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The Community's Perception and Attitude toward Malapari (*Pongamia pinnata*) as a Biofuel: A Case Study in Patutrejo Village, Purworejo Regency

Sanudin^{1*}, R U D Sianturi² and E Fauziyah¹

¹ Agroforestry Technology Research and Development, Ciamis, 46271, Indonesia.
ORCID ID: 000-0003-4738-6353.

² Forest Tree Seed Technology Research and Development Institute, Bogor, 16129, Indonesia.

*sanevafa2014@gmail.com, ²nauliratna@gmail.com, ¹fauziyah_eva@yahoo.com

Abstract. Biofuel production as an alternative energy source has been promoted and spread worldwide, but there is actual potential. Malapari (*Pongamia pinnata*) is a forestry-based biofuel. This paper aims to determine community perception and attitude towards malapari as a biofuel. The research was conducted in August - October 2018 in Patutrejo Village, Grabag District, Purworejo Regency, Central Java. This research was conducted using a survey method. Determination of respondents used a purposive sampling method. Respondents consisted of 38 people. The result showed respondents had poor to feeble perceptions and attitudes towards malapari. It is presumably because public knowledge of the use of malapari as a biofuel is low due to lack of socialization from related parties. There is no evidence of the utilization/processing of malapari seeds as a biofuel.

1. Introduction

Biofuel production as an alternative energy source has been promoted and spread worldwide, but there is actual potential [1]. Many governments have implemented rules and provided subsidies to encourage biofuel production and consumption [2]. Biofuel is one of the most widely available and abundant renewable energy sources, with a low environmental impact [3]. This source can meet the rising energy demand, including power and liquid fuel demand. It can also help with agricultural and rural development, as well as economic development [4].

Forest biomass, agricultural biomass, and waste biomass are the three types of biofuels [5]. Malapari (*Pongamia pinnata*) is a biofuel derived from the forest. Malapari seeds have lately become commercially significant due to their high oil content. Malapari seed oils are high in oleic acid, which may improve the fuel characteristics of biodiesel [6].

Despite the significant expansion in the production and usage of biofuels in recent years, as well as the significant amounts of public and private money at stake, public opinion research on biofuels is rare [7]. By understanding community perceptions and attitudes towards malapari as a source of biofuel, we see that this is the basis for developing malapari as a source of biofuel. This paper aims to determine community perception and attitude of malapari as a biofuel.



2. Method

The research was conducted in August to October 2018 in Patutrejo Village, Grabag District, Purworejo Regency, Central Java. This research was conducted using a survey method. Determination of respondents used a purposive sampling method. Respondents consisted of 38 people who were divided into two (2) groups of respondents, namely: a) respondents who were involved in the construction of the Malapari demonstration plot built by Agroforestry Technology Research and Development Ciamis in 2016-2019, both as landowners (four people), involved in planting and maintenance of the demonstration plot (six people), smallholder of the land (three people); b) The respondents who were involved in the Energy Self-Sufficient Village or Desa Mandiri Energi (DME) program based on *nyamplung* (*Calophyllum inophyllum* L) in 2009-2014 in Patutrejo Village were both involved in planting and maintenance activities (25 people).

On a three-point Likert scale, each question was assessed (0 = no, 1 = unsure, 2= affirmative). To categorize the degree of knowledge/understanding, perception, and attitude, the percentiles of the total score were utilized (25 percent = extremely poor, 25–50 percentiles = low, 51–75 percentiles = moderate, and > 75 percentiles = good) [8]. The data collected was processed and analyzed using narration and tabulation.

3. Results and discussion

3.1. Characteristics of respondents

Thirty-eight (38) household or family members were interviewed, with 7.8% of women and 92.2% of men. The responders were, on average, 48 years old. The respondents' average household size was three individuals, and they had a low level of education. Each household possessed an average of 0.55 hectares of land (garden and paddy field). With an average farming experience of 19 years, the average land owned total (including yard) was 0.77 hectares. The respondents' primary sources of income are gardens and rice fields. Respondents obtained land through inheritance (84.2%) and village government distributions (*bengkok*) (15.8%). Eighty-seven percent of those polled mentioned agriculture [9].

3.2. Respondents' Knowledge of Malapari

Malapari (*Pongamia pinnata* (L.) Pierre) grows a lot in the Forest Holding Resort (Resort Pemangkatan Hutan/RPH) Loano BKPH Purworejo, KPH South Kedu functions as a windbreaker. The malapari was planted in the 1980s. RPH Loano has an area of 12.4 hectares which administratively includes several villages, including Patutrejo Village. All respondents knew that the malapari existed and grew around the demonstration plot and of its function as a windbreak. This knowledge comes from information passed from generation to generation, and they have seen firsthand the malapari stands in the Perum Perhutani area (RPH Loano) in their village. This knowledge is related to malapari stem, leaf, fruit, flower, and bark characteristics. Respondents referred to malapari by the local name *dadap bong*.

