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# Grouping of Performance Effectiveness Assessment of Forest Management Units in North Sumatra Province

Tumpak Dolok Siregar[1,2], OK Hasnanda Syahputra[2], Siti Latifah[2]
[1]*Department of Environment and Forestry, North Sumatra Province, Indonesia*
[2]*Faculty of Forestry, Universitas Sumatera Utara, Indonesia*
*Corresponding author:* siregar.tumpak@gmail.com; okhasnanda@usu.ac.id

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**ABSTRACT**

Forest Management Units (FMU) are established to realize the effective and sustainable management of forests and other management plans, including organization, implementation management, as well as control and supervision. The management of forests by FMU is closely tied to the role of existing human resources, both qualitatively and quantitatively, as well as the rate of deforestation. To understand the extent of FMU's performance success, an instrument in the form of a Performance Assessment is needed as an evaluation tool for achieving forest management, one of which is by using the questionnaire based on the Technical Guidelines for Assessing Effective Forest Management Institutions in Supporting Independent Communities and Sustainable Forests from the Director of Forest Utilization Planning Development. The performance assessment variables are then processed using cluster analysis to obtain groupings of FMUs in North Sumatra Province based on clusters and the average effectiveness value of FMUs. The research results show that there are 3 Clusters with details for Cluster I consisting of 7 (seven) Units, Cluster II consisting of 11 (eleven) Units, and Cluster III consisting of 15 (fifteen) Units. The characteristics obtained in Cluster 1 indicate that all variables are above the population average, which represents Effective FMUs.

**Keyword:** Cluster Analysis, Clustering K-Means, Effectiveness of FMU, Forest Management Unit, Organization

## 1. Introduction

The 2015-2019 National Medium-Term Development Plan (RPJMN) is one of the priority activities for sustainable forest management which is outlined into priority projects for strengthening Forest Management Units in the form of forest governance that is prioritized in realizing the formation of all Forest Management Units (FMU), accelerating boundary demarcation, confirming forest areas, and allocating greater forest utilization to the community. Forest management is carried out by improving forest governance in Indonesia, one of which is by establishing Forest Management Units (FMU) [1]. The establishment of FMU is expected to be used as an opportunity for conflict resolution and play a role in the context of improving forest governance that guarantees business certainty and also justice for communities around forest areas.

The FMUs region in North Sumatra Province consists of 33 FMUs divided into 18 (eighteen) units of Protected Forest Management Units (KPHL) and 15 (fifteen) units of Production Forest Management Units (KPHP). Although in terms of quantity, the number of FMUs has reached the target, the development of FMUs still faces various obstacles, including: challenges related to the working relationship between FMUs and the Ministry, human resources, funding mechanisms and organization, support from central and local policies related to cooperation between parties and strategic consolidation with national programs [2], differences in

perception regarding FMUs, insufficient regulations related to FMUs, weak coordination among policymakers, and low community participation [3]. These obstacles then impact the effectiveness of FMUs performance in managing forests in each FMUs region.

To determine the success of FMU performance, an instrument is needed in the form of a Performance Assessment as an evaluation tool for achieving forest management at the site level, both at the Production FMUs and the Protected FMUs. In addition, the objectives to be achieved in measuring FMU performance include determining the level of achievement of organizational goals, facilitating the Government in formulating policy improvement strategies, improving FMU performance, and providing learning facilities and motivating employees [4].

Many studies have examined the performance measurement of FMU using methods such as the Forest Watch Indonesia (FWI) Method, the Operational Assessment Method for FMU, and the FMU Performance Instrument Method, each having the characteristic that FMU is the management level at the site and has the authority for self-management of forest area utilization. With the enactment of Law No. 11 of 2020/Regulation No. 2 of 2020 concerning Job Creation, FMU has undergone a structural organizational role with a facilitation function according to its responsibilities, rather than being the executor of site-level forest management. The study conducted using the effectiveness FMU Method is an evaluation and refinement of the previous performance assessment methods that align with the authority, duties, and functions of FMU. This study is expected to provide additional information related to the success of forest management in North Sumatra Province, so that it can be used as a source of information in studies related to FMU development performance in North Sumatra Province in the future.

