



Analysis of Private Forest Resource Management in Socio-Cultural and Institutional Aspects: A Case Study of Tana Toraja and North Toraja Regencies, Indonesia

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Abstract

The use private forest (kombong) in Toraja is much related to the local and cultural tradition of the community. Private forest yield utilizes for traditional ceremonies (rambu solo', rambutuka'), Tongkonan building material, and souvenir for tourist. The private forest potency has been decreased that cause stock for the materials is not balance anymore between supply and demand. This study aims to: (1) analysis of Index and sustainability status of private forest management in the aspects institutional and socio-cultural, (2) analysis of sensitive indicator towards sustainable management of the private forest from socio-cultural and institutional aspects. The site studies are situated in Tana Toraja and NorthToraja at three locations of private forests (Tampo, Padangiring, and Sangkaropi). The research was being conducted from October 2014 to June 2015. The research methods applies Multidimensional Scaling (MDS) with Rapid appraisal Technique of Toraja private forest (Rap To-PF) which is modified from Rapfish (Rapid Appraisal for fisheries).

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The result shows that socio-cultural aspect is quite sustainable (52.15 % - 57.68 %) and institutional aspect is less sustainable (27.83 % - 47.20 %). From 15 analyzed indicators, there are four indicators as triggering factor which is sensitive influenced and it is necessary to intervene in relation to index and sustainability status of socio-cultures and institutional aspect to outline policy interpretation in the private forest.

Keywords: index and sustainability status; privateforest; multidimensional scaling.

1. Introduction

Utilization of forest resources has been positively contributing to national development of Indonesia. Today, forest zones are being target to be explored by both non-forests interest and forest wood interest group. The exploitation neglects the carrying capacity of the forest that causes depletion on the resources. This leads to degradation over the resources and potential decreasing in resources due to over exploitation [1]. The degradation includes biophysical environment, economic, socio-cultural and socio-political dimensions. Forest management and its utilization have been oriented in timber management generating failure outcome. It is indicated by depletion on the resources and inactive participation of village community nearby the forest. In addition, the forest and the environmental degradation stipulate to climate change and global warming [2]. As a result, forest damage can be valuable lesson learning of today's forest management.

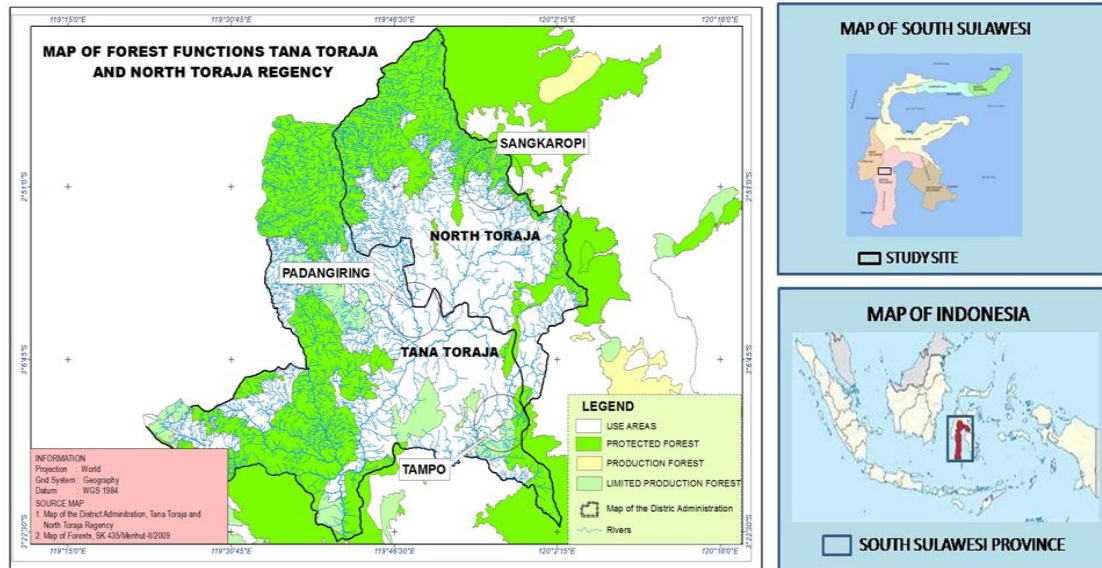
Forest management focuses on economic development, triggering poverty on the people who live around the forest [3] which in worse consequences devalued Indonesia original cultures' values owing to modernization [4].

