GEOGRAPHIC INFORMATION SYSTEM OF COMMUNITY SEEDLING NURSERY IN WATERSHED AND PROTECTED FOREST MANAGEMENT UNIT OF CIMANUK-CITANDUY

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ABSTRACT

Community Seedling Nursery (CSN) is seedling nursery managed by community groups through the production of seeds of various timber plants or Multi-Purpose Tree Species (MPTS). Determination of the type of plant to the critical planting location is conducted by examining the economic value and the seed zone of the plant. It leads to the plants of CSN are dying. Forest and Land Rehabilitation (FLR) monitoring of CSN plants was recorded in the report of the proposed plan of farmer group activities. The table format of this report is difficult to read to assess the location of which watersheds have been planted. Geographic Information System (GIS) is one of the ways to monitor FLR on CSN plants to make it possible to see the distribution of CSN plants at each location point according to the critical level of the land. Integrating a decision support system (DSS) and the results of GIS analysis can determine the location of suitable types of plants. GIS visualization can present the boundaries of each region. The results show that the system can assist the Head of FLR Section in determining the location of suitable types of plants and monitor FLR of CSN plants.

Keywords: Forest and Land Rehabilitation, Community Nursery, Geographic Information System, Decision Support System.

1. INTRODUCTION

Watershed and protected forest management is a Technical Implementation Unit of Ministry of Environment and Forestry under the Directorate General of Control of Watersheds and Protection Forests. It was formed on 29 January 2016 through the Minister of Environment and Forestry Regulation Number P.10/Menlhk/Setjen/OTL.0/ 1/2016 which contains positions, duties, functions, organization, work procedures, echelon and other provisions. In optimizing the task of managing watersheds and protection forests, it has 34 unit that are spread throughout Indonesia, one of which is Watershed and Protected Forest of Cimanuk-Citanduy. Based on 2013 data, it has an area of 1,742,720.77 ha consistsing of 112 Watersheds and 12 Sub-watersheds In an effort to support the function and recovery of the watershed, it has a Forest and Land Rehabilitation Section which is engaged in forest and land rehabilitation. One of the activities that supports the implementation of forest and land rehabilitation is Community Seedling Nursery (CSN).

Interview results with Mr. Eman Suherman S.Hut., MM., as Head of FLR stated that when this effort handling rehabilitation forest and land to critical land do with way plant of CSN plant. Determination type plant to location planting carried out by groups farmer or party hall with look value economical and seed zone grow from plant that is. CSN 2016 in the District Garut that there are 3 locations village land critical experience many plants die, occurs in kind eucalyptus grow each around 90.48% (27,144 stems), 75.05% (22,516 stems) and 54.51% (16,352 stems). It happen because off site planting, condition type plant experience dead not suit terms grow to condition land and cause determination location type plants on the land critical less right target because not the suitability type plant with level criticality land and criteria terms grow plants. If not corresponding with land critical then will cause water not could absorbed with well then water brings sedimentation mud. It impact siltation river will will caused erosion, landslides or flood.

Monitoring of FLR is done by sending staff to the CSN seed planting location. The staff monitored directly to the field starting with the condition of the creaking of the land, maintaining the seeds such as watering, fertilizing, replanting to the number of seedling stems from the growing seeds. The monitoring activities were recorded by staff listed in the report on the proposed farm group activities. From the results of monitoring, it can be seen the criticality of the land and the number of seedlings that grow from the results of the nursery. If the number of stems growing does not reach the target of 30,000, the farmer group must return the funds to the hall for a number of targets. Monitoring activities in the field are still manual by directly reviewing the field and recording them using the excel form. This makes it difficult to carry out

continuous monitoring so that many farmers groups that are not monitored result in long-term rehabilitation monitoring activities.

Watershed and Protected Forest of Cimanuk-Citanduy needs an information system that can map present CSN data and information, where the system is expected to be able to assist The Head of FLT section in determining the location of suitable types of plants and monitor FLR of CSN plants.

