Public Perception on the Success of Reforestation in a Degraded Land

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Abstract: Reforestation is an activity that involves planting or man-made trees regeneration and other plants in the state forest areas and in other areas based on land-use plan designated as forest. The purpose of this study was to determine the public perception of the difficulty of successful reforestation activities in the Lake Toba catchment area. The data were taken from primary and secondary data. Primary data were information collected by reforestation activities in the villages, secondary data were collected in the study site general conditions existing at the village government agencies, of which sampling method was done by purposive sampling, i.e., sampling deliberately chosen. The results showed a lack of socialization in the extension of government reforestation activities, uncontrolled forest fires, lack of maintenance of seed that has been planted, and the type of plant is less suitable.

Key words: Reforestation, Lake Toba catchment area, purposive sampling, public perception.

1. Introduction

The damage of the Lake Toba catchment area is increasingly alarming as the accumulation of various problems, such as dry climate, the frequent occurrence of forest and land fires, private land ownership by custom, caring society and a lack of public knowledge to make the choice of plants greening useful to improve the local economy in the surrounding area. Burning of land is also done deliberately for cattle grazing, and often causes a fire to get out of control so as to spread to a wooded area and cause land and forest fires very large. Low public economy resulted in the community tends to prioritize economic interests [1]. According to Utomo [2], in the area adjacent to the access road and farmland resident, fires can occur 1-2 times a year.

The Lake Toba catchment area has a mild climate, so this region does not allow to be turned into a garden as oil palm and rubber. Consequently, no plantation companies and communities are interested in gardening in this region. Plants are easily found, such as pine, local mango and a number of other adaptive crops grown in the region. These conditions

resulted in a decreased motivation of people to care for the environment. Greening efforts were made by the government about a positive response by the community, because the types of crops grown do not give economic impact for the community, such as pine, for the work, etc. [3].

According to Research Institute of The University North Sumatra [4], the land area of Lake Toba catchment area is 259,594 ha. The extents of the area designated as forest area amount to 143,840 ha (51%). Apparently based on the results of the analysis of the land cover map, the remaining forest area in 2011 was 62,403 ha (22.5%) [5]. It is feared that number continues to decline until now.

Reforestation efforts were undertaken by the government with failure, because the fire destroyed pine plantations and made the environment getting worse. In the future, success of the greening of the Lake Toba catchment area with the desired plant community is expected to boost the economy and improve the quality of the environment in this region.

2. Materials and Methods

This research was conducted at the catchment area

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of Lake Toba, which includes seven districts: Simalungun, Karo, Dairi, Toba Samosir, Samosir, Humbang Hasundutan and North Tapanuli in the province of North Sumatra, Indonesia (Fig. 1). Then 10 villages were selected from this seven districts which located in the catchment area of Lake Toba. This research was conducted for three months from May to August 2014.

Materials used in this study were a questionnaire sheets and a map of the location of the research. The tools used in this study were stationery, digital cameras and computer devices.

The research data were taken from primary data and

secondary data. Primary data collected include information related to reforestation in various villages in the Lake Toba catchment area and research information about the public perception of the reforestation program that has been implemented. The secondary data analyses and describes the general conditions of the research areas among other variables. The particular data describes the villages and the district agencies.

2.1 Data Collection

The sampling is divided into two parts, namely, the sample villages and sample respondents. In the sample

Fig. 1 Map of the distribution of the seven district administrative area included in the catchment area of Lake Toba.

1. District Simalungun; 2. Karo; 3. Dairi; 4. Toba Samosir; 5. Samosir; 6. Humbang Hasundutan; 7. North Tapanuli.

villages, the approach used in determining the location of the research is purposive sampling method, and in this case is taken 10 villages located in the catchment area of Lake Toba.

Respondents in this study were the village chief, traditional leaders and community of the village. Samples of study were as many as 10 respondents for each village. Hence, from 10 villages of seven districts in the watershed of Lake Toba, the authors interviewed total 100 respondents from 10 villages.