Forest resources management and its exploitation are basically not only a problem of practical concern (e.g. land, water, trees, wood and non-wood production) but it is also more in social impact stemming from primary needs of demands and increasing in community welfare at rural community. However, forest management have to involve participation of the community based on their local understanding, knowledge, technology, experience and tradition [4]. Traditional knowledge of local wisdom and its application in forest management providing ecosystem services such as food and medical sources. It would be vanished if it is not preserved by the generation [5]. The knowledge and local wisdom are existed in Tana Toraja and North Toraja where the private forest management is strongly related to local tradition and cultural values of the community. To illustrate, one of the utilization of the private forest or at the Torajan language is called "kombong" has been using for traditional ceremonies (e.g. rambu solo', rambu tuka'), basic construction material for Tongkonan, and souvenirs for tourist. Kombong in its development is being devalued by modernization which leads to decreasing on the basic construction materials for Tongkonan and the ceremonies due to unbalance in demand and supply for the materials.

2. Research methods

2.1. Time and Studies Site

The research was conducted in Tana Toraja and North Toraja, South Sulawesi Province by collecting sample in three locations of the forest at Tampo, Padangiring, and Sangkaropi sub districts, shown in Figure 1. It started from preparation, pre-research to data collection during eight months, beginning in October until June, 2015.



2.2. Categories and Data Sources

The data categories are primary and secondary data. Primary was obtained from field survey, in depth discussion, and list of inquiries to the community in the site studies. In order hand, Secondary data was gathered from literature review, documents and reports from various agencies involved in the research topic.

2.3. Methods and Data Analysis

Private forest sustainable management analysis in the socio-cultural and institutional aspects are studying through Multidimensional Scaling Approach (MDS) along with Appraisal Rapid Technique of Toraja private Forest (Rap To-PF) which modified with Rapfish Modification (Rapid Appraisal for Fisheries) that is developed by Fisheries Center, University of British Colombia [6, 7, 8]. In its implementation, Rapfish uses technique called Multidimensional Scaling (MDS). The object or point which is observed in the field is mapped into two or three dimensions in which is why the object or the point is attempted to be plotted closer over the origin point. In other words, two points or similar object is charted into one point which is adjacent each other. In contrast, different object and point are noted through point which is far apart [9]. Hence, ordinated technique (Distance determination) at MDS is based on Euclidean Distance, in dimensional room is written as follows:

$$d(x, y) = \sqrt{(x_1 - y_1)^2 + (x_2 - y_2)^2 + \dots + (x_p - y_p)^2} \quad (1)$$

Caption : x_1 = First object on observation i

y_2 = Second object on observation i

p = Number of observation

Configuration or ordination from an object or a point at MDS is approximated by Euclidian regression distance (d_{ij}) from i point to j point with origin point (δ_{ij}) as similar formula as following:

$$d_{ij} = \alpha + \beta \delta_{ij} + \epsilon \tag{2}$$

In general, there are three ways could be applied for the similar regression, is least square method (KRYST), Interchangeable Least square method grounding on root of Euclidean distance (squared distance) or called ALSCAL method, and this is based on Maximum Likelihood. From the three methods, ALSCAL algorithm is the most suitable for Rapfish and it is simply available in most statistical software (e.g. SPSS and SAS) [10].

ALSCAL method optimizes square distance (d_{ij}) over quadratic data (origin point = d'_{ij}) at two dimensions (i,j) which is noticed in the formula named S-Stress [11] at the following:

$$S = \sqrt{\frac{\sum_{i < j}^n (d_{ij} - d'_{ij})^2}{\sum_{i < j}^n d_{ij}^2}} \tag{3}$$

Square distance is Euclidian distance which is weighted or written :

$$d^2 = \sum_{\alpha=i}^r W_{\alpha} (X_{ia} - X_{ja})^2 \tag{4}$$

In addition, MDS method is applied through several steps. (1) indicator determination of the private sustainable forest management for each aspect (e.g. Socio-culture and institutional), (2) assessment in each indicator at ordinal scale on sustainability criterion for each factor and ordination analysis based on “multidimensional scaling”. (3) index drafting and sustainability status of the private forest are reviewed from both aspects, (4) sensitivity analysis is used to identify sensitive indicator to show contribution at sustainability index, and (5) Monte Carlo analysis to evaluate random error impact on the prediction proses to ordinal values of the private forest management.

The research is structured into four status of sustainability categories in basic scale (0-100) which is adaptive from stability criteria and sustainable management of Agro-ecosystem [12] and sustainable analysis from various previous research as shown in Table 1.

