APPLICATION OF MULTI CRITERIA DECITION MAKING (RANKING METHODE) ANALYSIS FOR SUITABILITY AGROFORESTRY UP-LAND

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ABSTRAK

Taman Nasional Halimun Salak memiliki potensi biologi dan ekologi bernilai tinggi dan dapat didefinisikan oleh masyarakat dan lingkungan di sekitar Taman Nasional Halimun Salak (TNHS), sehingga kawasan ini dapat diasumsikan sebagai kawasan stok air yang cukup besar untuk Provinsi Jawa Barat dan Banten.Masalah keputusan spasial adalah khas dan meliputi suatu set yang luas dari alternative dan multiple yang layak, kriteria evaluasi dari *conflicting* dan *incommensurate*. Penelitian ini bertujuan untuk menentukan kriteria dan indikator dalam rangka menemukan lokasi yang sesuai/cocok untuk *Upland Agroforestry* dengan metode renking dan pembobotan , serta analisis GIS (Geo Information System). Metode yang digunakan adalah *Multy Criteria Decition Making* (MCDM). Data yang diperoleh akan dianalisis dengan GIS dengan software Arcview 32 yang meliputi ; *scooring, overlay, query, calkulation dan modelling analysis.*Data sosial ekonomi yang dikumpulkan melalui wawancara semi terstruktur akan dianalisis dengan deskriptif. Hasil penelitian menunjukkan bahwa kriteria dan indikator dapat diperoleh untuk pembobotan kesesuaian *Upland Agroforestry* yaitu tanah, slope, elevasi,jarak dari sungai , jalan, dan pemukiman. Kelas Kesesuaian lahan untuk Upland Agroforestry di areal Koridor Taman Nasional Salak Halimun terdiri ats tiga kelas yaitu ; kurang sesuai dengan luas 514,2 ha, sesuai luas 2461,4 ha, dan sangat sesuai luas 6537,1 ha, Kebanyakan areal yang ada sangat sesuai untuk up-land agroforestry yaitu luasnya 6537,1 ha.Komposisi vegetasi Upland Agroforestry terdiri atas pohon/tanaman kehutanan 16 jenis, tanaman pertanian 10 jenis, ikan 2 jenis, binatang ternak 2 jenis, sedangkan produktivitas lahanupland Agroforestry per ha, pertahun adalah 11 juta rupiah.

Kata Kunci : ***Multi criteria pengambilan keputusan, metode rangking, kesinambungan lahan. agroforestri.***

INTRODUCTION

The potencial of Halimun-Salak National Park (HSNP) biology and ecology, can we view as an expensive value and defined to society and their environment in around of HSNP area, so that , this region can be assump as enough big water stock for West Java Province and Banten Province.

All farmers in around of HSNP have been live for tens years before HSNP issued by Forestry Departemen of Indonesia as conservation area. Although most of them have been out of this area, a part of them still live in HSNP area up to the present time (JICA, 2007)

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Spatial decision problems typically imvolve a large set of feasible alternatives and multiple, conflicting and incommensurate evaluation criteria. The alternatives are often evaluated by a number of individuals (decition makers, managers, stakeholders, interest groups). The individuals are typically characterized by unicque preferences with respect to the relative importance of criteria on the basis of which the alternatives are evaluated. Accordingly, many spatial decision problem give rise to the GIS-based multicriteria decition analysis (GIS-MCDA). These two distinctive areas of research, GIS and MCDA, can benefit from each other (Malczewski, 2006).Multi-Criteria Decision Making (MCDM) is the study of methods and procedures by which concerns about multiple conflicting criteria can be formally incorporated into the management planning process (Nieminen, 2007).Futhermore Jaya (2006), said that ranking methode is each elemen/criteria given by value based on level importance that perform cardinal rank.

Agroforestry is define as the planned combination of trees, crops and/or animal, in certain area , at the same time or at the time series.The other words, any ecology interaction and/or real economic, positif and or negatife among of woody plant system and non woody plant(Nair, 1993). Huxley, (1999) said that agroforestry is a dynamic resources managemen system ecologically with cultivate in agriculture land or grazing area for obtain many sustainable products so that can increase social,economic and environmental benefit for all land user.

