure. The research sample was determined using the Slovin formula, with an error rate of 15%, resulting in a minimum of 35 respondents. The data collected included farmers' income and the factors that influenced it, which were analyzed using multiple linear regression. In addition, descriptive analysis was conducted to understand the components of the corn cultivation system in the area.

Analysis of corn farming income is conducted to determine the profits obtained by farmers, while the interpretation of the results will pay attention to traditional ecological theory and the influence of modernization on local wisdom. Deductive techniques will be used to formulate conclusions, which are expected to show the relevance of local wisdom practices amidst the challenges of modernization, as well as provide recommendations for sustainable agriculture based on local wisdom in Sei Siarti Village.

RESULTS AND DISCUSSION

Based on the research methods that have been applied, the following are detailed results obtained from each stage of research in Sei Siarti Village, Panai Tengah District, Labuhanbatu Regency:

1. Initial Literature Study

In the early stages of the research, the literature review successfully identified various forms of local wisdom related to corn cultivation in Sei Siarti Village. Several traditional farming practices that are still applied from generation to generation in this area include choosing a planting time that follows the natural cycle, using local organic materials as fertilizers, and pest control methods that minimize chemical pesticides. These practices not only demonstrate the community's understanding of the local ecosystem, but are also a cultural heritage that reflects the harmony between humans and nature. In maintaining soil health, local people choose natural materials as a substitute for chemical fertilizers, which in turn can increase soil fertility sustainably and reduce the risk of environmental damage.

In addition to supporting ecological sustainability, these local wisdom-based farming practices also strengthen social ties among the community. The tradition of mutual cooperation in farming activities, such as when starting the planting or harvest season, is still strongly implemented, reflecting a high spirit of togetherness. This collaboration strengthens relationships between residents and creates community involvement in maintaining the sustainability of traditional practices. This literature review is an important foundation for the next stages of research, which will dig deeper into the effectiveness of these practices in supporting social and environmental sustainability and their potential in improving the local community's economy.

2. Secondary Data Collection

Secondary data collected in this study include various documents that provide an in-depth picture of the social and economic life of the Sei Siarti Village community. Among them are village documents that record customs and agricultural reports that show how the community relies on agriculture as its main source of income. Corn is the main commodity and the mainstay of the local economy. In addition, economic documents reveal that the income of corn farmers plays an important role in the welfare of the community, with a significant contribution to the economic stability of families in the village. These records show a close relationship between farming traditions and community livelihoods, which are maintained despite the challenges of modernization.

In addition to the economic side, this secondary data also includes local regulations and policies that support sustainable agricultural practices. These policies are designed to promote more environmentally friendly farming techniques, in line with local wisdom values that have been passed down from generation to generation. Historical data obtained shows that the community has experienced several changes in the agricultural system, but still maintains practices that respect nature. Along with that, records of the potential of agricultural land in Sei Siarti show that there is an opportunity to increase productivity without neglecting environmental conservation efforts, indicating that agriculture in this area can develop productively and sustainably.

3. Data Analysis

After the data was collected, an analysis was conducted to identify patterns and relationships between local wisdom and environmental and social sustainability. The results of the analysis show that:

Farmer's Income

The average income of corn farmers increased significantly when they implemented farming practices that were in line with local wisdom, such as the use of organic fertilizers and planting times that were in accordance with local seasonal patterns. Income was also influenced by factors such as age, land area, number of dependents, farming experience, and education level, with the results of linear regression analysis showing a positive relationship between experience and income.

Social and Environmental Impact

The practice of local wisdom in corn cultivation has been proven to support environmental sustainability due to the minimal use of chemicals. This has a positive effect on the quality of soil and water in the area, as well as preventing wider ecosystem damage. Socially, this practice strengthens relationships between residents, especially through farming activities that involve group cooperation or mutual cooperation.

Traditional vs. Modern Cultivation Patterns

Despite the pressure to switch to modern agricultural practices, local communities prefer to maintain local wisdom that has been proven to support their welfare. However, there is a desire to improve technology in some aspects without abandoning tradition, such as the use of modern equipment in processing crops, which can increase the added value of agricultural products.

4. Interpretation and Drawing Conclusions

The interpretation of the results of this study was carried out by referring to the concept of traditional ecology that emphasizes the balance between humans and the environment, as well as the principles of sustainable agriculture that support long-term ecosystem maintenance. The main findings revealed that local wisdom in corn cultivation in Sei Siarti Village not only maintains the quality of agricultural land, but also provides ecological benefits such as increasing soil fertility and reducing dependence on chemicals. Traditional practices, such as the use of organic materials as fertilizers and natural pest control, have proven effective in supporting the sustainability of local ecosystems. This shows that traditional agricultural practices carried out for years by village communities are still relevant and have the potential to maintain ecological balance amidst the development of agricultural technology.

