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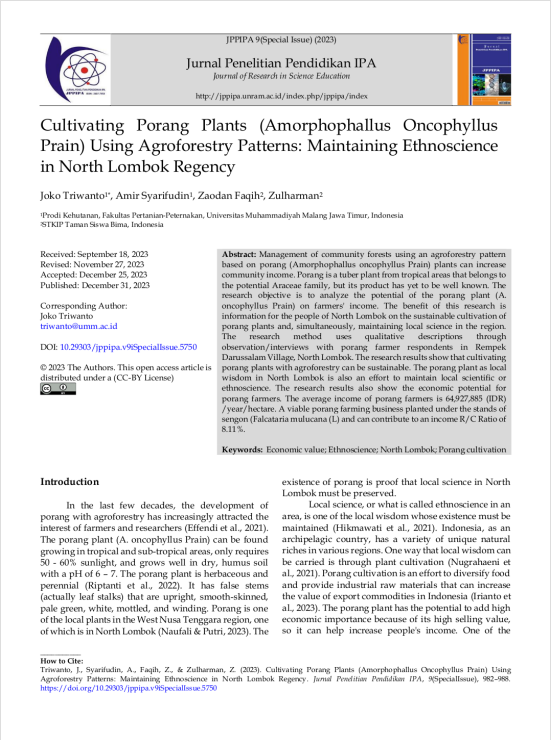

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Cultivating Porang Plants (Amorphophallus Oncophyllus Prain) Using Agroforestry Patterns: Maintaining Ethnoscience in North Lombok Regency

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Abstract: Management of community forests using an agroforestry pattern based on porang (Amorphophallus oncophyllus Prain) plants can increase community income. Porang is a tuber plant from tropical areas that belongs to the potential Araceae family, but its product has yet to be well known. The research objective is to analyze the potential of the porang plant (A. oncophyllus Prain) on farmers' income. The benefit of this research is information for the people of North Lombok on the sustainable cultivation of porang plants and, simultaneously, maintaining local science in the region. The research method uses qualitative descriptions through observation/interviews with porang farmer respondents in Rempek Darussalam Village, North Lombok. The research results show that cultivating porang plants with agroforestry can be sustainable. The porang plant as local wisdom in North Lombok is also an effort to maintain local scientific or ethnoscience. The research results also show the economic potential for porang farmers. The average income of porang farmers is 64,927,885 (IDR) /year/hectare. A viable porang farming business planted under the stands of sengon (Falcataria mulucana (L) and can contribute to an income R/C Ratio of 8.11 %.

Keywords: Economic value; Ethnoscience; North Lombok; Porang cultivation

Introduction

In the last few decades, the development of porang with agroforestry has increasingly attracted the interest of farmers and researchers (Effendi et al., 2021). The porang plant (A. oncophyllus Prain) can be found growing in tropical and sub-tropical areas, only requires 50 - 60% sunlight, and grows well in dry, humus soil with a pH of 6 – 7. The porang plant is herbaceous and perennial (Riptanti et al., 2022). It has false stems (actually leaf stalks) that are upright, smooth-skinned, pale green, white, mottled, and winding. Porang is one of the local plants in the West Nusa Tenggara region, one of which is in North Lombok (Naufali & Putri, 2023). The existence of porang is proof that local science in North Lombok must be preserved.

Local science, or what is called ethnoscience in an area, is one of the local wisdom whose existence must be maintained (Hikmawati et al., 2021). Indonesia, as an archipelagic country, has a variety of unique natural riches in various regions. One way that local wisdom can be carried is through plant cultivation (Nugrahaeni et al., 2021). Porang cultivation is an effort to diversify food and provide industrial raw materials that can increase the value of export commodities in Indonesia (Irianto et al., 2023). The porang plant has the potential to add high economic importance because of its high selling value, so it can help increase people's income. One of the

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income opportunities from Porang is export activities (Soedarjo, 2021). Japan is one of the leading countries importing porang from Indonesia. Porang tubers (A. oncophyllus Prain) are a favorite menu for most people, processing them into Konyaku (tofu) and Shirataki (noodles).