2. THEORY BASIS

2.1 Geographic Information System

Geographical information system is a system that contains attribute data and spatial data in its database [1]. The definition of geographical information systems varies greatly over time. Definition of geographic information systems according to several experts, as follows [2] :

1. Mural (1999)
   GIS is an information system that can input, store, recall, process, analyze and produce geographic reference data. Geographical reference data is used to support decision making for planning, management, land use, natural resources, environment and transportation and other public services.
2. Bernhardsen (2002)
   GIS is a computer system used to manipulate geographic data. This system is implemented with computer hardware and software that can store data, manipulate data, verify data, compile data, change data, update data, manage data, exchange data, call and represent data and analyze data.

2.2 Geographic Information System Data Model

Geographical information systems have two types of data, namely spatial and non-spatial data :

1. Spatial Data
   Spatial data serves to determine the identification of the position of an element on the surface of the earth. The spatial data model used in geographic information systems is divided into two, including [3] :
   a. Vector data model
      The vector data model is represented by symbols consisting of related lines and points that represent boundaries and boundary locations of geographic entities, including line (line), polyline (polygon), point (point), area (area) and node (cut point).
   b. Raster data model
      The raster data model is generated from satellite and air shooting technology, which presents geographical objects as cell structures known as pixels.
2. Non-Spatial Data
   Non-spatial data is data that contains information on an object contained in a map and is not related to the geographical position of a particular object, eg the area of hectares, number of seeds, level of criticality of the land and etc [3].

2.3 Spatial Operation

Spatial operations are one strength possessed by GIS. Drawing conclusions on spatial analysis in these spatial operations. Spatial operations complement simple to complex spatial processes Generated spatial operations are divided into three, including [4] :

1. Single layer operation
   Single layer operations are performed on one spatial data layer. Spatial operations included in the category of a single layer operation are changes, selection, and classification of features.
2. Double layer operation
   Double layer operations are carried out using minimal spatial double layer data. This operation can produce new spatial data with data values obtained from spatial data subject to the operation. Double layer operations are divided into overlay operations, proximity analysis, and spatial relationship analysis.
3. Spatial transformation
   Classification operations are generally determined by agreement or interval class of an attribute value. Classification operations are widely used to produce certain thematic maps. Classification operations can be carried out by logical processes or simple categories using modules that are available in the software.

2.2 Forest and Land Rehabilitation

Forest and land rehabilitation (FLR) is the recovery, defense and improvement of forest and land functions so that the carrying capacity, productivity and role of forests and land in supporting life support systems are maintained. FLR for watersheds is a nationally active policy to deal with areas related to environmental disasters and to improve the quality of river flows.

2.3 Community Seedling Nursery

Community Seedling Nursery (CSN) is a community group consisting of local village men and women who plant forest species and/or Multi Purpose Tree Species (MPTS) plants starting from seeds to seeds where the budget comes from government funds [5].

2.4 Critical Land

Critical land is land that is already unproductive because its use and management do not pay attention to soil and water conservation criteria which results in damage, loss or reduced function of the land. Decreasing environmental quality as a result of various types of unwise use of land resources can be seen through critical land indicators.

2.3.1 Preparation of Critical Land Spatial Data

The preparation of Critical Land Spatial Data has been regulated in the Regulation of the Directorate General of PDASHL Number P.3/PDASHL/SET/KUM.1/7/2018 concerning the compilation of spatial data on critical land can be seen in Figure 1 [6].

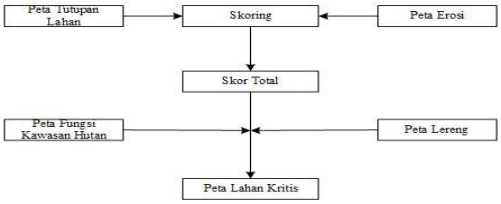

Figure 1 Preparation of Critical Land Spatial Data

Description of each element composing spatial data of critical land, including :