Agroforest sistem were view as more complex ecology and economic than monoculture system.The production of an Agroforestry system always vary **and** depend on the others. At least,a componen is woody plant, so that their sycle always more than one year (Nair, 1993). Agroforestry system also have local characteristics, because of it's have to favorable toward ecology,social-economic and institutions.It'was show that Agroforestry were multydisipliner, for example Aqgronomyr, hortyculture, forestry, social, economic, and technology (Huxley,19 99)

Agroforestry is an important in the society of TNGHS as livelihood , the up-land suitability have never observed yet, while their productivity have not yet reach optimum. The other side, water, soil and climate factors seems to support the farm system on that site.Based on that information above, that s research would be done as follow," Application of Multi Criteria Decision Making (Ranking Method) Analysis for Suitability up-Land Agroforestry ." The Objectives of this research are To define criteria and indicator to find suitable area for Agroforestry by rangking- weighting method and GIS analysis, to define Suitability and land for Upland Agroforestry

METHODOLOGY

Materials :

- Digital Camera
- GPS
- Maps
- Computer
- Software : Arcview 3,2

Method :

Multy Criteria Decition Making ---> Ranking Methode (each elemen/criteria given by value based on level importance that perform cardinal rank. For example) :
1 = weakly important
2 = moderately
3 = important
4 = very important
5 = extremely important

Sampling Method :

- Purposive sampling (Sukagali village)
- Number of family Population (population size) = 36
- Number of Sample = 10
- Sampling Intensity = 10/36×100% = 27%

Primary Variable Observation

a. Identity Agroforestry Farmers
b. Ground check : UTM, Slope, Elevation, Distance of (Main river, Small river, Road and Settlement)
c. Semi structure Interview : Scoring to define the Priority of plant choosen in their Agroforestry Conponent based on farmers opinion.

Secondary Data :

- Maps
- Social & Economic data
- Population
- Community
- Livelihood
- Others related the topics

Data Analysis and Modelling
Ranking weighting method

Definition : Rangking methode is each elemen/criteria given by value based on level importance that perform cardinal rank. For example :

1= Weakly important
2= Moderately
3= Important
4= Very Important
5= Extreemly important

Ranking weighting formulation as follows :

$$W_{ij} = \sum_{k} r_{jki} / \sum_{i=1} \sum_{k=1} r_{jki}$$

W : weight
r : Indicator ranking
j : Criteria
ki : Indicator

2. GIS Analysis

GIS analysis use were , scoring , overlay , query , calculation and modelling.
Model Analysis (Jaya, 2006) was used as follows :

$$\mathbf{Y = W_1X_1 + W_2X_2 + W_3X_3 + W_4X_4 + W_5X_5 + W_6X_6}$$

Where :
Y = Land Suitability
W_1 : Weight of soil fertility
X_1 : Indicator of soil fertility
W_2 : Weight of slope
X_2 : Indicator of slope
W_3: Weight of elevation
X_3 : Indicator of elevation
W_4 : Weight of river distance
X_4 : Indicator of river distance
W_5: Weight of road distance
X_5 : Indicator of road distance
W_6: Weight of settlement distance
X_6 : Indicator of settlement

distance

Socio economic Analysis

Social-economic data were collected would be analyzed by descriptive analysis.

RESULTS AND DISCUSSION

Criteria and Indicator :

Criteria and Indicator were used based on Semi Structure Interview from the rom the Agroforestry farmer as follow ::

No.	Criteria	Indicator	Verifier	Score
1.	Soil	Soil fertility	Fertile soil	5
2.	Slope	0 - >45 %	0-8 %	1
			8-15 %	2
			15-25 %	5
			25-45 %	4
			45->45 %	3
3.	Elevation	500 – 1250 m	500 – 750	1
			> 750 – 900	2
			> 900 – 1000	5
			> 1000 – 1150	4
			> 1150 – 1250	3
4.	River / Water distance	0 – 500 m	0 -100	5
			100 – 200	4
			200 – 300	3
			300 – 400	2
			400 – 500	1
5.	Road distance	0 – 1000 m	0 – 200	5
			200 – 400	4
			400 – 600	3
			600 – 800	2
			800 – 1000	1
6.	Settlement distance	0 – 1000 m	0 – 200	5
			200 – 400	4
			400 – 600	3
			600 – 800	2
			800 - 1000	1

Rangking Weighting Method Weghting of criteria and indicator

Criteria and Indicator	Value	Total	Weight			
	1	2	3	4		
Soil (X1)	5	5	5	5	25	0.362
Slope (X2)	2	2	2	2	8	0.126
Elevation (X3)	1	1	1	1	4	0.068
River distance (X4)	5	5	5	5	25	0.362
Road distance (X5)	4	4	4	4	16	0.232
Settlement distance (X6)	3	3	3	3	12	0.17
Total	69	1				

Based on the criteria and indicator have observed by Semi Struture Interview and Groundchek , modelling can be model as follow **:**