This potential needs to be managed optimally to meet national food needs. Porang tubers can be a food choice that people use to increase food needs (Ningtyastuti et al., 2023). Porang sweet potatoes are low in calories, so they can be helpful as a healthy diet food. Apart from that, the porang plant has a robust root system and functions as a soil retainer, so it can prevent soil erosion and maintain land fertility. Several benefits of the porang plant are in terms of local scientific knowledge, food sources, and plant characteristics that can maintain soil structure, leading to the conclusion that the cultivation of porang plants should receive more attention (Mufidah et al., 2021). Cultivation of porang plants (A. oncophyllus Prain) is essential because this plant has high economic potential (Inonu et al., 2023; Iqbal & Nur, 2023; Irianto et al., 2022, 2023). This really helps in improving people's standard of living, apart from more manageable maintenance and relatively high selling prices for porang production.

One method of cultivating plants is agroforestry (Chairiyah et al., 2023; Effendi et al., 2021). Community forest management using an agroforestry pattern is very open to development so that forests not only store natural resources in the form of wood, but there are still many non-timber potentials that can be benefited from, one of which is through agroforestry. Porang with agroforestry can also provide significant environmental benefits (Pieter et al., 2022). Apart from that, agroforestry systems can also increase biodiversity and improve surrounding microclimatic conditions, which have a positive impact on ecosystem balance and maintain environmental sustainability (Irianto et al., 2023). In the development of porang plants there are several problems related to the management of porang plants, including not yet knowing how much economic benefit there will be, and effective management strategies still need to be developed to maintain the growth and productivity of porang cultivation with certainty (Fithri Pulungan et al., 2022; N. Harijati & Fikri, 2021).

In the North Lombok region, porang plant agroforestry based has begun to be implemented. Therefore, a complete study is needed to understand the process of cultivating porang plants using an agroforestry pattern as an effort to improve the welfare of the people of North Lombok and as an effort to maintain local science in the region. The research aims to examine the economic and environmental benefits and identify the factors that contribute to the success of this system (Nunung Harijati & Widoretno, 2018; Hikmawati et al., 2021). Based on the problems and research objectives above, it is essential to carry out porang-based agroforestry research, which is expected to provide insight into developing a sustainable porang agroforestry system that is competitive.

Method

Location

The research was conducted in the North Lombok Regency area, West Nusa Tenggara, shown in Figure 1.

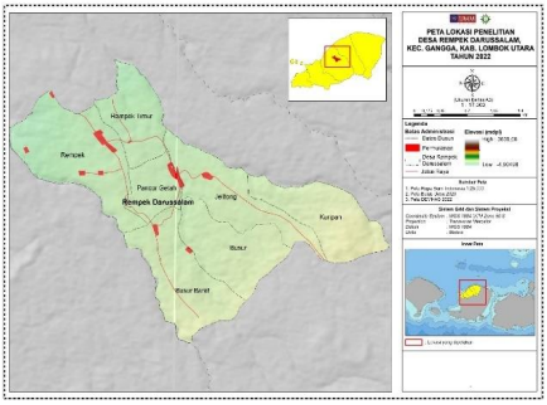

Figure 1. Location Map of Rempek Darussalam Village, North Lombok Regency, NTB (source https://www.google.com/maps)

Data Collection

Respondents in the research were informants who were determined based on considerations of being able to provide complete information regarding the cultivation of porang plants at the research location. Informants were also selected in stages based on the researcher's needs and obtained exclusive data. Informant data was obtained through the interview method.

Data Analysis

The interview data was then analyzed, with data reduction first carried out. Data analysis consists of data reduction activities, data display, and drawing and verifying conclusions. The following data analysis is to calculate the economic potential of the income of porang farmers. Calculation of income from developing porang plants carried out by farmers can be calculated using the following formula:

a. Reception

$$TR = P \times Q \quad (1)$$

Information:

TR = Total revenue (Total Revenue) (IDR)

P = Price (Price/Kg)

Q = Quantity (Amount of Production/Kg)

Expenditure

$$TC = TFC + TVC \quad (2)$$

Information:
TC = Total Cost (Total Cost) (IDR)
TFC = Total Fixed Cost (Total Fixed Cost) (IDR)
TVC = Total Variable Cost (Total variable costs) (IDR)

c. Income

$$I = TR - TC \quad (3)$$

Information:
I = Income (Income) (IDR)
TR = Total Revenue (Total Fixed Costs) (IDR)
TC = Total Cost (Total Cost) (IDR)

$$R/C\ Ratio = \frac{Total\ Revenue}{Total\ cost}$$

Under the condition:
R/C > 1 means that porang farming is efficient
R/C = 1 means that porang farming is inefficient and has no losses
R/C < 1 means porang farming is inefficient