1. Land Cover
   Land cover is assessed based on the percentage of tree canopy closure on the area of each land system according to RePPProT (Regional Physical Planning Project for Transmigration).
2. Erosion
   Erosion of land carried by water and wind to other places. A fertile and good soil layer is lost due to erosion so that the soil loses its ability to absorb and hold water. In preparing erosion critical land which is assessed from the level of erosion hazard.
3. Slope
   Slope is a high ratio with a flat distance on a land. Slope unit can use percentage (%) and degree.
4. Function Forest Area
   Forest areas are areas designated by the government to become permanent forests. In its management it is divided into two functions, namely functions in forest areas and functions outside the forest area. The functions of forest areas include conservation forests, protected forests, production forests and so on. Whereas the function outside the forest area is designated as another area of use. CSN includes functions outside the forest area.

2.4 Decision Support System

The purpose of the Decision Support System (DSS) is to assist managers in making decisions related to issues that are semi-structural. DSS produces alternatives that will then be used by the user [7].

2.5 Monitoring

Monitoring is a chain of activities which includes gathering, reviewing, reporting, and acting on the processes implemented. Generally, monitoring is used in checking between performance and predetermined targets. Monitoring seen from the relationship to performance management is an integrated process because it ensures the process goes according to plan (on the track). Monitoring can provide information on the sustainability of the process to set steps towards continuous improvement [8].

3. Research Methodology

The research methodology used is descriptive method with a quantitative approach. Quantitative descriptive research is a basic and systematic effort to provide answers to a problem and get more in-depth and broad information on a phenomenon by using research stages with a quantitative approach. [9]

The research framework carried out in the study can be seen in Figure 2.

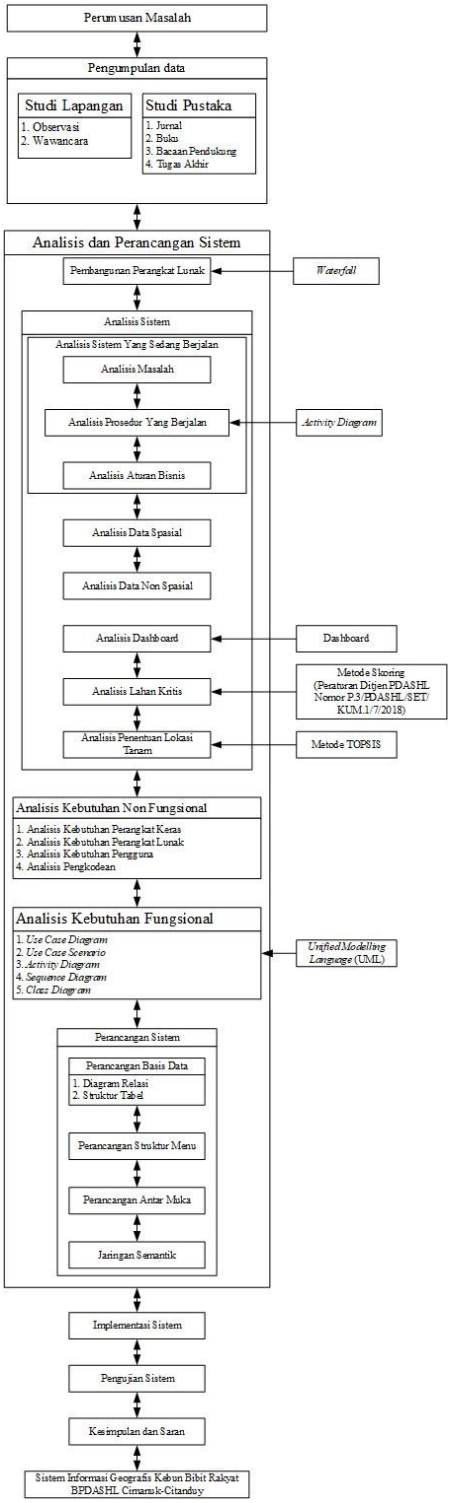

Figure 2 Research Flow

4. RESEARCH CONTENT

4.1 Analysis of Geographic Information Systems

Analysis of geographic information system is a stage describing how input (input), processing (process), and output (output) along with the flow of geographic information systems to be created. The following is a model of people's seed garden GIS, which can be seen in Figure 3.