## 2. Methodology

The performance assessment of FMUs is conducted by collecting data through a questionnaire containing a list of questions and conducting interviews with 33 (thirty-three) FMUs within the scope of the Regional Environmental and Forestry Office of North Sumatra Province, namely from FMU I to XXXIII. The performance assessment is based on the questionnaire included in the Technical Guidelines for Assessing Effective Forest Management Institutions in Supporting Self-Reliant Communities and Sustainable Forests, issued by the Director of Forest Utilization Planning Development in accordance with Decree Number: SK.14/BRPH/PKPH/HPL.0/07/2022 dated July 15, 2022. The results of the questionnaire responses are then processed using cluster analysis in SPSS to observe the grouping of FMUs in North Sumatra Province based on clusters and to determine the average effectiveness assessment of FMUs.

Cluster analysis or group analysis is a data analysis technique that aims to group an object or individual into one group that has relatively homogeneous properties but has different properties between groups. With cluster analysis, it will be possible to group large amounts of observation data with relatively many variables, so that the data reduced by groups will be easy to analyze. The cluster analysis used in this study begins with the stage of determining the Cluster Analysis variables which are then carried out by selecting the Cluster Analysis design with the right similarity measurements and Data Standardization and Observation Standardization. The next stage is to assume cluster analysis which is continued with cluster formation (if the hierarchical method) to identify the number of clusters that should be formed. The next stage is Cluster Interpretation, namely by giving the right label or name and characterizing the characteristics of the cluster to determine the characteristics of each cluster, and then Validation and Profiling of the clustering results are carried out to check the stability of the cluster analysis results obtained [5].

Before conducting cluster analysis, the data was tested for multicollinearity which was conducted to test for independent variables that had similarities with other independent variables [6] and to see the correlation between variables using VIF values [7], so that if there was data that showed multicollinearity, then data transformation into natural logarithm form [8]. To test for multicollinearity by looking at the tolerance value where if the tolerance value $\leq 0.1$ and the VIF value $\geq 10$ then multicollinearity occurs.

The multicollinearity test has previously been conducted on 42 variables in the questionnaire, and it was found that the data in question showed the presence of multicollinearity, making cluster analysis impossible to perform using 42 (forty-two) variables. This is likely due to the numerous and varied nature of these variables. Therefore, identification was carried out by grouping the 42 (forty-two) variables into 10 (ten) variables to avoid the exclusion of variables when processing data with SPSS. The identification of relative similarities of

the criteria was carried out and grouped into 10 (ten) variables consisting of Budget, Resources, Document Preparation Plan, Activity Implementation Plan, Coordination Plan, Management Plan Preparation, Activity Implementation, Coordination Implementation, Community Empowerment, and Sustainable Forest Management.