Result and Discussion

Characteristics of the people of North Lombok as porang farmers

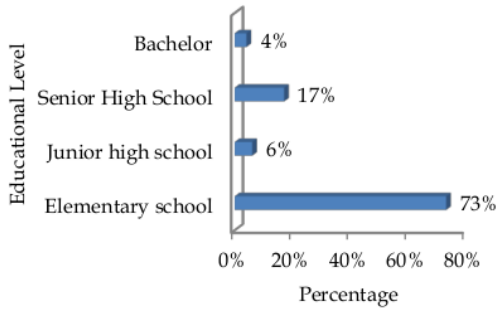

Figure 2. Graph of Educational Levels of Porang Farmers in Rempek Darussalam Village

The graphic above shows that the level of education referred to is the story of formal education taken by the people of Rempek Darussalam Village as farmers who cultivate pouring plants. The data shows that the level of education is dominated by elementary school (SD) with 38 people (73%), junior high school (SMP/MTs) with 3 people (6%), senior high school (SMA/MA) with 9 (17 %) and 2 people (4%). The low educational qualifications of farmers in the research location indicate the low economic level of porang farmers. The common human resource education factor is one of the obstacles to improving community welfare because farmers find it difficult to provide information related to the development of porang cultivation (Istikomayanti & Mitasari, 2021). If the farmer's education level is low, the pattern of thinking and insight will also be common; conversely, if the education level is higher, it will be faster to innovate in developing the porang farming business (Karmaita et al., 2022; Mufidah et al., 2021; Naufali & Putri, 2023).

The porang plant has great potential to be cultivated, either in processed raw form or in the form of processed products. Indonesia has exported many porang plants to foreign countries such as Japan, Korea, and China. Currently, porang tubers are shipped in semi-finished form, such as making chips, which shows that opportunities for cultivating porang are also increasingly wide open (Ningtyastuti et al., 2023; Nugrahaeni et al., 2021; Nurlina et al., 2023). The development of porang plants has promising prospects with high economic value; moreover, growing porang does not require technology and large capital because, with one planting, there is no need to plant seeds again (Pieter et al., 2022; Riptanti et al., 2022). Developing a porang-based agroforestry pattern is easy for farmers, and the results can meet requirements and improve welfare (Mufidah et al., 2021). Porang plants under stands will not damage or change land use and will ensure sustainable development of porang plants (A. onophyllus Prain). Porang cultivation is very promising because it is a source of income for people living near forests (Rosida et al., 2022; Sabani & Alamsyah, 2023). Cultivation of porang plants (A. onophyllus Prain) can be done by planting stands without destroying or cutting trees and utilizing empty land under the brackets (*Tegakan*) in agroforestry.

Figure 3. Porang Cultivation with Bulbil/Frog seeds

Agroforestry growth is a forest product concept expected to meet the needs and welfare of communities around the forest while maintaining ecology so that it can be carried out sustainably (Riptanti et al., 2022). A

sustainability-based planting process can be applied to the cultivation of porang plants, which can be seen from an ecological aspect. Currently, the process of cultivating porang plants through community forests is felt to be slow, so this needs to be overcome by planting porang among the stands (Soedarjo, 2021; Soedarjo & Djufry, 2021). This will provide gradual additional income from his land. The opportunities for cultivating porang are very large. Moreover, porang can produce even if planted under stands and grow well and produce good tubers. The initial seeds of porang, known as bulbil/frogs, can be obtained from the forest to be further cultivated, as seen in Figure 3.

Figure 4. Storage of porang tubers for seeds

Figure 4 shows the storage of porang tubers (A. onophyllus Prain) as one way of storing large quantities of porang seeds in tubers. Storing porang tubers for development is not done by stacking porang tubers; if they are stacked, they are prone to rot because air circulation is not smooth enough. 2.7 kilograms of porang tubers can be produced for every kilogram of bulbil. Storage like this is very easy; just put it on the ground and get even air circulation and sunlight. The process of cultivating porang plants uses more porang tubers (Sugiarto et al., 2023; Supriyono et al., 2021; Wahidah et al., 2021). Cultivation of porang plants has a high potential to increase the income of the people of North Lombok Regency, which borders protected forest stands (*Tegakan*)—Figure 5.