2.2 Techniques and Data Collection Stages

Data are collected directly by conducting interviews and discussions, as well as the deployment of questionnaires. An oral interview question and answer were made between two or more people directly. This activity is conducted to dig deeper information for completeness of research data. Conducting interviews with key informants needed is to help the interviewer obtain accurate information. In this study, interviews were conducted to the village officials and local communities.

Questionnaire is a list of questions or statements given to all respondents directly or indirectly. Distribution of questionnaires was conducted to obtain primary data needed in research. Data obtained from 100 respondents from 10 villages were further processed to obtain public perception of the reforestation program launched by the government. Each questionnaire contains 30 questions relating to how the public perception of environmental conditions around Lake Toba catchment area, the awareness of the population about the importance of forest preservation and environment, the knowledge about the benefits of forests to society and environment, the public awareness of forest conservation and reforestation programs that has been done, and the desires of the community towards reforestation program as to what they wanted to support the success of the greening program.

2.3 Data Analysis

Based on Central Bureau of Statistics data [6], the total population of the 10 villages tested was 11,122 people (Table 1). Based on the Slovin formula, the numbers of respondents were 99 people, rounded to 100 people, with the provisions of each village 10 respondents. Total respondents were divided into: (1) one head of the village/village officials; (2) one traditional leader; (3) three general public people; (4) five farmer/rancher/fisherman.

The data collected from the questionnaire were expressed in tabular form (tabulation) in the form of cross-frequency characteristic data of the respondents, which include income, education level and occupation.

Public perception in this study was assessed based on the motivation of people for planting and the reforestation failure reason. The data obtained from the results of the questionnaire are presented in the form of tabulation. Sampling method was done by purposive sampling that is deliberately chosen. Election group of subjects was based on population characteristics or properties that have been previously known. The sample size was determined using Slovin formula, as Eq. (1):

$$n = N / (1 + Ne^2) \quad (1)$$

where, n = sample size, N = size of population, and e = percent leeway inaccuracy that can be tolerated because of sampling error, set at 10%. The formula used to obtain the number of people who are used as a sample.

3. Results and Discussion

3.1 Respondents Characteristics

The respondents in this study were randomized to see how the public perception around Lake Toba is linked low levels of success of reforestation activities.

Table 2 shows the education level of respondents. Five education levels have been found. Senior high

Table 1 Numbers of residents of each village.

No.	Village	Sub-district	District	Total population
1	Tongging	Merek	Karo	918
2	Silalahi-I	Silahisabungan	Dairi	1,061
3	Paropo	Silahisabungan	Dairi	394
4	Tomok	Simanindo	Samosir	3,209
5	Tigaras	Dolok Pardamean	Simalungun	1,311
6	Lintong Nihuta	Tampahan	Toba Samosir	986
7	Tarabunga	Tampahan	Toba Samosir	508
8	Sosorlotung	Muara	Humbang Hasundutan	519
9	Simangulampe	Baktiraja	Humbang Hasundutan	563
10	Tipang	Baktiraja	Tapanuli Utara	1,653
Total				11,122

Source: Central Bureau of Statistics, 2014 [6].

Table 2 Characteristics of respondents by education level.

No.	Education level	Amount (person)	Percentage (%)
1	Un-educated	0	0
2	Elementary school	29	29
3	Junior high school	21	21
4	Senior high school	43	43
5	Universities	7	7
Total		100	100

Table 3 Characteristics of respondents by job.

No.	Type of job	Amount (people)	Percentage (%)
1	Farmer	61	61
2	Fishermen	15	15
3	Traders	16	16
4	Stock farmer	2	2
5	Civil servant	6	6
Total		100	100

school (SMA) has the highest composition of 43%, followed by elementary school (SD) of 29%, junior high school (SMP) by 21% and higher education (diploma degree) at 7%. Higher education level has more influence on one's understanding of the psychological needs compared to someone whose level of education is lower. Besides, education level also affects the people type of job, and the type of work affect the amount of income and the amount of revenue influential in determining the consumption of goods and services, such as services to conserve forests. This condition is associated with the paradigm of rural and less education have indifference in preserving the forest and knowledge of the importance

of forests value for human life. This is consistent with the statement of Aida-Vitayala [7], who said that the level of education is proportional with productivity and efficiency. Based on the analysis of the questionnaire, the characteristics of respondents based on jobs were listed in Table 3.