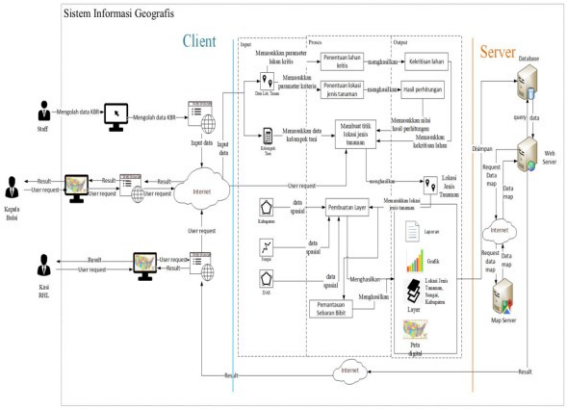

Figure 3. GIS Model Community Seedling Nursery

4.2 Spatial Data Analysis

Spatial data on the system that will be built match crops, plant seeds, critical land, watershed, rivers and districts. The spatial data is distinguished by different forms of spatial and color data so that the information displayed appears more clearly. The following is the specification of spatial data information on the application to be built that can be seen in Table 1.

Table 1. Spatial Data Analysis

No	Layer	Description	Spatial Data	Example
1	Plant compatibility	Suitable for planting plants	Point	
		Rather suitable for planting plants	Point	
		Not suitable for planting plants	Point	
2	Seed Plant	The location of the CSN plant seeds with land conditions is very critical	Point	
		Location of CSN plant seeds with critical land conditions	Point	
		The location of CSN plant seeds with land conditions is rather critical	Point	
		Location of CSN plant seeds with the condition of potentially critical land	Point	
		The location of CSN plant seeds with land conditions is not critical	Point	
3	Critical Land	Very Critical Land	Point	
		Critical Land	Point	
		Rather Critical Land	Point	
		Critical Potential Land	Point	
		Not Critical Land	Point	
4	Watershed	Daerah yang membatasi aliran sungai di BPDASHL Cimanuk-Citanduy	Polygon	
5	River	Regions that limit river flow in Watershed and Protected Forest Cimanuk-Citanduy	Polyline	
6	Districts	Watershed and Protected Forest Cimanuk-Citanduy work area	Polygon	

4.3 Non-Spatial Data Analysis

Non-spatial data or attribute data is a support that contains information contained in spatial data. Analysis of non-spatial data used to build this system can be seen in Table 2.

Table 2. Non Spatial Data Analysis

No	Name	Description	Attribute
1	CSN	Contains information about people's seed nursery data.	Name of farmer group, name of regency, name of sub-district, name of village, type of plant, number of stems, block, area, photo before planting, photo after planting.
2.	Critical Land	Contains information on the assessment of land criticality from a critical land parameter.	Slope, Land Closure, erosion, soil criticality
3	Plant compatibility	Contains information about the suitability of plant types	Plant type name, preference value

4.4 Critical Land Determination Analysis

Analysis of several critical land determinant parameters produces spatial data of critical land. The method used in determining the criticality of the land using the scoring method. The parameters for determining critical land along with scoring are based on the Regulation of the Directorate General of PDASHL Number P.3/PDASHL/SET/KUM.1/ 7/2018, including :

1. Slope

Table 3. Slope

No	Slope Class (%)	Description
1	0-8	Flat
2	>8-15	Sloping
3	>15-25	Rather steep
4	>25-40	Steep
5	>40	Very steep

