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Measurement of Boundaries and Installation of Boundary Marks for the Function of The Muara Mahat Limited Production Forest in Kampar District, Riau Province

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ABSTRACT
Forest areas that remain with permanent boundaries, namely location, location, area and boundaries that are fixed and definite physically in the field and have legal certainty. To achieve certainty of forest areas, forest area confirmation is carried out, through a long process, namely designation of forest areas, boundary arrangement, mapping and determination of forest areas. The purpose of the Functional Boundary Arrangement is to make the Functional Boundary Mark of the Muara Mahat Limited Production Forest Area in Kampar Regency, Riau Province have legal certainty regarding the location, area and boundaries both administratively and physically in the field. The methods used in general are: Observation, is an activity for observing satellite signals to boundary markers in the Muara Mahat Limited Production Forest Area, Kampar Regency, Riau Province. Receiver, to measure auxiliary points or turning points with a distance of approximately 100 meters. The results of the implementation of the Definitive Boundary Arrangement activity in the form of a map with the title "Map of the Muara Mahat Limited Production Forest Area Boundary Arrangement in Kampar Regency, Riau Province Scale 1: 50,000" which consists of 1 map sheet. In making the map, it is equipped with various symbols according to the information found in the field and contains a situation map on a scale of 1: 1,000,000, signed by the Forest Area Boundary Arrangement Committee. Of the 59 (fifty-nine) boundary markers that are attached, there are measurement points that are carried out using a GPS receiver type GPS receiver type navigation brand Garmin 64SC with an absolute method by averaging with a distance of ± 100 meters. Measurements using GPS Navigation are used as a reference for the measurement route and as a benchmark for the Boundary Pal seal.

Keywords: *Boundary Mark, Limit Measurement, Mahat Estuary*

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INTRODUCTION

Forestry management aims for equitable and sustainable people's prosperity by ensuring the existence of forests with sufficient area and proportional distribution; optimizing various forest functions including conservation functions, protection functions, and production functions to achieve balanced and sustainable environmental, social, cultural, and economic benefits; increasing the carrying capacity of river basins; increasing the ability to develop community capacity and empowerment in a participatory, equitable, and environmentally aware manner so as to create social and economic resilience and resilience to the effects of external changes; and ensuring equitable and sustainable distribution of benefits. (Article 3 of Law of the Republic of Indonesia no. 41/1999 concerning forestry). The dependence of residents in and around forest areas on forest resources is a very common condition in Indonesia. The closeness of their interaction is greatly influenced by the cultural order that has been passed down from generation to generation, because forests are considered capable of providing physical and spiritual well-being (Supriyanto, 2012).

Forests in Indonesia are the third largest tropical forests in the world, which function as the lungs of the world that can produce oxygen gas to meet the survival of humans, animals, plants, and can absorb carbon dioxide, which is carbon that is harmful to human life. Most human life directly or indirectly depends on the existence of forest resources. Therefore, the obligation to maintain and manage the sustainability of nature is a challenge for society, including in managing forest sustainability (Benita, 2022).

Kartodiharjo, et al. (2011). Stated that one of the main prerequisites in sustainable forest management is the existence of a fixed forest area with permanent boundaries, namely location, position, area and boundaries that are fixed and definite physically in the field and have legal certainty. To achieve certainty of the forest area, forest area confirmation is carried out, through a long process, namely designation of forest areas, boundary arrangement, mapping and determination of forest areas. The entire series of activities are a unity in the activity of confirming forest areas with the main objective of obtaining legal certainty over forest areas including the status of forest areas legally and physically in the field. Forest areas must have a clear and definite status (clear and clean) which is marked by boundary signs in the field and in administrative documents of the area, there is a confirmation that the area has strong legal force both in designation and determination by the authorities, there is community recognition, free from the rights of other parties, and is managed properly and correctly (Udoyo, 2014).

RESEARCH METHODOLOGY

This activity has been carried out inlocation of the Muara Mahat Limited Production Forest Area, Kampar Regency, Riau Province for 2 (two) months, starting from July 2023 to September 2023.