The data in Table 3 show that the majority of people work around Lake Toba is a farmer by 61%, followed by the work of traders by 16%, 15% fishermen, 6% civil servant and 2% stock farmers. Traditional leaders in the region itself generally work as farmers. The majority of people who live around Lake Toba are farmers. Low levels of public education and the situation in the region force

residents to rely on the agricultural sector. Management systems used by the public were shifting cultivation. These habits will increase the number of degraded lands and even cause a fire due to land clearing by fire. Seeing these conditions, income just from farming was not enough anymore for the community. Society is also doing a side job as a trader and fisherman to fulfill their needs.

3.2 Causes of Reforestation Failure

Based on the data analysis of questionnaires results, the causes of failure of reforestation activities vary as shown in Table 4.

Based on Table 4, it can be seen that the cause of the failure is largely government's less social to the community with a percentage of 38%, fire with a percentage of 35%, lack of maintenance or maintenance with the percentage of 19% and less desirable plant species communities with a percentage of 8%.

The low success rate of planting is due to lack of socialization of the government to the whole society. This leads to that the majority of people do not participate in planting activities. Communities that participate in planting are usually chosen by the government as people and village leaders. Active involvement of the community is crucial in order to achieve the success of forest and land rehabilitation. This is similar to Tjokroamidjojo [8], who reported that the successful achievement of development goals requires the active involvement of the community at large. Not only from the highest policy-making, the planners, implementers operational employees, but also from farmers, fishermen, laborers, small traders, businessmen and others, the participation is called for

active involvement. The low success rate of reforestation activities in Lake Toba catchment area was caused from forest fires factors. Wildfires already are common during the dry season around Lake Toba catchment area, because landform sloping, strong winds and dry conditions cause a small spark that is easily spread and cause forest fires. Besides, there are several factors that caused fires around the edge of Lake Toba, namely, forest fires caused by lightning and wood friction, burning forests used to make agricultural land more broadly, and some fires are deliberately made by public for hunting wild boar.

On the reforestation program that has been done before, the majority of plant species chosen for reforestation in the region are pine (*Pinus merkusii*), eucalyptus (*Eucalyptus alba*) and ingul (*Toona sinensis*). Only a small portion of the program managers provide other types, such as avocado (*Persea americana*) and durian (*Durio zibethinus*). This is because that this type of plant propagation is much easier than the multi-purpose tree species and the price is much cheaper. Whereas, communities around Lake Toba catchment area is less interested in the type of trees planted, because the trees planted is a type of tree that does not produce fruit. People are more interested in the type of tree that produces fruit and fruit can be harvested.

3.3 Planting Activities Carried out in the Last Five Years

Reforestation activities normally are carried out by the government to involve the community to planting reforestation activities. The planting carried out in the last five years are listed in Table 5.

Table 4 The cause of the failure of reforestation.

No.	Cause of reforestation failure	Percentage (%)
1	Fire	35
2	Less care/maintenance	19
3	The government is less social to the community	38
4	Type plants less interested in the community	8
Total		100

Table 5 The planting activity carried out in the last five years.

No.	Village	Year					Initiator
		2010	2011	2012	2013	2014	
1	Tongging		✓				Toba Go Green, Dandim 0205/TK
2	Silalahi-I					✓	Lake Toba Reforestation, Dairi Government
3	Paropo			✓			Toba Go Green, Dandim 0206/D
4	Tomok					✓	Toba Go Green, Dan Brigif 7/Rimba Raya
5	Tigaras	✓					Toba Go Green, Dan Brigif 7/Rimba Raya
6	Lintong Nihuta			✓			Toba Go Green, Kodam I/BB
7	Tarabunga			✓			Toba Go Green, Kodam I/BB
8	Sosorlotung				✓		Indonesian Public Bank care about the environment on Program Toba Go Green, Kodam I/BB
9	Simangulampe					✓	Toba Go Green, Dandim 0210/TU
10	Tipang					✓	Toba Go Green, Dandim 0210/TU

Source: Military District Command I/BB, 2015 [9].

