Application of analytical hierarchy process in implementation of community forest management permit work plan

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Abstract. Community Forest Utilization Business Permit (CFUBP), is a permit granted to utilize forest resources in forest areas whose main use is intended to empower local communities. This study aims to analyze the priority level of the implementation of the Annual Work Plan (AWP) for CF management in Bina Mangrove Forest Farmers Group (FFG), Sentang Village, Teluk Mengkudu District, Serdang Bedagai District. The research was conducted from January to March 2021 using primary and secondary data. The method used is Analytical Hierarchy Process (AHP) using expert choice software tools. The data collection method is Focus Group Discussion (FGD). From the results of seeding with AHP, the priority for implementing the Annual Work Plan (AWP) for CF management in the Bina Mangrove FFG is the forest utilization criteria with a value of 0.54. The criteria for forest protection or security, development of local wisdom, monitoring and evaluation are next with the same value of 0.14. The criteria for marking the boundaries of the working area or zoning are in the last order with a value of 0.04. The value of inconsistency is 0.08.

1. Introduction
Community Forest Utilization Business Permit (CFUBP), is a business permit granted to utilize forest resources in protected forest areas and production forests. CFUBP Business Plan is a work plan prepared by CF holders. The plan includes activities for marking working area boundaries, dividing blocks or zoning work areas, forest utilization, protection, forest security, and developing local wisdom based on the Regulation of the Directorate General of PSKL No. 16 [1]. According to Purbawiyatna et al. [2], sustainable forest management must pay attention to several aspects, namely ecological or environmental functions, social and economic functions. Meanwhile, according to Nandini [3] the management includes technical aspects consisting of biophysical conditions of the place, stand potential, land suitability, farming techniques, application of conservation techniques and silviculture. The economic aspect consists of potential economic value, product marketing techniques. The institutional aspect consists of the profile and management system of CF.

According to Marsono [4] Analytical Hierarchy Process (AHP) is a method for solving a complex unstructured situation into several components in a hierarchical arrangement, by assigning a subjective value to the relative importance of each variable, and determining which variable has the highest priority in order to affect the outcome of the situation. According to Rahmawaty et al [5] there are four stages in AHP, namely; arrangement of the problem hierarchy, pairwise comparison assessment, priority and consistency. According to Mustika [6] the working principle of the AHP method is
identification of causal factors, hierarchical arrangement, prioritization, consistency and priority weighting. The causal factors can be expanded into criteria in decision making. The arrangement of the hierarchy is to determine which are faced which are the goals of the system as a whole. Meanwhile, according to Tominanto [7] the arrangement of the hierarchy is done by determining goals at the top level.

According to Makkasau [8] the determination of the priority of each criterion and alternative is done by making a comparison of the two in pairs. From this comparison, a qualitative opinion value will be obtained. To obtain a quantitative value, an opinion rating scale is used in the form of numbers. Rahmawaty [9] uses the AHP application in making participatory and better land use decisions. Wedayani and Widyasari [10] used the AHP method to plan forest management strategies in order to obtain a series of community business strategy priorities in forest sustainability. The purpose of this study was to analyze the priority level of the implementation of the Annual Work Plan (AWP) for CF management in Bina Mangrove Forest Farmer Groups (FFG), Sentang Village, Teluk Mengkudu Subdistrict, Serdang Bedagai District.

2. Research Methods

2.1. Research location and time
The research was conducted at KTH Bina Mangrove, Sentang Village, Teluk Mengkudu Subdistrict, Serdang Bedagai District. This KTH is located at 99°08'16.7" E – 03°33'45.8" N to 99°09'07.3"E – 03°33'23.4" N. The map and condition of the research location are presented in Figure 1 and Figure 2. The study was carried out from January to March 2021.

Figure 1. Map of CFUBP Bina Mangrove FFG Working Area
2.2. Research tools and materials
The tools used in the research are; stationery, laptops, cameras, recorders and Expert Choice software. While the material used is a survey questionnaire to determine the priority order of the implementation of the 2020 AWP in the Bina Mangrove FFG.

2.3. Data collection

2.3.1. Primary data. Primary data is data obtained directly from data sources. Primary data in this study were obtained through questionnaires or interviews.