2. Land Cover

Table 4. Land Cover

No	Symbol	Description	Class	Score
1	Lanud	Airport	1	12
2	A	Body of water		12
3	Rw	Swamp		12
4	S	Savana		12
5	Pm/Tr	Settlement/Transgovernment		12
6	Hp	Primary Dryland Forest		12
7	Sw	Rice fields		12
8	Tm	Ponds		12
9	Hmp	Primary Mangrove Forest		12
10	Hms	Secondary Mangrove Forest		12
11	Hrp	Primary Swamp Forest		12
12	Hrs	Secondary Swamp Forest		12
13	Hs	Secondary Dryland Forest	2	24
14	Ht	Plantation Forest		24
15	Pk	Farm	3	36
16	B	Shrubs	4	48
17	Br	Swamp		48
18	Pt	Dryland Agriculture		48
19	Pc	Mixed Dryland Agriculture		48
20	T	Open Land	5	60
21	Tb	Mining		60
22	Aw	Cloud	0	0
23	TAD	No data		0

3. Erosion

Table 5. Erosion

No	Erosion Class	Score
1	<15	8
2	15-60	16
3	60-180	24
4	180-480	32
5	>480	40

4. Land criticality

Table 6. Critical Score

No	Critical Score
1	0-36
2	>36-52
3	>52-68
4	>68-84
5	>84-100

5. Function of Forest Area

Table 7. Forest Area Outside Decision Matrix

Class	Critical Score				
	0-36	>36-52	>52-68	>68-84	>84-100
0-8	TK	TK	PK	AK	AK
>8-15	TK	PK	AK	AK	AK
>15-25	PK	AK	AK	K	SK
>25-40	AK	AK	AK	K	SK
>40	AK	AK	AK	K	SK

Determination of critical land includes the following :

From the data on location of KBR Phase I and II planting in 2018 there are 26 village locations in the KBR planting village which will calculate the critical level of the land where data from each location is Table 8.

Table 8. Critical Land Data for Each Village

No	Village	Location coordinates		Slope Class	Land Cover	Erosion Class
		Latitude	Longitude			
1	Sidamulih	-7,5139	108,4794	8%-15%	Mixed Dryland Agriculture	180-480
2	Girilaya	-7,0969	108,3689	25%-40%	Mixed Dryland Agriculture	>480
3	Karangagung	-7,4970	107,9218	8%-15%	Dryland Agriculture	180-480
4	Cilampuyang	-7,0178	108,0747	8%-15%	Dryland Agriculture	>480
5	Cipasung	-7,0154	108,3929	<8%	Mixed Dryland Agriculture	180-480
6	Tugu Mulya	-7,0154	108,3927	<8%	Mixed Dryland Agriculture	180-480
7	Margajaya	-6,9902	108,1965	<8%	Rice fields	15-60
8	Lemahputih	-7,0007	108,1778	8%-15%	Dryland Agriculture	>480
9	Bangbayang	-7,0401	108,2085	8%-15%	Dryland Agriculture	>480
10	Lampuyang	-6,9902	108,1965	<8%	Rice fields	15-60
11	Padarek	-6,9838	108,2046	<8%	Rice fields	15-60
12	Jatimekar	-6,8414	108,0366	<8%	Rice fields	<15
13	Situmekar	-6,8813	108,0386	8%-15%	Rice fields	15-60
14	Neglasari	-6,9358	108,0386	25%-40%	Plantation Forest	180-480
15	Cibitung	-6,7604	108,0669	<8%	Dryland Agriculture	180-480
16	Pawenang	-6,9302	108,1103	8%-15%	Mixed Dryland Agriculture	>480
17	Kirisik	-6,9701	108,1702	8%-15%	Settlement	<15
18	Ranggon	-6,9323	108,0693	<8%	Rice fields	<15
19	Ujungjaya	-6,7119	108,0984	<8%	Plantation Forest	15-60
20	Cikawung Ading	-7,7713	108,1483	<8%	Dryland Agriculture	60-180
21	Pamijahan	-7,5635	108,0794	<8%	Mixed Dryland Agriculture	180-480
22	Cipatujah	-7,7484	108,0292	<8%	Mixed Dryland Agriculture	180-480
23	Mandalaguna	-7,4995	108,2897	<8%	Mixed Dryland Agriculture	180-480
24	Sukamukti	-7,2384	108,1859	<8%	Dryland Agriculture	>480
25	Kadipaten	-7,1012	108,1674	15%-25%	Mixed Dryland Agriculture	>480
26	Boja	-7,2623	108,7896	15%-25%	Plantation Forest	60-180

Then based on 26 planting location data can be known the criticality of the land with the following stages :

1. Determining the Land Cover Score
   To find out the parameter score of land coverage based on weighting can be seen in Table 9.