Figure 5. Protected forest

Harvesting Porang Plants (A. onophyllus Prain)

The harvest period for the porang plant is reached after the porang has grown for 5-6 months (during the rainy season), while in the dry season, the porang plant experiences a dormant or resting period with the appearance of wilted and dry leaves. Agroforestry in porang cultivation integrates porang plants with companion tree plants, which can be done sustainably (Pfeiffer et al., 2006; Rohman et al., 2020; Silvianingsih et al., 2020). The process of harvesting porang plants is carried out during the dry season because, in this season, the tubers do not grow. Porang plants (A. onophyllus Prain) that can be sold are good tubers or weighing 4-6 kg/tuber. Harvesting of porang frog/bulbil seeds (A. onophyllus Prain) is done by observing the stems and leaves wilting/drying. (figure 3.6). Porang frog/bulbil seeds that are sold usually in one stem/tree have 3-5 frogs/bulbils weighing 1.5 kg/tree.

Community Income from Harvesting Porang Plants

The harvested porang plants are sold in 2 types, namely in the form of tubers and frogs/bulbils. The porang tuber harvest is sold for 2,500 (IDR)/kg, while the selling price for frog/bulbil seeds is 30,000 (IDR)/kg. People's income depends on how many porang plants are developed and the harvest they get. The findings of interviews with farmers show that the total price income for porang tubers/kg of porang farming communities is 344,750,000 (IDR), with an average of 6,629,808 (IDR). For porang frogs/bulbils/kg, the income is 1,551,375,000 (IDR), with an average of 29,834,135 (IDR). The amount of price income (price) for each farmer is determined by the size of the harvest of porang tubers and frogs/bulbils (A. onophyllus Prain) obtained. The total income (revenue) of the porang farming community received from porang tubers and frogs/bulbils was 1,896,125,000 (IDR), with an average income of 36,463,942 (IDR). Revenue is the cost that a person or farmer obtains from their production, so in this study, revenue is the sum of the revenue from tubers and the revenue from porang frog seeds (A. onophyllus Prain).

Fixed costs are costs that do not change when production activities increase and decrease, and variable costs show characteristics that can vary from fixed or variable costs. The fixed costs incurred by porang farmers are 208,000,000 (IDR), namely the total costs of all members of the porang farmers. Each porang farmer costs 4,000,000 (IDR), not including purchasing equipment when harvesting porang plants. One of the porang farmer groups, namely Lestari, is known to have variable costs of 60,900,000 (IDR), with an average per member of 1,171,154 (IDR). Based on the results, the overall income of porang farmers from selling tubers and frogs/bulbils is 1,667,225,000 (IDR) per year, and the

average income of harvest farmers in one year is 32,062,019 (IDR). It can be concluded that cultivating porang plants provides a decent income for porang farmers, including all Darussalam Porang Lestari Farmers Group members.

Data Ratio

It is known that its efficiency is seen from the feasibility value of the R/C Ratio of 8.11. This efficiency value is obtained from the comparison of revenue with total costs. This means that for every 1 rupiah a farmer spends on his porang farming business, he gets a payment of 8.11%. So, the results of the analysis of the efficiency of porang farming by the Rempek Darussalam sustainable porang farming group are efficient, and cultivation and development are feasible because the value obtained is >1 and can be cultivated sustainably.

Conclusion

The porang plant has great potential to be cultivated, either in processed raw form or in the form of processed products. The development of porang plants has promising prospects with high economic value; moreover, growing porang does not require technology and large capital because, with one planting, there is no need to plant seeds again. The porang plant as local wisdom in North Lombok is also an effort to maintain local scientific or ethnoscience. The research results also show the economic potential for porang farmers. The average income of porang farmers is 64,927,885 (IDR) / year/hectare. A viable porang farming business planted under the stands of sengon (Falcataria mulucana (L) and can contribute to an income R/C Ratio of 8.11%

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Author Contributions

Conceptualization, Joko Triwanto, Amir Syarifudin, and Zaodan Faqih; methodology, Amir Syarifudin and Zaodan Faqih; validation, Amir Syarifudin and Joko Triwanto.; formal analysis, Zaodan Faqih; investigation, Zaodan Faqih; resources, Zulharman; data curation, Joko Triwanto, Amir Syarifudin, and Zaodan Faqih; writing—original draft preparation, Zaodan Faqih; writing—review and editing, Joko Triwanto, Amir Syarifudin, and Zaodan Faqih; visualization, Zaodan Faqih and Zulharman.; supervision, Joko Triwanto, Amir Syarifudin, and Zaodan Faqih; project administration, Zaodan Faqih, and Zulharman; funding acquisition, Joko Triwanto, Amir Syarifudin, and Zaodan Faqih. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors declare no conflict of interest.

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