Table 1: Index values and sustainable status of private forest management

| Value index | Sustainability status |
|----------------|--------------------------------|
| 0.00 - 25.00 | Worse (unsustainable) |
| 25.01 - 50.00 | Less (less sustainable) |
| 50.01 - 75.00 | Sufficient (quite sustainable) |
| 75.01 - 100.00 | Good (very sustainable) |

Source: developed by Marten, 1998

3. Results and Discussion

3.1. Sustainable Status of Socio-culture Aspect

Socio-cultural aspect covers eight indicators for sustainable analysis. The indicators is considered to provide influence at sustainable level toward socio-culture aspect such as: (1) Land right status, (2) Private forest origins, (3) Farming period of the private forest, (4) Educational degree ,(5) Allocation of private forest yield at one Tongkonan, (6) The private forest yield for other people,(7) Stakeholder relationship model, and (8) Family involvement in the private forest management.

Index value of socio-cultural aspect on each unit analysis, has been shown in the Figure 2(a) which is an outcome of MDS analysis. The result are: Tampo is 52.15 %, Padangiring is 55.18 % and Sangkaropi is 57.68 %. Those values situates in interval of 50.01 – 75.00 which is categorized as adequate for sustainability.

The leverage Analysis in three site studies obtains two sensitive indicators which are educational degree and allocation of private forest from one Tongkonan. Sustainability index and result of leverage analysis is illustrated in Figure 2.

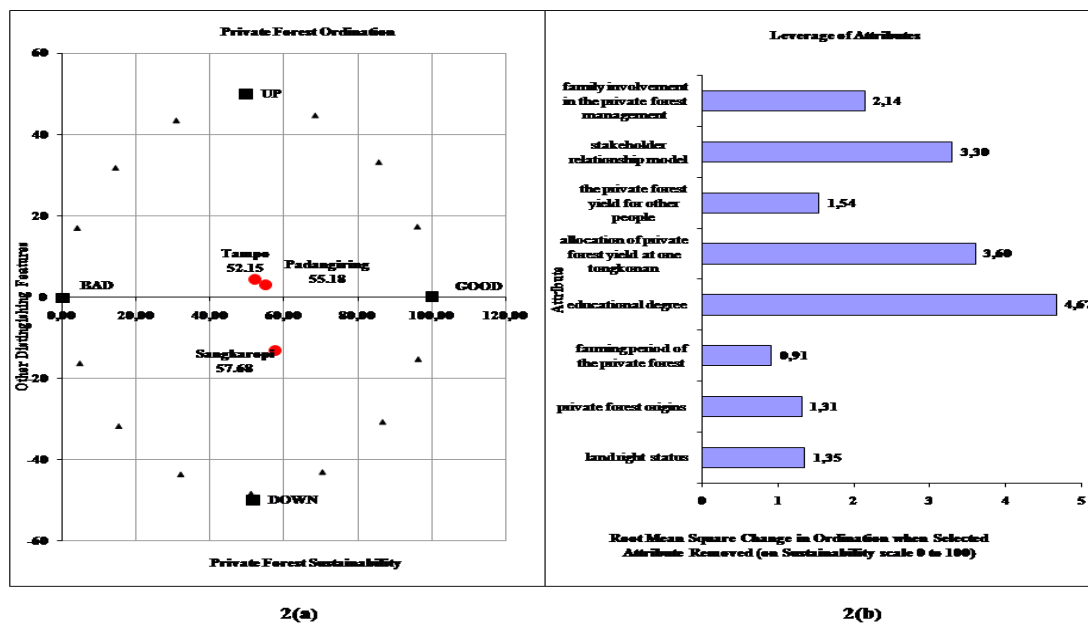


Figure 2: Sustainability index and leverage analysis of socio-culture aspect

Educational degree is the most sensitive indicator (Figure 2(b)). Interview result confirms that Landlord of private forest has various educational degrees from incomplete primary school to bachelor graduated. Generally, those who do not possess educational degree are approximately 28.15 %. Primary school is (28.89 %), Junior high school (20.74 %), Senior high school (21.48 %), and bachelor (0.74 %). This means that educational qualification of the landlord is still lower. As a result, knowledge about private forest development is very narrow. To develop sustainability status of socio-cultural aspect in order to manage the private forest, it might be organised through informal education (e.g. in house training and course) or study comparative to other regions which have been applied sustainability principal [13,14].