Table 9. Land Cover Parameter Score

No	Village	Land Cover	Class	Score
1	Sidamulih	Mixed Dryland Agriculture	4	48
2	Girilaya	Mixed Dryland Agriculture	4	48
3	Karangagung	Dryland Agriculture	4	48
4	Cilampuyang	Dryland Agriculture	4	48
5	Cipasung	Mixed Dryland Agriculture	4	48
6	Tugu Mulya	Mixed Dryland Agriculture	4	48
7	Margajaya	Rice fields	1	12
8	Lemahputih	Dryland Agriculture	4	48
9	Bangbayang	Dryland Agriculture	4	48
10	Lampuyang	Rice fields	1	12
11	Padarek	Rice fields	1	12
12	Jatimekar	Rice fields	1	12
13	Situmekar	Rice fields	1	12
14	Neglasari	Plantation Forest	2	24
15	Cibitung	Dryland Agriculture	4	48
16	Pawenang	Mixed Dryland Agriculture	4	48
17	Kirisik	Settlement	1	12
18	Ranggon	Rice fields	1	12
19	Ujungjaya	Plantation Forest	2	24
20	Cikawung Ading	Dryland Agriculture	4	48
21	Pamijahan	Mixed Dryland Agriculture	4	48
22	Cipatujah	Mixed Dryland Agriculture	4	48
23	Mandalaguna	Mixed Dryland Agriculture	4	48
24	Sukamukti	Dryland Agriculture	4	48
25	Kadipaten	Mixed Dryland Agriculture	4	48
26	Boja	Plantation Forest	2	24

2. Determining the Erosion Score
   To find out the parameter value of land coverage based on weighting can be seen in Table 10.

Table 10. Erosion Parameter Score

No	Village	Erosion Class	Score
1	Sidamulih	180-480	32
2	Girilaya	>480	40
3	Karangagung	180-480	32
4	Cilampuyang	>480	40
5	Cipasung	180-480	32
6	Tugu Mulya	180-480	32
7	Margajaya	15-60	16
8	Lemahputih	>480	40
9	Bangbayang	>480	40
10	Lampuyang	15-60	16
11	Padarek	15-60	16
12	Jatimekar	<15	8
13	Situmekar	15-60	16
14	Neglasari	180-480	32
15	Cibitung	180-480	32
16	Pawenang	>480	40
17	Kirisik	<15	8
18	Ranggon	<15	8
19	Ujungjaya	15-60	16
20	Cikawung Ading	60-180	24
21	Pamijahan	180-480	32
22	Cipatujah	180-480	32
23	Mandalaguna	180-480	32
24	Sukamukti	>480	40
25	Kadipaten	>480	40
26	Boja	60-180	24

3. Menghitung total skor lahan kritis
   To calculate the total score using the equation formula, namely :

$$SK = PL + E \quad (1)$$

Keterangan :
SK : Land Critical Score
PL : Land Cover Score
E : Erosion Score

The results of the total scorecard calculation to the criticism of each village's land can be seen in Table 11.

Table 11. Total Score of the Critical Land of Each Village

No	Village	PL	E	SK
1	Sidamulih	48	32	80
2	Girilaya	48	40	88
3	Karangagung	48	32	80
4	Cilampuyang	48	40	88
5	Cipasung	48	32	80
6	Tugu Mulya	48	32	80
7	Margajaya	12	16	28
8	Lemahputih	48	40	88
9	Bangbayang	48	40	88
10	Lampuyang	12	16	28
11	Padarek	12	16	28
12	Jatimekar	12	8	20
13	Situmekar	12	16	28
14	Neglasari	24	32	56
15	Cibitung	48	32	80
16	Pawenang	48	40	88
17	Kirisik	12	8	20
18	Ranggon	12	8	20
19	Ujungjaya	24	16	40
20	Cikawung Ading	48	24	72
21	Pamijahan	48	32	80
22	Cipatujah	48	32	80
23	Mandalaguna	48	32	80
24	Sukamukti	48	40	88
25	Kadipaten	48	40	88
26	Boja	24	24	48