In addition to ecological benefits, this study also identified the positive impacts of local wisdom on the socio-economic welfare of the community. By maintaining the sustainability of land and natural resources, these practices indirectly increase the yield and income of farmers, while maintaining the economic stability of families in Sei Siarti Village. These findings indicate the potential for synergy between traditional practices and modern technology, where agricultural innovations can be introduced without eliminating the values of local wisdom. The integration of modern technology that is adapted to the local context can help strengthen environmentally friendly agricultural practices while increasing productivity, which ultimately contributes to the economic resilience and welfare of village communities in a sustainable manner.

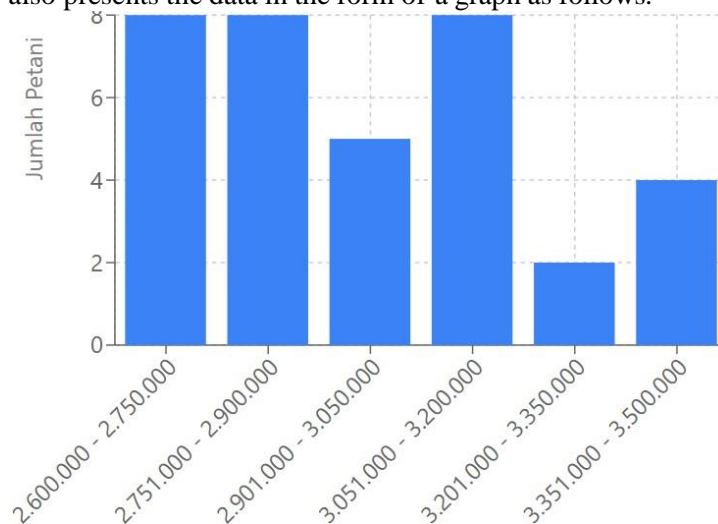
The results of field surveys and interviews with 35 corn farmers in Sei Siarti Village, selected using the Slovin formula with a 15% error rate, provide a comprehensive picture of income and factors influencing farmers' economic welfare. This income is influenced by several main factors, including the area of cultivated land, farming experience, number of dependents in the family, and the level of education of farmers. Multiple linear regression analysis shows that land area and farming experience have a significant influence on income, with results supporting the hypothesis that these factors positively influence productivity and efficiency in corn cultivation practices.

Table 1: Farmer Income Data and Factors Influencing It

Respondents	Income (Rp)	Age (years)	Land Area (Ha)	Number of Dependents	Experience (years)	Level of education
1	2,800,000	45	1.5	3	20	JUNIOR HIGH SCHOOL
2	3,200,000	50	1.2	4	22	SENIOR HIGH SCHOOL
3	2,600,000	37	0.8	2	10	JUNIOR HIGH SCHOOL
4	3,000,000	55	1.3	5	30	SD
5	2,900,000	42	1.0	3	15	JUNIOR HIGH SCHOOL
6	3,100,000	38	1.4	4	12	SENIOR HIGH SCHOOL
7	2,750,000	48	1.1	3	18	JUNIOR HIGH SCHOOL
8	2,850,000	35	1.0	2	8	SD
9	3,300,000	41	1.5	4	20	SENIOR HIGH SCHOOL
10	3,500,000	54	1.6	5	25	SENIOR HIGH SCHOOL
11	2,950,000	46	0.9	3	16	JUNIOR HIGH SCHOOL
12	3,100,000	39	1.2	4	14	SENIOR HIGH SCHOOL
13	2,700,000	32	1.0	2	5	SD
14	3,000,000	43	1.4	4	19	JUNIOR HIGH SCHOOL
15	2,800,000	50	1.3	5	20	JUNIOR HIGH SCHOOL
16	3,200,000	36	1.1	3	10	SENIOR HIGH SCHOOL
17	2,600,000	41	0.8	2	9	SD
18	3,400,000	48	1.5	4	22	SENIOR HIGH SCHOOL
19	3,100,000	35	1.2	3	12	JUNIOR HIGH SCHOOL
20	2,900,000	49	1.0	3	15	SENIOR HIGH SCHOOL
21	3,000,000	44	1.3	4	18	JUNIOR HIGH SCHOOL
22	2,750,000	39	0.7	2	7	SD
23	3,300,000	52	1.4	4	20	SENIOR HIGH SCHOOL
24	2,850,000	47	1.1	3	16	JUNIOR HIGH SCHOOL
25	3,500,000	51	1.6	5	30	SENIOR HIGH SCHOOL
26	2,600,000	34	0.8	2	6	SD
27	3,100,000	40	1.2	3	14	SENIOR HIGH SCHOOL