2.3.2. Secondary data. Secondary data is data supporting research which includes the general condition of the research location, both the physical environment, socio-economic community, and population identity statistics. Other supporting data consists of FFG membership data, RKU data for the 2020-2029 period and RKT for the 2020 period, as well as other data related to research sourced from the library.

2.4. Research object collection method
To determine the priority of AWP implementation, the method used is Analytical Hierarchy Process (AHP) using expert choice software tools. The data collection method is Focus Group Discussion (FGD), which is a systematic process of collecting data and information about a particular and specific problem through group discussions. The sources used are based on position, expertise and experience. In this study, the resource persons used were the Head of the Technical Implementation Unit (TIU) of the Pematangsiantar Region II Forest Management Unit (FMU), Forestry Extension or Companion Extension and Bina Mangrove FFG Management.

2.5. Data analysis technique
To analyze the prioritization of AWP implementation using the Analytical Hierarchy Process (AHP) method, the procedure is as follows:
1. Arrange the hierarchy in the AHP hierarchical structure chart
2. Create a pairwise comparison matrix between criteria
3. Setting the priority weight of the criteria
4. Measuring logical consistency

Figure 2. Condition of Research Location at Bina Mangrove FFG
5. Make a pairwise comparison matrix and the priority weights between alternatives in relation to the criteria and measure their logical consistency
6. Make global priorities
7. Return to the hierarchical study chart and write down the calculation results in the respective criteria and alternative boxes
8. Making decisions based on the results of data processing using expert choice software

The hierarchical structure of the research is as follows:

1. The main goal (G)
   The goal in this research is Determination of Priority for Implementation of the 2020 Work Plan at CFUBP Bina Mangrove FFG

2. Criteria (C)
   The criteria in this study are:
   2.1. Marking of work area boundaries or zoning
   2.2. Forest utilization
   2.3. Forest protection or safety
   2.4. Development of local wisdom
   2.5. Monitoring and evaluation

3. Alternatives (A)
   The alternatives in this research are:
   3.1. Technical aspects
   3.2. Socio-economic aspects
   3.3. Institutional aspects

The research hierarchy structure chart is presented in Figure 3.

![Figure 3. Chart of research hierarchical structure in Bina Mangrove FFG](image)

3. Results and Discussion
From the data analysis obtained the weight of the criteria presented in Table 1.
Table 1. Criteria Weights of AHP Output Bina Mangrove FFG

| No | Criteria                                      | Value of Criteria | Ranking |
|----|-----------------------------------------------|-------------------|---------|
| 1  | Marking of work area boundaries or zoning     | 0.04              | 5       |
| 2  | Forest utilization                            | 0.54              | 1       |
| 3  | Forest protection or safety                   | 0.14              | 3       |
| 4  | Development of local wisdom                   | 0.14              | 3       |
| 5  | Monitoring and evaluation                     | 0.14              | 3       |

Inconsistency = 0.08

From the Figure 3, it can be seen that the criteria for forest utilization are in the first place with a value of 0.54, followed by the criteria for protecting or safeguarding forests, developing local wisdom, monitoring and evaluating the same number, namely 0.14. While the criteria for marking the boundaries of the work area or zoning are in the last order with a value of 0.04 with a value of the level of inconsistency at 0.08. For the weight of each alternative can be seen in Table 2.

Table 2. Alternative Weights of AHP Output Bina Mangrove FFG

| No | Alternative                                    | Value of Alternative | Ranking |
|----|-----------------------------------------------|----------------------|---------|
| 1  | Technical aspects                              | 0.21                 | 2       |
| 2  | Socio-economic aspects                         | 0.59                 | 1       |
| 3  | Institutional aspects                          | 0.20                 | 3       |

Inconsistency = 0.08

Based on the figure, it can be seen that the alternative weights of socio-economic aspects are in first place with a value of 0.59, technical aspects are in second place with a value of 0.21 and institutional aspects are in third place with a value of 0.20 with an inconsistency value of 0.08. The value of inconsistency of criteria and alternatives is below 10%. This shows that the respondents' answers are consistent so that the research does not need to be evaluated and re-interviewed. This is in line with Marsono's [4] statement if the value of inconsistency is greater than 10%, the research needs to be evaluated and re-interviewed with informants regarding comparisons between elements.