However, most of the respondents did not know about the use of malapari for biofuel. A key hurdle is a lack of knowledge. Farmers lack the necessary knowledge to properly develop energy crops. They confirmed that, when it comes to future energy crop production decisions, farmers' attitudes are more relevant than the promise of cash rewards [10]. One of the most significant barriers to the development of biofuels is a lack of understanding about energy crop production [11]. This lack of bioenergy knowledge is widespread, particularly among farmers worldwide [12] [13].

3.3. Level of perception and attitude respondents to malapari

Regarding the utilization of malapari, as many as 13.2% of respondents stated that malapari can be used as a biofuel. The respondents' knowledge of the utilization of malapari was limited to its use as ordinary fuel (firewood) and as a windbreaker.

Farmers had only a hazy grasp of the forest biomass sector due to a lack of education and information regarding biofuels. They propose that effective biofuel teaching programs be developed to fulfill the demands of many stakeholders in order to tackle this issue [14].

Malapari stands in Indonesia are currently being grown naturally. One of the obstacles to large-scale production and availability to satisfy the needs of bio-energy generation is a lack of understanding about its cultivation [15]. 50% of respondents perceived that malapari could grow with other plants, but only until the age of the malapari is around three years old. It means that other crops such as seasonal crops (chili and other crops) could be planted for 1-2 years of malapari life because there will be competition for nutrients and sunlight after that.

Small-scale agroforestry-based biofuel production has been promoted as a way to alleviate rural poverty, but no data on farmer acceptance of such new systems exists [10]. In Hassan district, South India, the influence of a biofuel extension program and farmer characteristics on the adoption of oilseed tree combinations on smallholdings found that tree cultivation is significantly more common than oilseed collection. The former is aided by various biofuel extension program operations. It's a good agroforestry program, but it's not a good biofuel program [16]. This strategy involves carefully integrating oilseed trees into the existing farming system. Oilseed tree combinations are planted on field boundaries and throughout the landscape to prevent competition with crops, while the trees thrive on and recycle nutrient and water residual streams [17].

Village officials supported the Malapari demonstration plot program, which was built on village land (*bengkok*) for the demonstration plot. On the other hand, the community also shows its reluctance to be involved in malapari development. Plot demonstrations are an effort to attract people's attention to be followed or apply themselves in the field. The Malapari demonstration plot did not provide a role or benefit for developing individual motivation as a provider of counselling materials or information, extension methods, media or tools, and network development.

Polls on biofuels as a source of alternative energy are divided. Some research [18] suggested a positive outlook, while others [19] revealed mounting concerns and questions. Biofuels are a contentious science problem because of these differing viewpoints [7]. The perception of malapari innovation is still low due to the low suitability of the farming business, technology that is perceived to be complicated, so that it does not provide potential relative benefits for respondents. This perception is also influenced by the failure to adopt technology innovation based on nyamplung in the study location. The business of biofuel-based nyamplung is not yet profitable [20].

They are less interested in the cultivation and processing of malapari. It is in line with [10], which states that the study of public perceptions of biofuels is an essential factor determining people's attitude to biofuel. The levels of perceptions and attitudes of respondents to malapari are represented in Table 1.

Table 1. Level of perception and attitude respondents to malapari.

No	Category	Perception	Attitude
		Frequency (%)	Frequency (%)
1	Good (>75%)	0 (0)	0
2	Moderate (51-75%)	10 (26,32)	6 (15,79)
3	Poor (25-50%)	28 (73,68)	5 (13,16)
4	Feeble (<25%)	0	27 (71,05)

In general, most respondents had poor to feeble perceptions and attitudes towards malapari (Table 1). It is presumably because public knowledge of the use of malapari as a biofuel is low due to lack of socialization from related parties. There is no evidence of the utilization/processing of malapari seeds as a biofuel. It is different from the DME program in 2009-2014. It has provided knowledge about the utilization and processing of nyamplung seeds into biodiesel, although there are many problems in its implementation so that the program is not sustainable.

4. Conclusion

Respondents had poor to feeble perceptions and attitudes towards malapari as a biofuel. It is presumably because public knowledge of the use of malapari as a biofuel is low due to lack of socialization from related parties. There is no evidence of the utilization/processing of malapari seeds as a biofuel. The findings of this study have important implications for future biofuel development activities, namely encouraging positive community perceptions and attitudes through the provision of comprehensive information from both socio-economic and ecological perspectives. It is crucial because there is a wide gap regarding the malapari for biofuel development.

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