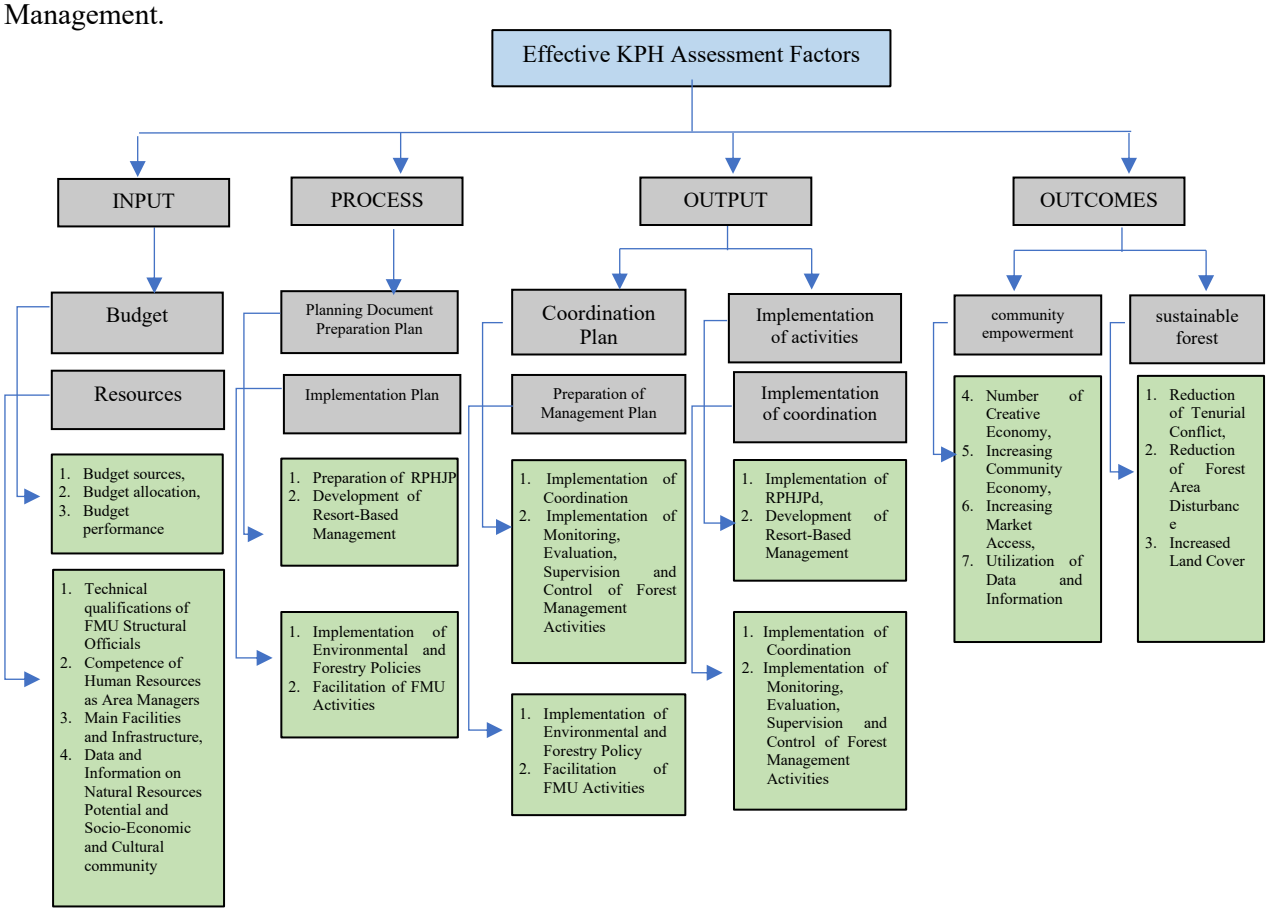


**Figure 1.** Research Factor Framework Analysis.

## 3. Results and Discussion

After obtaining the results of the self-assessment questionnaire conducted by the FMUs, an analysis of the data is carried out and then grouped into 10 (ten) variables. Before conducting cluster analysis, the data was tested for multicollinearity, where based on the results of the multicollinearity test, it was found that the data to be subjected to cluster analysis did not show any multicollinearity so that cluster analysis could be carried out.

**Table 1.** Results of multicollinearity test

| Model | | Collinearity Statistics | |
|---|---|---|---|
| | | Tolerance | VIF |
| 1 | budget | 0.213 | 4.698 |
| | resources | 0.321 | 3.117 |
| | document preparation plan | 0.315 | 3.175 |
| | activity implementation plan | 0.136 | 7.340 |
| | FMU coordination plan | 0.116 | 8.599 |
| | preparation of management planning | 0.188 | 5.329 |
| | implementation of activities | 0.240 | 4.160 |
| | implementation of coordination | 0.254 | 3.943 |
| | community empowerment | 0.294 | 3.405 |
| | achievement of sustainable forests | 0.525 | 1.903 |

Based on the results of Cluster analysis using SPSS, the results showed that there were 3 (three) Clusters with details for Cluster I as many as 7 (seven) units, Cluster II as many as 11 (eleven) units and Cluster III as many as 15 (fifteen) units. The details of each unit for each Cluster can be seen in Table 2.