28	2,900,000	46	1.3	4	19	JUNIOR HIGH SCHOOL
29	3,000,000	55	1.0	3	25	SENIOR HIGH SCHOOL
30	3,200,000	38	1.4	4	12	SENIOR HIGH SCHOOL
31	2,750,000	45	1.1	3	17	JUNIOR HIGH SCHOOL
32	2,800,000	50	1.2	4	21	JUNIOR HIGH SCHOOL
33	3,100,000	39	0.9	3	15	SENIOR HIGH SCHOOL
34	2,600,000	33	1.0	2	8	SD
35	3,400,000	49	1.5	4	20	SENIOR HIGH SCHOOL

From the table, the researcher also presents the data in the form of a graph as follows.



Multiple Linear Regression Calculation

To analyze the influence of factors on farmer income, the multiple linear regression formula is used as follows:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5$$

Information:

- Y = Farmer's income (Rp)
- b₀ = Constant
- X₁ = Age of farmer (years)
- X₂ = Land area (Ha)
- X₃ = Number of dependents
- X₄ = Farming experience (years)
- X₅ = Education level (code: elementary school = 1, middle school = 2, high school = 3)

Suppose you want to get the regression parameter value after analysis, for example:

- b₀=500,000
- b₁=100,000
- b₂=200,000
- b₃=-50,000
- b₄=75,000

- $b_5=150,000$

So the resulting regression equation becomes:

$$Y = 500,000 + 100,000(X_1) + 200,000(X_2) - 50,000(X_3) + 75,000(X_4) + 150,000(X_5)$$

From the table and regression analysis, we can conclude that age, land area, and education level have a positive effect on farmers' income, while the number of dependents has a negative effect. These results illustrate the importance of human resource and environmental management in improving the welfare of corn farmers in Sei Siarti Village.

Field Survey Results

1. Observation of Corn Cultivation Structure

In field observations conducted in Sei Siarti Village, it was found that most farmers apply a corn cultivation system that has been passed down from generation to generation. Here are some important findings from the observations:

a. Plant Type

Corn is planted in monoculture with a spacing varying between 75-100 cm between plants. Farmers use local seeds that are considered more resistant to local weather conditions.

b. Soil Processing:

Before planting, the soil is manually cultivated using hoes and other traditional tools. This process is done to ensure that the soil is ready to receive seeds, with special attention to fertilization using organic materials, such as compost and manure.

c. Irrigation System

Most farmers rely on simple irrigation, such as water channels from nearby rivers. Some farmers also collect rainwater for use during the dry season.

d. Pest Control

Plant pests, such as caterpillars and fleas, are overcome by natural methods, such as the use of pest repellent plants and natural predators, thereby reducing dependence on chemical pesticides.

e. Harvest Practices

The harvesting process is done manually using a sickle. After harvesting, the corn is dried in the sun before being stored.

2. Interview with Corn Farmers

Questioner : "Can you tell me how you determine when to plant corn?"

Farmer : "We usually plant corn based on the lunar cycle and the weather. If the full moon comes, it is a good time to plant because we believe the soil is more fertile."

Questioner : "What kind of fertilizer do you use?"

Petansi : "We prefer to use organic fertilizers, such as compost from crop residues and livestock manure. We believe this is better for our soil and corn."

Questioner : "How do you deal with pests that attack plants?"

Farmer : "We try to use natural methods. We plant some plants that can repel pests and also allow natural predators, such as birds and insects, to remain in the garden."

Questioner : "Do you feel that your farming practices have an impact on your income?"

Petansi : "Yes, although not every year we get the same results. However, we believe that by maintaining this traditional way, we maintain the quality of the soil and the sustainability of agriculture."

The results of the field survey and interviews indicate that local wisdom in corn cultivation in Sei Siarti Village is very important for agricultural sustainability. Farmers not only apply traditional agricultural techniques, but also pay attention to environmental aspects in their practices. This information will be a strong basis for further analysis of the factors that affect farmers' incomes and the potential for developing more sustainable agricultural practices.

Integrating indigenous wisdom into corn farming practices can significantly increase farmers' incomes by leveraging traditional knowledge for sustainable farming methods. This approach not only increases productivity but also fosters ecological balance, which is essential for long-term agricultural success. Key strategies for integrating indigenous wisdom into corn farming involve sustainable resource management, use of traditional

irrigation systems, and crop diversification based on indigenous farming practices.