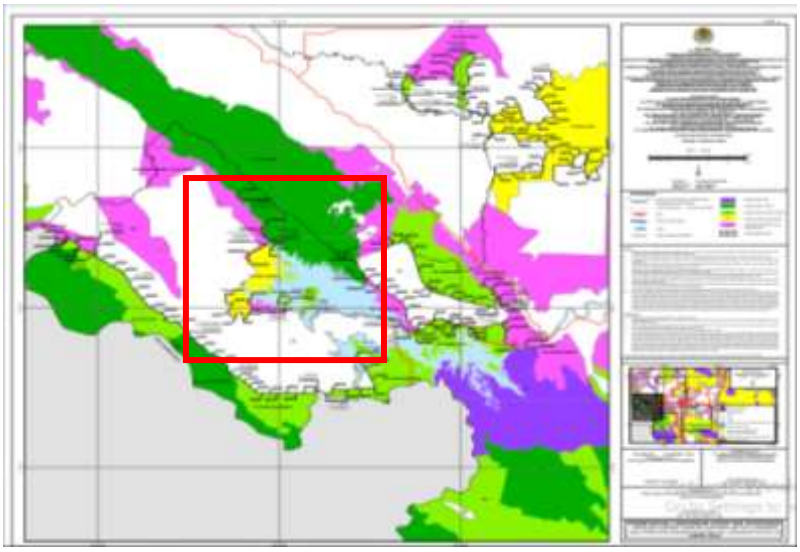

Figure 1. Work Map

Functional boundary measurement activities, first prepare the equipment, especially the feasibility of measuring instruments and other supporting tools. The things that need to be prepared before implementing the intended activity are as follows: Work Map (border projections include third party rights based on secondary data, such as: release boundaries and boundaries that have been demarcated, definitive settlements that have been decided by authorized officials), Boundary Arrangement Guidelines and Temporary Boundary Staking Work Instructions and identification of third party rights. Letters: Task Order Letter (SPT), Cover Letter, Letter of Request for Assistance for Manpower and others. Stationery, camping units, medicines and other materials/tools needed in the field Mapping type GNSS Receiver. Garmin Navigation type GNSS Receiver. Shunto Compass and digital camera.

The methods generally used are: Observation, is an activity to observe satellite signals to boundary markers in the Muara Mahat Limited Production Forest Area, Kampar Regency, Riau Province. Receiver, to measure auxiliary points or turning points with a distance of approximately 100 meters. Interview, is a Field Work Practice activity carried out by collecting data and information needed by conducting questions and answers to various parties who know or provide data information for boundary arrangement activities and information needed as data for compiling reports. Documentation, is an activity to complete data and reveal problems that are the object of discussion in the intended Field activities.

Data analysis was carried out in the qualitative descriptive category, by making simple notes obtained from observation activities, interviews in the field, then processing the data in a descriptive narrative manner accompanied by presentation in the form of tables and images to facilitate understanding related to the discussion that has been made.

RESULT AND DISCUSSION

Implementation of Boundary Arrangement

1. Boundary arrangement techniques

a. *GPS Receiver*tipe mapping to measure the pal point at each multiple of the length of the ± 100 meter limit route. Measurements using this type of Receiver are carried out withDifferential positioning method. This method is carried out by observing satellite signals at the boundary marker by paying attention to the location that can receive signals from at least 4 (four) satellites. Simultaneous observation uses one receiver at the base station and another receiver at the boundary marker or boundary monument as a rover. The distance between the base station and the rover is a maximum of 600 km. The base station used is the CORS BIG Bangkinang Basestation (CBKN) in the form of a pillar located on a pillar in the yard of the Bangkinang Telkom Plaza in Langgini Village, Bangkinang District, Kampar Regency, Riau Province with the address of the Bangkinang Telkom Plaza Jl. DI Pandjaitan No. 98, so that the geographical coordinates of the reference pillar are known to be at 101 ° 1 '19.87535" East and 0 ° 20' 14.01523" North and the ellipsoid height is 40.130 meters.

b. *Receiver*tNavigation type to measure auxiliary points / turning points with a distance of ± 100 meters. Measurement using this type is done with the absolute method, namely taking points with an averaging system with an accuracy of less than 7.5 meters.

2.Breaking the Limit

Boundary striping in measuring and installing definitive boundary markers is done by cutting down undergrowth with a minimum boundary strip width of 2 (two) meters and clearly visible in the field following the work map route, so that it can be used as a road to the next boundary point/mark, and can be used as an inspection/checking road and for forest security purposes.

3. Installation and Numbering of Boundary Markers

Field boundary marker measurements in the form of numbered zinc plates/palms and artificial boundary monuments are carried out by observing each boundary marker/zinc plate/palm point using Mapping type GNSS, the observation time at each boundary marker/zinc plate/palm point is at least 15 minutes with an epoch of 1 second. If it is not possible to observe the boundary points because the receiver cannot capture the signal, then observations are made by offset (observations are made in another place) to determine the coordinates of the boundary point by calculating the distance and azimuth to the observation point or in other ways in accordance with general provisions. (Yuwono, et., al. 2011).