**Table 2.** Results of Effective KPH Assessment based on Cluster Analysis

| No | Cluster I (7 unit) | Cluster II (11 unit) | Cluster III (15 unit) |
|---|---|---|---|
| 1 | Unit VI | Unit IX | Unit I |
| 2 | Unit XII | Unit X | Unit II |
| 3 | Unit XVII | Unit XI | Unit III |
| 4 | Unit XVIII | Unit XIII | Unit IV |
| 5 | Unit XIX | Unit XIV | Unit V |
| 6 | Unit XXVIII | Unit XXIV | Unit VII |
| 7 | Unit XXIX | Unit XXV | Unit VIII |
| 8 | | Unit XXVI | Unit XV |
| 9 | | Unit XXVII | Unit XVI |
| 10 | | Unit XXX | Unit XX |
| 11 | | Unit XXXII | Unit XXI |
| 12 | | | Unit XXII |
| 13 | | | Unit XXIII |
| 14 | | | Unit XXXI |
| 15 | | | Unit XXXIII |

To find out the effective value of the variables, the variables are then processed using cluster analysis in SPSS to see the grouping of KPH Units based on clusters and to find out the average assessment of KPH effectiveness. Determination of variables that affect KPH effectiveness can be seen in the mean/average assessment of KPH effectiveness. The final results of the cluster analysis can be seen in Table 3.

**Table 3.** Final results of cluster analysis

| No | Variabel | Cluster | | | Mean |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | |
| 1 | budget | 5.20 | 4.30 | 3.69 | 4.213 |
| 2 | resources | 8.52 | 7.16 | 6.17 | 6.996 |
| 3 | document preparation plan | 2.13 | 1.58 | 1.55 | 1.681 |
| 4 | activity implementation plan | 15.16 | 13.60 | 9.00 | 11.841 |
| 5 | FMU coordination plan | 3.11 | 2.59 | 1.95 | 2.409 |
| 6 | preparation of management planning | 2.04 | 1.81 | 1.59 | 1.759 |
| 7 | implementation of activities | 14.85 | 13.13 | 10.59 | 12.341 |
| 8 | implementation of coordination | 3.02 | 2.82 | 2.28 | 2.618 |
| 9 | community empowerment | 11.08 | 7.43 | 7.08 | 8.046 |
| 10 | achievement of sustainable forests | 9.09 | 10.50 | 8.01 | 9.068 |
| | | 74.20 | 64.92 | 51.91 | 60.972 |

Based on the table above, there is no missing data in the cluster analysis, and as many as 7 (seven) Units are in cluster I, as many as 11 (eleven) Units are in cluster II and as many as 15 (fifteen) Units are in cluster III, with the following predictions:

Cluster I

The characteristics obtained in cluster I are that all variables are above the population mean. From the results of this analysis, it can be concluded that the KPH Units in cluster I are Effective KPHs as many as 7 (seven) units.

Cluster II

The characteristics obtained in cluster II are as many as 2 (two) variables below the population mean and as many as 8 (eight) variables above the population mean. The variables above the population mean are budget variables, resources, activity implementation plans, KPH coordination plans, preparation of management plans, implementation of activities, implementation of coordination, and achievement of sustainable forests. From the results of this analysis, it can be concluded that the KPH Units in cluster II are Quite Effective KPHs as many as 11 (eleven) units.

Cluster III

The characteristics obtained in cluster III are that all variables are below the population average. From the results of this analysis, it can be concluded that the KPH Units in cluster III are Less Effective KPHs as many as 15 (fifteen) units.