Appearance of thesecond sensitive indicator is triggered by probability of the landlord who allocates the private forest to renovate Tongkonan house only, consequently stipulating less motivation of the landlord to develop the private forest. Hence, an attempt to solve the issue is bychanging mindset to utilize half of the yield for commercial purpose [15].

3.2. Sustainability Status of Institutional aspect

The indicator presuming to give effect at sustainable level for institutional aspect is consisting of seven indicators. (1) Presence or farming group organization , (2) Meeting frequency, (3) Institutional collaboration program, (4) Funding support program, (5) Training participation activities, (6) implementation of the extension, and (7) law enforcement of private forest yield permit.

From MDS analysis result, index values of institutional aspect in each unit analysis is indicated at Figure 3 (a). 47.20 % for Tompo, 27. 83 % for Padangiring, and 40.37 % for Sangkaropi. These values are in interval of 25.01 to 50.00 classified as less sustainable.

There are two sensitive indicators which can be acquired from leverage analysis. They are: (1) Funding support program and (2) Institutional collaboration program. The sustainable index and leverage sustainable analysis result is fully described at Figure 3.

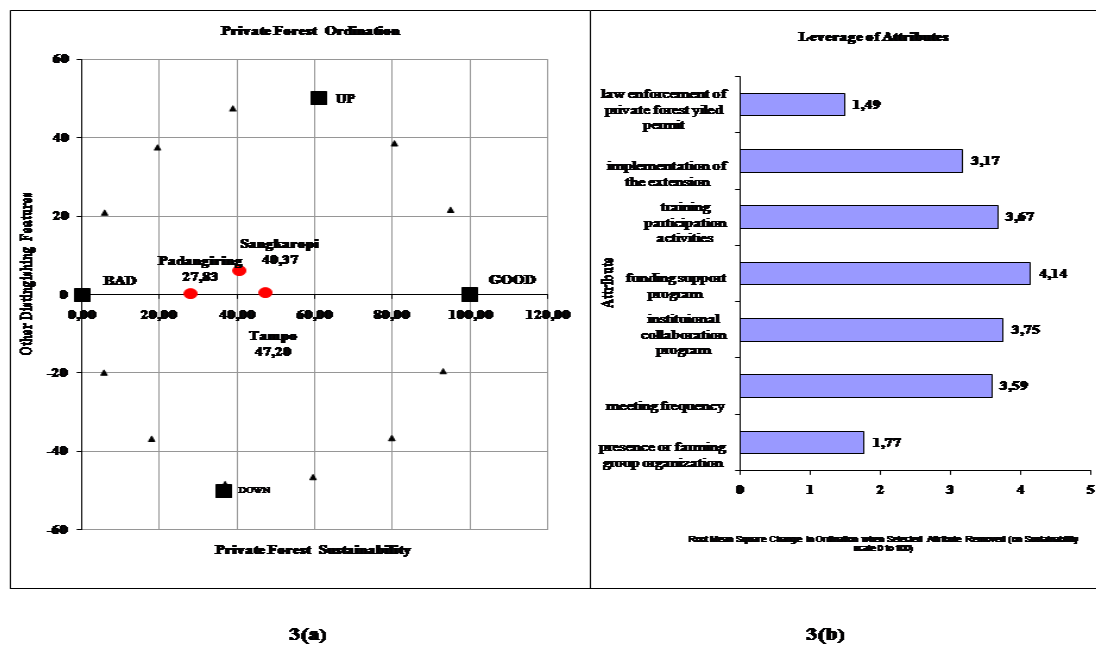


Figure 3: Sustainability index and leverage analysis institutional aspect

Figure 3 (b) shows funding support program as the sensitive indicator. It is stemmed from less attention of stakeholders (e.g. local government, ministry of forestry and environmental affairs) to endorse private forest development. The funding supportso far is still basically for project demand. In order site, the landlord of the

private forest expects the program that has been applied in the regions will be sustainable. attempts to improve sustainability status of institutional aspect is through independent farming group participation that is included in funding to support private forest development [16].

The institutional collaboration program as second sensitive indicator is the result of participants' role who involved in the program where the participation is not effective yet. Each partisan or agency uses its own partial program that usually comprising minimum assistance to the private forest landlord. Activities of institutional collaboration program are being conducted during the project only. Institutional capacity of farming group in the site study is considerably insufficient in relation to the total and areas of the forest. Today, management of the farming group is still inactive and unable to assist the landlord to escape from economic gaps. In fact, the presence of farming group is very important in forest development. There are several ways to improve the organizational capacity of the farming group. (1) improving attention at private forest enterprise through incentive empowerment, (2) Thinking about the potency of the existing social capital (e.g. family spirit , collaboration, and farmer voluntary services), (3) Increasing role of young farmer who learn a lot from experience in organizational activities, and (4) Utilising the local government support in initiating establishment of cooperation scheme and implementation of forest and areas rehabilitation programs [17].