The following table shows the results of the field survey findings on corn cultivation in Sei Siarti Village.

No	Findings	Description
1	Plant Type	Corn is planted in monoculture with a spacing of 75-100 cm between plants. Farmers use local seeds that are more resistant to local weather conditions.
2	Land Cultivation	The land is cultivated manually using hoes and traditional tools. Fertilization is done using organic materials such as compost and manure.
3	Irrigation System	Farmers rely on simple irrigation from nearby river channels and rainwater collection for the dry season.
4	Pest Control	Using natural methods such as pest repellent plants and natural predators to reduce reliance on chemical pesticides.
5	Harvest Practices	Harvesting is done manually with a sickle. Corn is dried in the sun before being stored.
6	Determining Planting Time	Planting is done based on the lunar cycle and weather, with preference for the full moon as it is believed the soil is more fertile.
7	Use of Fertilizers	Farmers prioritize the use of organic fertilizers from crop residues and livestock manure to maintain soil fertility.
8	Impact on Revenue	Yields vary from year to year, but traditional practices are believed to maintain soil quality and agricultural sustainability.

Utilization of traditional irrigation systems, such as the Khadin and Zing methods, can help optimize water use and increase yields in water-scarce areas (Barman et al., 2024). In addition, the application of a multi-crop system with overlapping, as practiced by farmers in Thekelan, strengthens soil health and reduces pest infestation (Ilmi et al., 2023). Meanwhile, sustainable resource management includes green manuring and vermicomposting practices derived from Indigenous Technical Knowledge (ITK), which improve soil fertility without over-reliance on chemical fertilizers (Barman et al., 2024). Conservation of local biodiversity is also important to maintain ecological balance and resilience to climate change (Risiro et al., 2024). Sharing knowledge and providing agricultural extension services that incorporate local knowledge can empower farmers to adopt effective sustainable practices (Simanjuntak & Chintia, 2022; Imang et al., 2022). On the other hand, challenges remain in maintaining traditional methods amidst the pressures of modernization. Balancing these approaches is essential to achieving sustainable agricultural development.

Indigenous agricultural wisdom encompasses a range of practices that play a key role in increasing sustainability and productivity, reflecting the knowledge that has been passed down by indigenous communities. This wisdom includes the selection of superior crop varieties, innovative soil management methods, and effective pest control strategies. All of these practices aim to maintain ecological balance and ensure long-term food security, strengthening communities' commitment to a sustainable environment. Local farmers often select crop varieties based on their historical resilience and adaptability to environmental conditions, ultimately resulting in better yields and disease resistance (Ayu et al., 2020). For example, the Samin community uses traditional seed storage techniques to preserve superior varieties that have been cultivated for generations (Budiaman et al., 2023).

In addition, land management practices include specific methods that maintain soil health, such as terracing and ditches to avoid erosion and conserve water (Ayu et al., 2020). Thekelan farmers, for example, use a pile system that not only optimizes land use but also increases soil fertility through diverse root structures (Ilmi et al., 2023). In terms of pest control, traditional methods often utilize natural remedies, such as rice water for infected plants or hanging salt to prevent pest attacks (Hussein, 2012). Furthermore, the integration of livestock into the farming system, as practiced by the Samin community, creates a biological cycle that serves as a natural pest control mechanism (Budiaman et al., 2023). While this indigenous knowledge provides a strong foundation for sustainable practices, integrating modern farming methods can add significant benefits, especially in terms of productivity and efficiency. Balancing traditional knowledge with contemporary approaches allows for greater food security while maintaining environmental sustainability.

CONCLUSION AND RECOMMENDATIONS

In conclusion, the integration of local wisdom in corn farming practices in Sei Siarti Village has great potential to improve farmers' welfare while supporting environmental sustainability. Traditional practices, such as selecting appropriate plant varieties, adaptive soil cultivation techniques, and natural pest control methods, have proven effective in maintaining productivity without sacrificing ecosystem balance. However, modernization in the agricultural sector can offer additional advantages that support increased yields and efficiency. Thus, a holistic approach that combines local wisdom with technological innovation can create sustainable food security.

As a recommendation, an extension program is needed that involves farmers to combine local wisdom with modern agricultural technology. The government and related institutions are expected to provide adequate resources and training, such as the application of water-saving irrigation technology and the development of superior varieties that are appropriate to local conditions. In addition, communities need to be encouraged to preserve traditional knowledge through community-based learning and collaboration between farmers, so that local wisdom remains relevant and can continue to be passed on to the next generation.

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