The Effective KPH value based on the Cluster analysis of the Assessment Indicators on the criteria obtained results that the KPH units in North Sumatra Province that have an Effective KPH value are presented in Table 4.

**Table 4** Results of Cluster Analysis on Effective KPH Grouping

| No | Unit | Score |
|---|---|---|
| 1 | Unit VI | 70.975 |
| 2 | Unit XII | 71.050 |
| 3 | Unit XVII | 72.400 |
| 4 | Unit XVIII | 72,325 |
| 5 | Unit XIX | 73.375 |
| 6 | Unit XXVIII | 73.150 |
| 7 | Unit XXIX | 85.975 |

In this study, the cluster method was used to group FMU units in North Sumatra Province. Cluster analysis is a multivariate technique that has the main objective of grouping objects/cases based on their characteristics so that each object that has similar characteristics (the closest similarities) will be grouped into the same cluster (group) [9]. Based on the calculation results with Cluster analysis on Effective KPH, there are 3 (three) KPH clusters where in the three clusters there is 1 (one) Cluster with the highest mean value, namely Cluster I. There are only 7 (seven) units in cluster I with the highest results were obtained in the first order of Unit XXIX with a value of 85.975, the second order of Unit XIX with a value of 73.375, the third order of Unit XXVIII with a value of 73.150, the fourth order of Unit XVII with a value of 72.400, the fifth order of Unit XVIII with a value of 72.325, the sixth order of Unit XII with a value of 71.050 and the seventh order of Unit XII with a value of 70.975.

Based on the assessment results, there are 15 (fifteen) Clusters with less effective values, which is still more than KPHs with effective values. The North Sumatra Government is expected to be able to improve the supporting variables in the assessment that make KPH effective, namely budget, resources, document preparation plan, activity implementation plan, FMU coordination plan, preparation of management planning, implementation of activities, implementation of coordination, community empowerment and achievement of sustainable forests, so that with full support from the government, the number of effective KPHs in North Sumatra Province can increase.

*3.1. Budget*

The budget is one of the important sectors in forest management to strengthen the institutional capacity of the FMU through support from the State Revenue and Expenditure Budget, the Regional Revenue and Expenditure Budget, Special Allocation Funds, and various other funding supports. Although Law No. 11/2020 on Job Creation and its subsequent regulations, namely Government Regulation No. 23/2021 on Forest Management, have removed the authority of self-management for FMU, thereby making FMU function only as a facilitator, local governments continue to provide operational support and funding for forest management by FMU. The adequacy and availability of the budget are very important for the implementation of forest management activities in FMU. However, in reality, some activities in FMU are not carried out due to the lack of budget. This is due to many activities planned through the Long-Term Forest Management Plan not being accommodated in the regional budget. The results of the [10] study that during 2018 - 2020 the North Sumatra Provincial Forestry Service budget was considered not good in terms of budget use, especially the harmony of spending between direct and indirect spending because the average indirect spending was 79%, while for direct spending it was 22%. The impact if indirect spending is greater than direct spending, it will have an impact on regional development which will result in reduced funds that are in contact with the community or on agency activity programs.

*3.2. Resources*

Each FMU has a Head of FMU and FMU personnel (Structural Officials and Staff) who must meet the standards of competence in forestry technical fields and administrative requirements in accordance with the provisions of regulations. According to [11] the limited number and quality of HR in FMU is a major challenge for the development of FMU today. It is necessary to improve the fulfillment of HR needs both in terms of quality (competence) and quantity (number). The standards of competence in the technical fields of forestry can be obtained through education and training. Currently, the number of FMU human resources is still insufficient, so it is necessary to increase both the quantity and their capabilities, considering the vast working

area, along with adding infrastructure facilities and means of forest management by FMU. In addition, the resources available in the FMU include the potential natural resources in the form of timber, non-timber forest products, and environmental services within the management area of the FMU unit, which have become an attraction for investors and the surrounding community. Therefore, to determine a mutually beneficial investment activity, a detailed identification of forest resource potential is needed as data for the FMU and investors. However, until now, data regarding the potential of natural resources in FMU units is still minimal, thus requiring an inventory activity to ascertain the potential forest resources in the FMU management area.