In the implementation of measurements in the field using the Mapping type GNSS with observations at the boundary pole point/zinc plate/boundary monument and/or observations carried out in other places (offset), the receiver still cannot capture satellite signals, so measurements are carried out using the Navigation Type GNSS with an averaging system with an accuracy of less than 7.5 meters.

a. Border post

The boundary markers installed are made of reinforced concrete measuring 10 x 10 x 130 cm, staked to a depth of ± 60 cm so that the part above the ground is ± 70 cm. The ends of the markers are painted white along ± 20 cm and given black boundary marker numbers on both sides, namely those facing the forest area and the outer boundary of the forest area. The numbering is done sequentially clockwise, the numbering follows the work map and/or follows the instructions in the work instructions. The boundary markers are installed at intervals of ± 500 meters.

b. Border Monument

The boundary markers are made of reinforced concrete measuring 40 cm x 40 cm, staked ± 75 cm deep so that the part above the ground is ± 75 cm. The top of the boundary marker is bolted as an observation and measurement point. On both sides facing the forest area and the outer boundary of the forest area, the numbering is done sequentially following the boundary marker number. The installation of forest boundary markers is carried out at measurement points with a flat distance ranging from 5,000 meters to 15,000 meters and is attempted in a strategic place or at the turning point of the forest area boundary.

c. Bulletin board

The notice board is made of zinc plate measuring 40 cm x 30 cm with yellow base paint and black writing. The notice board is placed in a strategic position at every distance of approximately 1 km alternately attached to a large tree trunk approximately 170 cm above the ground.

4. Data Processing and Mapping

a. Differential positioning method

The process of processing measurement data using the differential positioning method in the Muara Mahat Limited Production Forest Area, Kampar Regency, Riau Province was carried out using GPS Pathfinder Office software. To correct the measurement data from the Mapping type GNSS used as a Rover during field measurements with a bond to the CORS BIG Bangkinang Basestation (CBKN) in the form of a pillar located on the pillar in the yard of the Plasa Telkom Bangkinang in Langgini Village, Bangkinang District, Kampar Regency, Riau Province with the address Plasa Telkom Bangkinang Jl. DI Pandjaitan No. 98, so that the geographical coordinates of the reference pillar are known to be at 101 ° 1 '19.87535" East and 0 ° 20' 14.01523" North and an ellipsoid height of 40.130 meters, obtained by downloading the file on the websitewww.srgi.big.go.id.

Based on the results of observations on the measurement data of points in the field taken with the GNSS Mapping type used as Rover, it is known that there is a difference in data accuracy before and after being corrected using the GPS Pathfinder Office software. Before being corrected, the accuracy ranged from 5 meters to 7 meters, but after being corrected with the CORS BIG Bangkinang (CBKN) tie point data, the accuracy increased to between 0.5 meters and 2.0 meters.

b. Absolute Method

The data processing process of measurement results using the differential absolute method in the Muara Mahat Limited Production Forest Area, Kampar Regency, Riau Province was carried out using DNR GPS software. DNR GPS software is used to convert data taken using GNSS Navigation Type.

Boundary Arrangement

1. **Measurement Results With Trimble GeoXT 3000**

   Before carrying out the post-processing process, the rover data from the measurement results of the Muara Mahat Limited Production Forest Area in Kampar Regency, Riau Province in the field on the Trimble Geo XT 3000 receiver was downloaded to a computer using Pathfinder Office 5.85 software. Next, the data from the base station measurements were obtained by downloading the file on the website.www.srgi.big.go.id.as a basis for correcting rover measurement results.

2. **Measurement Results With Garmin 60CSx**

   Of the 59 (fifty nine) boundary markers that are staked, there are measurement points that are carried out using a GPS receiver type GPS receiver type navigation brand Garmin 64SC with an absolute method by averaging with a distance of ±100 meters. Measurements using GPS Navigation are used as a reference for the measurement route and as a benchmark for the Boundary Marking.

   To improve the accuracy of the measurement results of the functional boundaries of the Muara Mahat Limited Production Forest Area, in Kampar Regency, Riau Province, the data processing process was carried out through the post-processing process using Pathfinder Office 5.85 software. The results of the post-processing process used Pathfinder Office 5.85 software. The accuracy estimate based on the processing of corrected position data is divided into several levels of accuracy: accuracy of 5-15 cm as much as 5.57%, 15-30 cm as much as 20.15%, 30-50 cm as much as 12.90%, 0.5-1 m as much as 31.63%, 1-2 m as much as 21.53%, 2-5 m as much as 7.38% and >5 m as much as 0.84%. The following are the measurement results of the Muara Mahat Limited Production Forest Area, Batu Gajah Limited Production Forest Block I, Batu Gajah Limited Production Forest Block II and Bagan Sinembah and Rangau Permanent Production Forest Block III in Kampar Regency, Riau Province after processing.