So from the calculation of the total critical land score can be determined the level of criticality of the land by comparing the slope of the slope in Table 7, it can be determined the severity of the land of each village, the results can be seen in Table 12.

Table 12. Results of the criticality of land in each village

No	Village	Slope (%)	SK	Land criticality
1	Sidamulih	8%-15%	80	Rather Critical
2	Girilaya	25%-40%	88	Very Critical
3	Karangagung	8%-15%	80	Rather Critical
4	Cilampuyang	8%-15%	88	Rather Critical
5	Cipasung	<8%	80	Rather Critical
6	Tugu Mulya	<8%	80	Rather Critical
7	Margajaya	<8%	28	Not Critical
8	Lemahputih	8%-15%	88	Rather Critical
9	Bangbayang	8%-15%	88	Rather Critical
10	Lampuyang	<8%	28	Not Critical
11	Padarek	<8%	28	Not Critical
12	Jatimekar	<8%	20	Not Critical
13	Situmekar	8%-15%	28	Not Critical
14	Neglasari	25%-40%	56	Rather Critical
15	Cibitung	<8%	80	Rather Critical
16	Pawenang	8%-15%	88	Rather Critical
17	Kirisik	8%-15%	20	Not Critical
18	Ranggon	<8%	20	Not Critical
19	Ujungjaya	<8%	40	Not Critical
20	Cikawung Ading	<8%	72	Rather Critical
21	Pamijahan	<8%	80	Rather Critical
22	Cipatujah	<8%	80	Rather Critical
23	Mandalaguna	<8%	80	Rather Critical
24	Sukamukti	<8%	88	Rather Critical
25	Kadipaten	15%-25%	88	Very Critical
26	Boja	15%-25%	48	Rather Critical

4.5 Analysis of determining the type of plant

Analysis of determining the type of plant aims to determine which locations are suitable for planting according to growing conditions. In the analysis of determining the location of this type of plant, the TOPSIS calculation method is used in assessing criteria that form the basis of priority setting. Stages in the analysis of plant location determination can be seen in Figure 4.

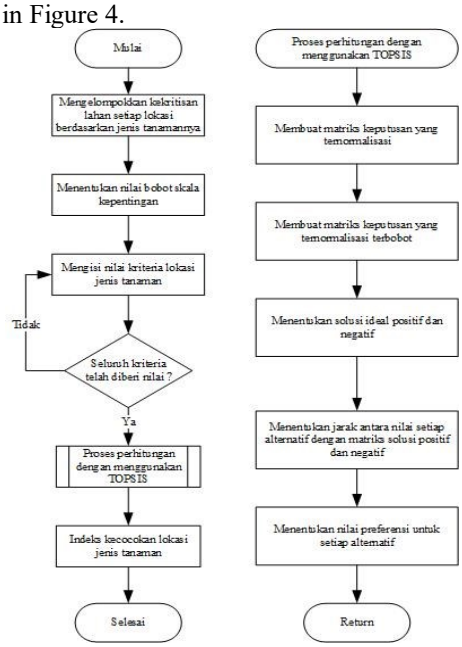

Figure 4. Flowchart Determining the Location of Plant Types

After the criticality of the land is known, classify each critical soil with the type of plant. The results of grouping the criticality of the land with the type of plants obtained from the results of interviews with staff and approval from Head of FLR section, can be seen from Table 13.