*3.3. Document Preparation Plan*

The forest management planning document is prepared by the FMU, which consists of a Long-Term Forest Management Plan to serve as a reference in the preparation of the Short-Term Forest Management Plan for each unit for forest management activities. Forestry management plans also need to be prepared to ensure sustainable use of forest resources. Forestry planning at the provincial level contains a description of current forestry conditions, existing institutional conditions, economic, social and ecological contributions related to strategic issues at the provincial level [12].

*3.4. Activity Implementation Plan and Implementation of Activities*

Before carrying out an activity, the FMU creates an Activity Implementation Plan so that the implementation of forest management activities can run efficiently and effectively. Based on the assessment results, all FMU units have planned the implementation of activities in forest management in their respective management areas, but in reality, the planned activities have not been fully implemented. This is due to the lack of synchronization between the Performance Plans of each FMU and the Performance Plans of each Department within the Environment and Forestry Office.

*3.5. FMU Coordination Plan and Implementation of Coordination*

The process of preparing the forest management plan at the Management Unit is carried out participatively by involving various parties. In addition, coordination is very necessary in the preparation of forest management planning by involving related stakeholders such as academics, business practitioners, media, the community, government, social community institutions, holders of forest utilization licenses, holders of usage approvals, holders of forest area release approvals, and holders of social forestry management approvals. According to [13], by conducting coordination before the preparation of forest management planning, contradictions in objective setting between work units and higher management levels do not occur.

*3.6. Preparation of Management Planning*

FMU as a Regional Technical Implementation Unit (UPTD) becomes a structural organization with a facilitation function, no longer as an entity that can directly utilize forest resources. The clause that forest utilization must not be conducted by KPH contradicts Law No. 41 of 1999 Article 21, which states that forest utilization is part of forest management [14].

*3.7. Community Empowerment*

Forest management is also carried out through social forestry management mechanisms which are efforts to provide legal access to local (customary) communities for the utilization of forest areas, resolution of forestry tenure conflicts, as well as improving their welfare, environmental balance, and socio-cultural dynamics in the form of Village Forests (HD), Community Forests (HKm), People's Plantations (HTR), Customary Forests (HA), and Forestry Partnerships. Through this PS mechanism, it is hoped that there will be empowerment of communities around the forest in the operational areas of the FMU.

*3.8. Achievement of Sustainable Forests*

According to [15], there are FMU activities that are carried out and have an impact on reducing deforestation. The spirit of Social Forestry is inseparable from efforts to save forests while providing a decent and prosperous life for the communities around the forest. Granting permits gives the community a commitment and mandate to protect the forest and its contents. In addition to providing economic and environmental benefits, another benefit of Social Forestry is unraveling prolonged tenure conflicts and land inequalities. Through this program, farmers in forest areas receive guarantees of legality or access rights to manage land in forest areas for planting various economically valuable crops. There are no more conflicts or land disputes with the government and permit holders.

## 4. Conclusion

Based on the results of the Cluster Analysis Assessment using SPSS, there were 7 (seven) Effective KPH Units, namely Unit VI, Unit XII, Unit XVII, Unit XVIII, Unit XIX, Unit XXVIII and Unit XXIX. Meanwhile,

the factors that influence the assessment of the Effectiveness of the Performance of the Forest Management Unit (KPH) Organization in North Sumatra Province are Budget, Resources, Preparation and Implementation of RPHJP/RPHJPd, Resort-Based Development, Coordination between Stakeholders, Facilitation of KPH Activities, Monitoring and Evaluation, Community Empowerment and Sustainable Forest Management. In addition, the results of this assessment can add information regarding the success of forest management in KPHs in North Sumatra Province, thus serving as a source of information in future studies related to the performance of KPH development in North Sumatra Province.

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