3. **Length of Boundary Route**

   The actual length of the boundary of the Protected Forest Area in the Muara Mahat Limited Production Forest Area, Batu Gajah Limited Production Forest Block I, Batu Gajah Limited Production Forest Block II and Bagan Sinembah and Rangau Permanent Production Forest Block III in Kampar Regency, Riau Province is 34,366.77 meters.

4. **Boundary Mark**

   a. Border Post

   The number of numbered concrete boundary markers measuring 10 x 10 x 130 centimeters that were made and installed was 55 (fifty five), which were installed in 4 forest area functions.

b. Boundary Monument

The boundary markers that were made and installed were 4 (four). The numbered boundary markers were made of concrete with dimensions of 40 x 40 x 150 cm.

c. Bulletin board

The number of numbered concrete boundary markers measuring 10 x 10 x 130 centimeters that were made and installed was 35 (thirty five), which were installed in 4 forest area functions.

5. Mapping

The results of the implementation of the Definitive Boundary Arrangement activity are drawn in the form of a map with the title "Map of the Boundary Arrangement of the Muara Mahat Limited Production Forest Area in Kampar Regency, Riau Province, Scale 1: 50,000" which consists of 1 map sheet. In making the map, it is equipped with various symbols according to the information found in the field and contains a situation map on a scale of 1: 1,000,000, signed by the Forest Area Boundary Arrangement Committee.

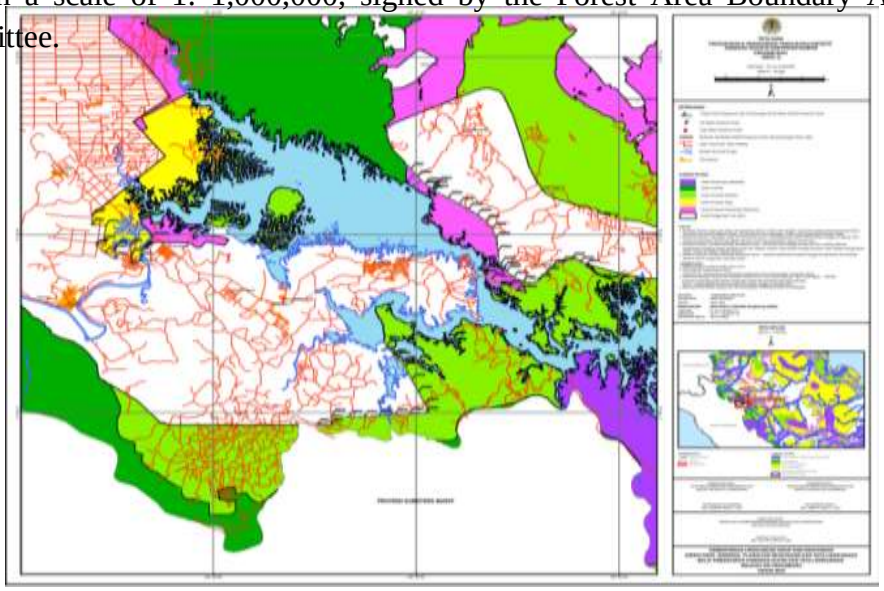

Figure 2.Results Map

CONCLUSION

Based on the research that has been carried out, it was concluded that:

Based on the Decree of the Minister of Environment and Forestry Number: SK.903/Menlhk/Setjen/Pla.2/4/12/2016 dated December 7, 2016 concerning the Riau Province Forest Area, the location of the measurement and installation of functional boundary markers located in the Muara Mahat Limited Production Forest Area, Kampar Regency, Riau Province is administratively located in the District Area of 3 (three) sub-districts, namely the Tapung District, Kuok District, XIII Koto Kampardi District, Kampar Regency, Riau Province. The results of field measurements of the realization of the functional boundary markers in the Muara Mahat Limited Production Forest Area, Kampar Regency, Riau Province are 34,366.77 meters long and 55 stakes and 4 boundary monuments.

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Law Number 41 of 1999 concerning Forestry, the implementation of forest protection and nature conservation aims to protect forests, forest areas and their environment, so that the protection function, conservation function and production function are achieved optimally and sustainably.