Table 13. Types of Critical Land Plants

Land criticality	Plant Type
Very Critical	Akasia
Critical	Jati
Rather critical	*Gmelina*
Critical Potential	Jabon
Not Critical	Sengon

From the results of the TOPSIS it was found that the selection of suitable plant species was based on interviews and approval from Kasi RHL in determining the location of suitable plant species from the index range [0. . 1] divided into 3 classes, namely: suitable, rather suitable and not suitable can be seen in Table 14.

Table 14. Crop Match Index of Each Village

Class	Plant Type Location Index	Plant Type	Village
Suitable	> 0.6667	Akasia	Girilaya
		Gmelina	Cibitung, Boja, Cikawung Ading, Cipatujah
		Sengon	Ujungjaya
Rather	0.3333 s.d. 0.6667	Akasia	-
		Gmelina	Pawenang, Karangagung, Cilampuyang, Neglasari, Pamijahan, Sidamulih, Mandalaguna, Sukamukti, Cipasung, Tugu Mulya, Bangbayang
		Sengon	Jatimekar, Ranggon, Padarek, Kirisik
Not Suitable	< 0.3333	Akasia	Kadipaten
		Gmelina	Lemah Putih
		Sengon	Situmekar, Margajaya, Lampuyang

The results of the acquisition from Table 14 in the Gmelina plant species can be seen in Figure 5.

Figure 5 Location of Compatibility of Gmelina Plant

4.6 Use Case Diagram

The Use case diagram is a model that describes the behavior or nature of an object in the information system that will be created. The use case describes an interaction between one or more actors with the system that will be created. The following is the design of the processes contained in Figure 6.

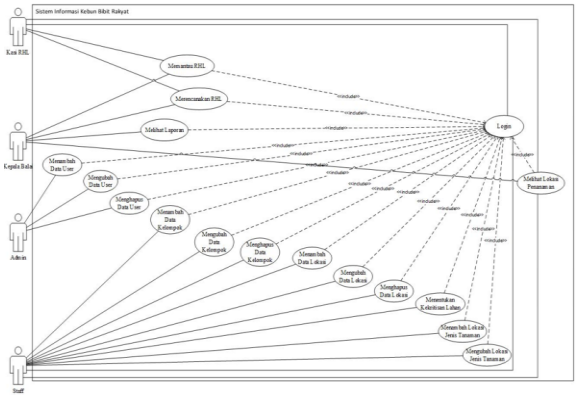

Figure 6 Use Case Diagram

4.7 System Testing

Tests carried out are black box testing by testing the functional software, User Acceptance Test (UAT) and end-user acceptance.

4.7.1 Conclusion of Testing Functionality

Based on the results of the system testing that has been carried out as a whole, it can be concluded that the geographic information system of the people's nursery Watershed and Protected Forest Cimanuk-Citanduy has gone through the stages of improvement in each process so as to produce the expected output.

4.7.2 Conclusion of UAT

Based on the test results of the User Acceptence Test (UAT) which has been carried out on the geographic information system of the community seedling nursery in Watershed and Protected Forest Cimanuk-Citanduy, it can be concluded that the system can proceed to the end-user acceptance testing stage.

4.7.3 Conclusion of User Acceptance

Based on the results of beta testing, it was concluded that the geographic information system of the people's nursery in Watershed and Protected Forest Cimanuk-Citanduy was in accordance with the expected objectives, which could facilitate the Head of FLR Section in monitoring forest and land rehabilitation and determining the location of suitable plants in the Cimanuk-Citanduy watershed.

5. Conclusion

Based on the results obtained in this final assignment, it can be concluded that the system built can help Head of FLR Section monitor the rehabilitation of forests and land at the CSN planting site and help determine the location of suitable plant species so that the forest and land rehabilitation on critical land is appropriate .

Based on the results achieved in building a geographic information system, the community nursery in Watershed and Protected Forest Cimanuk-Citanduy still has shortcomings, therefore it is recommended to add things that can complement it in the future, including: this system can be developed and added in the version mobile, can contain parameters as depositing the budget as a condition of payment for CSN activities, planning for forest and land rehabilitation can be applied and validation of location coordinate input to Cimanuk-Citanduy watershed area can be implemented.

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