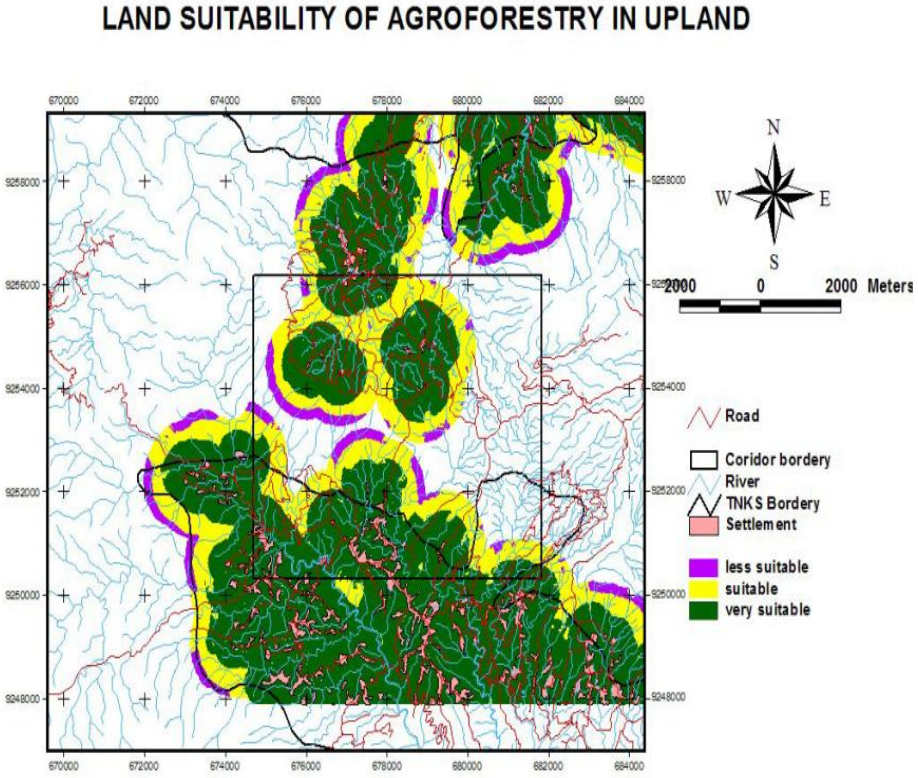
Model: Y = 0,362 X1+ 0.126 X2 + 0.068 X3 + 0.362 X4 +0.232 X5 + 0.17 X6

Up-Land Suitability Agroforestry

lLand suitability of up-land Agroforestry in were show in Ficture1.The picture showed that distribution of land suitability in around the corridor of Halimunp-Salak Nasional Park. Most of them very suitable for agroforestry 65371,1 ha. The land remained were suitable is 2461,4 ha, and less suitable is 512,2 ha (Table 1). It's suggested that there were water resources abundan , and large origin forest in around the Agroforestry was always support It's agroforestry system. The farmers have a soil vertility as priority to define their land, which water source distance were main cosideration

Tabel 1. Suitability Class and the Large of up-Land Agroforestry

No.	Suitability Class	Area(Ha)
1.	Less Suitable	514.2
2.	Suitable	2461.4
3.	Very Suitable	6537.1
	Total	9512.7



Social-Economic Aspect

Based on Semi structure Interview had been done for Agroforestry farmer, we can perform the results as below

1. Composition of Existing Agroforestry

a. TREES (Wood, Multi Purpose Trees,Shrubs,Podder trees)

1. Durian
2. coconut
3. Avocado
4. orange
5. jackfruit
6. clove
7. Banana
8. Albizia
9. Jackfruit
10. Uruhiris
11. Mahoni
12. Bamboo
13. Tea
14. Rubber
15. Coffea
16. Pete

b. CROPS

banana; chilli, tomato, long bean, lettuce,paddy rice,corn, brocolly,papaya

c. Fisheries :

Nila and gold fish

d. Animal :

Chicken, and Goat

2. Land productivity

Average of Income per ha per year is 11 million rupiahs

3. The farmers needed based on economic value as below:

a. Trees will cultivate : coconut, Avocado,orange, jackfruit, clove,
b. Crops: chilli, tomato, long bean, lettuce,
c. Skill : training of cultivation,
d. Capital work: financial institution
e. Wood need for : House construction material, fuel wood, and not for sale.

CONCLUTION

1. The criteria and indicators had obtained for weighting suitable up-land Agroforestry as below :Soil,Slope,Elevation,River distance,Road distance,Settlement distance
2. The suitability class of up-land agroforestry in Coridor area consist of three classes namly ; less sutability with large 514,2 ha, suitable 2461,4 ha, and very suitable 6537,1 ha
3. Most of the area very suitable for up-land agroforestry 6537,1 ha.
4. The composision of Agroforestry consist of trees 16 kinds, crops 10 kinds, fisheries 2 kinds, animal 2 kinds.
5. Land productivity of Agroforestry per ha, per year is 11 million rupiahs
6. The agroforestry farmer supposed to use the area very suitable class for optimize their agroforestry productivity.
7. It' supposed to use the criteria and indicators for GIS- weighting suitable up-land Agroforestry as below :Soil,Slope,Elevation,River distance,Road distance,Settlement distance

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