3.3. Validation of Private Forest Sustainability Status

To know error level in MDS analysis and Rap To-PF sensitivity, then Monte Carlo analysis is being used in credentials interval of 95%. It shows differences of index values in private forest sustainability management (socio-culture and institutional aspects). MDS result and testing value of Monte Carlo are presented in Table 2.

Table 2: Differences of MDS values analysis and Monte Carlo analysis

| Sustainability aspects | Tampo | | | Padangiring | | | Sangkaropi | | |
|------------------------|-----------------|-------------|------------|-------------|-------------|------------|------------|-------------|------------|
| | MDS | Monte Carlo | Difference | MDS | Monte Carlo | Difference | MDS | Monte Carlo | Difference |
| | Socio -cultures | 52.15 | 52.40 | 0.25 | 55.18 | 55.03 | 0.15 | 57.68 | 57.23 |
| Institutional | 47.20 | 47.21 | 0.01 | 27.83 | 28.39 | 0.56 | 40.37 | 40.68 | 0.30 |

Source : Data Analysis, 2015

Table 2 conveys values differences of MDS and Monte Carlo analysis on each study site. Analysis outcome shows that Tampo having point from 0.01 to 0.25, Padangiring is 0.15 – 0.56, and Sangkaropi is 0.30 – 0.45. The value differences of those three sites study is shown at very small inaverage below 1, from 0.01 to 0.56. This indicates that error in MDS and Rap To-PF analysis can be minimized. In other words, sustainable analysis of private forest management can be explained as follows:(1) Error in the making of scoring at each indicator is relatively small, (2) Variation of Score making due to opinion and assessment who made by researcher is relatively slight, (3) Data analysis that repeatedly done is relatively stable, and (4) Error in input and data lost can be avoided.

Furthermore, to find out whether the indicators which have been reviewed in MDS analysis are quite accurate and accountable scientifically which visualized from stress value and co-efficiency determinant value (R^2). The value is appeared automatically at MDS analysis through Rap To-PF technique. The analysis result is presumably being adequately accurate and could be accounted if it had stress values smaller than 0.25 or 25 % [18]. The smaller stress point which is obtained, the better quality of the analysis result applied in. It is existed in determination of co-efficient value (R^2), quality of analysis would be better if determinant co-efficient value is bigger that is closed to 1 or 100% [6].

Table 3: Stress values and determinant co-efficient (R^2)

| | Tampo | | Padangiring | | Sangkaropi | |
|------------------------|----------|-------|-------------|-------|------------|-------|
| | S-Stress | R^2 | S-Stress | R^2 | S-Stress | R^2 |
| Sustainability aspects | | | | | | |
| Socio -cultures | 0.156 | 0.943 | 0.146 | 0.947 | 0.138 | 0.948 |
| Institutional | 0.165 | 0.939 | 0.145 | 0.948 | 0.152 | 0.944 |

Source : Data Analysis, 2015

Table 3 presents stress values and co-efficient determinant (R^2), the result of MDS analysis on the three sites study. Stress values ranges from 0.138 to 0.165 which is smaller than 0.25 or 25 % and co-efficient determinant (R^2) ranges from 0.939 to 0.948 which is closed to 1 or 100%. Therefore, the two parameters (Stress and R^2) and thus can be assumed all indicators which is occupied in the sustainable analysis of private forest management from socio-cultural and institutional aspects are relatively positive whereby additional indicators are not necessary to approach the real condition.

4. Conclusion

Sustainability status of private forest management in Tana Toraja and North Toraja can be reviewed as follows: (1) Socio-cultural aspect (52.15 % - 57.68%) categorizes as quite sustainable, and (2) Institutional aspect (27.83-47.20%) which is less sustainable.

Sensitive indicator effected or needed to intervene toward improvement of sustainability status of private forest management as many as four indicators from 15 indicators such as: educational degree, allocation of private forest in one Tongkonan (socio-cultures aspect), funding support, and organizational development (institutional aspect).

MDS analysis uses Rap To-PF error influence, can be minimized at accountable level of 95 %. As a result, this method can be used to evaluate level of sustainability management of private forest in the socio-cultural and institutional aspects.

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