Table 6 Types of plants planted as reforestation activities in the Lake Toba catchment area.

No.	Village	Type of tree plants						Year	Number of seedlings
		Eucalyptus	Kemiri	Avocado	Pine	Ingul	Durian		
1	Tongging				40,000	6,000		2011	46,000
2	Silalahi-I		5,000		20,000	5,000		2014	30,000
3	Paropo				40,000	3,000		2012	43,000
4	Tomok		2,000		5,000			2014	7,000
5	Tigaras		1,000	500		1,000	500	2010	3,000
6	Lintong Nihuta		1,000		5,000	2,000		2011	8,000
7	Tarabunga		1,000		5,000	2,000		2011	8,000
8	Sosorlotung		5,000					2013	5,000
9	Simangulampe	1,000			1,500		500	2014	3,000
10	Tipang	2,000					1,000	2014	3,000
Total									156,000

Table 5 shows that there are four types of planting activity carried out in the last five years, i.e., 2010-2014. Types of activities undertaken include Toba Go Green, Reforestation of Lake Toba, Toba Green Project and the Bank Rakyat Indonesia caring environment. In 2010, the Toba Green Project was carried out in the village Tigaras. In 2011, the Toba Go Green activities were carried out in three villages, namely, Tongging village, Lintong Nihuta and Tarabunga. In 2012, the Toba Go Green planting activities was carried out in Paropo village. In 2013, Indonesian Public Bank (BRI) was conducting the activities of environmental care in the village Sosorlotung. In 2014, there were two types of activities carried out, i.e., Reforestation Lake Toba in the village Silalahi-I and Toba Go Green in the village

of Tomok villages and rural Simangulampe Tipang, which is the highest year of planting activities.

3.4 The Types of Plants Planted as Reforestation Activities in Watershed of Lake Toba

The types of plants planted in reforestation activities in The Lake Toba catchment area are shown in Table 6.

Table 6 shows that there are six types of plants for planting activity, namely, eucalyptus, kemiri, avocado, pinus, ingul and durian. In 2010, the plant species used in planting activities are kemiri, avocado, ingul and durian held in the village Tigaras. In 2011, there were three villages executed planting activities, namely Tongging, Lintong Nihuta and Tarabunga. Tongging village used pine and ingul plant species,

while village Lintong Nihuta and Tarabunga used kemiri, pinus and ingul. In 2013, the village Sosorlotung used kemiri plant species. In 2014, there were four types of villages, village Silalahi-I, Tomok village, Simangulampe village and village Tipang carried out planting activities. The Silalahi-I village used kemiri, pine and ingul plant species. Tomok village used kemiri and pine plant species. The village Simangulampe used kemiri, pine and durian plant species, while the village Tipang using eucalyptus and durian plant species. The highest number of seedlings in the planting activity was conducted in villages Tongging, i.e., 46,000 seedlings. While the fewest number of seedlings 3,000 seedlings were held in the village Tigaras, Simangulampe and Tipang.

4. Conclusions

Notice of 156,000 seedlings were planted through reforestation program that has been implemented, it turns out that a success rate of growing plants in Lake Toba catchment area does not reach 10%. Public perception to keep and maintain the plant reforestation is very low because of the unwanted plants grown by the community. By 2015, the government plans to plant the seedlings as many as 20,000 seedlings.

5. Recommendations

The government should more intensively promote the importance of reforestation activities to all the people who live around Lake Toba. The public needs to be informed and involved in determining the type of reforestation plants so that people will care more

about maintaining and keeping the plant reforestation.

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