The criteria for forest use are the priorities for the implementation of the AWP that face the most obstacles. The socio-economic aspect is one alternative that has an impact on its implementation. Activities in this group require substantial funds. One of them is the development of environmental services or tourism services. The implementation of these activities requires cooperation and large capital. Therefore, the group needs to establish cooperation with outside parties. The criteria for security or protection, the development of community local wisdom as well as monitoring and evaluation activities are at the same level. These three activities have the same importance to be carried out. In the implementation of monitoring and evaluation, Saraan et al. [11] stated that the activity consisted of monitoring and evaluation activities, holding regular meetings to discuss the progress of activities, and evaluating activities. Fellow group members can work together to view and evaluate the business being managed. For border activities, there are not many obstacles because the permit boundaries are marked with natural boundaries such as beaches and river flows.

The technical aspects related to understanding the potential and human resources are alternatives that must be overcome. The implementation of CFUBP socialization and training activities for groups is an alternative to overcome the problem. One strategy in solving institutional problems is to establish good cooperation between group members and partnership agencies. With cooperation, major problems, especially in capital procurement, can be overcome. Requests for assistance in the form of proposals prepared by the group and addressed to relevant agencies can be an alternative to support the procurement of group capital. In addition, establishing cooperation to manage CFUBP in the form of partnerships with entrepreneurs and local governments is also very helpful for the group. This is in line with the statement by Lubis et al [12] that assistance and supervision activities by forestry
agencies are needed, especially in facilitating marketing, accessing loans, forming cooperatives and opening partnership networks.

The institutional aspect is the last alternative priority for implementing the work plan. The FFG institution is the executor of CF management. According to Lubis et al [12], group institutional assessment is carried out by assessing criteria that can reflect the group's institutional conditions. The criteria consist of: (1) management stability, (2) administrative stability, (3) permitted location stability, (4) successful business management, (5) planning, (6) boundary management, (7) protection zones and (8) protected forest. The success of management by FFG institutions cannot be separated from membership participation. According to Saraan et al [11] community participation in CF management is divided into four stages, namely; planning, implementation of activities, monitoring and evaluation and utilization of results.

The work plan that has been prepared for a period of 10 years by carrying out the concept of tourism service development will definitely attract the attention of entrepreneurs and the government to invest in it. The offer to develop potential areas, especially environmental services for mangrove forests and cypress forests on the coast, is a very promising business if managed properly. According to Rahmaway et al [9] natural resources can be managed in a multi-use manner, namely by maximizing the benefits that can be obtained. Allocation of land use for multiple uses can be achieved by the simultaneous and continuous use of several natural resource products that can be obtained on a particular land unit that requires the production of several goods and services from the same area. According to Wedayani and Widyasari [10] management must prepare a good plan and suggest types of plants that are suitable for forest conditions. Good management cannot be separated from monitoring and evaluating activities and avoiding conflicts. According to Harun and Hariyatno [13] conflict in the management of Social Forestry can affect the condition of a business, welfare, job opportunities and investment. To support higher economic growth, Rahmawaty [14] stated that land resource management is often unwise and does not consider sustainability (short-term) aspects. Socialization and law enforcement are alternatives in overcoming these problems.

Rahmawaty et al [15] stated that natural resource management often requires alternative management decisions. The decision-making instrument must be rational, careful and justifiable. AHP is one technique that can be used in making these decisions. AHP can analyze the suitability of the location and the general ability of the land. AHP can cover a variety of managerial and planning tasks such as management and planning for watersheds related to water quality and quantity, forest management, wildlife management, and recreation. Input from experts is needed on the social, legal, and political aspects of the condition and value of resources. AHP is relatively easy to apply, understand, and interpret.

4. Conclusion
The priority for implementing the Annual Work Plan (AWP) for CF management in the Bina Mangrove Forest Farmers Group is the forest utilization criteria with a value of 0.54. The criteria for forest protection or security, development of local wisdom, monitoring and evaluation are next with the same value of 0.14. The criteria for marking the boundaries of the working area or zoning are in the last order with a value of 0.04. The value of inconsistency is 0.08. The alternative weights of socio-economic aspects are in first place with a value of 0.59, technical aspects are in second place with a value of 0.21 and institutional aspects are in third place with a value of 0.20 with an inconsistency value of 0.08.

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