ABSTRACT

MARTINI YULIA, Evaluation of Rubber Plantation Development using Geographic Information System and Multi Criteria Analysis (Case Study in Banyuasin Regency, South Sumatera). Under The Supervision of MUHAMMAD BUCE SALEH AND ANTONIUS BAMBANG WIJANARTO.

The objective of the research is to evaluate of rubber plantation development in Banyuasin Regency using Geographic Information System and to analyze priority development of sub regency for rubber plantation using Analytical Hierarchy Process (AHP). Potential land for the development of rubber could be determined if soil and climate conditions are known. The soil and climate condition are linked to characteristics of rubber plantation. These relationships can produce a land suitability classification system, which aims to assess how far the level of suitability of the land to plant rubber. The method used consisted of three steps: (1) land suitability analysis from available maps (climate, soil, topography and existing land use); (2) productivity analysis of rubber from available production data in 2009; (3) Rubber area development by using Multi Criteria Analysis (MCA). The result of this research showed that all the areas of Banyuasin Regency are suitable for rubber plantation development. It was found that about 15.4% or 164,201 ha of Banyuasin Regency are highly suitable (S1) and about 84.6% or 904,681 ha are moderately suitable (S2) for rubber plantation. Then the existing rubber was evaluated the productivity of rubber which produce suitable areas with high productivity about 21,703 ha and low productivity about 31,021 ha. This research also produced areas suitable for planting rubber which are considered social and economic factors about 51,960 ha. The total area of priorities for rubber plantation development is 51,960 ha or 4.87% from area of Banyuasin Regency.

Keywords: AHP, Land Suitability, Productivity, Multi Criteria Analysis
ABSTRAK

MARTINI YULIA, Evaluasi Pengembangan Perkebunan Karet Menggunakan Sistem Informasi Geografis dan Analisis Multi Criteria (Studi Kasus di Kabupaten Banyuasin, Sumatera Selatan). Dibimbing oleh MUHAMMAD BUCE SALEH dan ANTONIUS BAMBANG WIJANARTO.

Tujuan dari riset ini adalah untuk evaluasi perkembangan perkebunan karet di Kabupaten Banyuasin menggunakan sistem informasi geografis dan untuk analisis prioritas kecamatan untuk perkembangan perkebunan karet menggunakan Process Hirarki Analitik (AHP). Potensi lahan untuk pengembangan tanaman karet dapat ditentukan jika keadaan tanah dan iklim diketahui terlebih dahulu. Kondisi tanah dan iklim tersebut berkaitan dengan sifat-sifat yang dikehendaki tanaman karet. Hubungan tersebut menghasilkan suatu sistem klasifikasi kesesuaian lahan, yang tujuannya untuk menilai seberapa jauh tingkat kecocokan suatu lahan terhadap tanaman karet. Metode yang digunakan terdiri dari 3 langkah: (1) Analisis kesesuaian lahan dengan menggunakan peta-peta yang tersedia (iklim, tanah, topografi dan penggunaan lahan); (2) Analisis produktivitas karet menggunakan data produksi tahun 2009 yang tersedia; (3) Penambahan luas karet menggunakan Analisis Multi Criteria. Hasil dari penelitian ini menunjukkan bahwa semua area Kabupaten Banyuasin sesuai untuk pengembangan perkebunan karet, sekitar 15.4% atau 164,201 ha dari luas kabupaten banyuasin adalah sangat sesuai (S1) dan sekitar 84.6% atau 904,681 ha adalah sesuai (S2) untuk perkebunan karet. Kemudian model yang digunakan untuk mengevaluasi tanaman karet yang ada dan produktivitas menghasilkan area sesuai dengan produktivitas tinggi sekitar 21,703 ha dan produktivitas rendah sekitar 31,021 ha. Penelitian ini juga menunjukkan bahwa area baru untuk menanam karet dengan pertimbangan faktor ekonomi dan social adalah sekitar 51,960 ha. Total prioritas area tanaman karet untuk dikembangkan di Kabupaten Banyuasin adalah sekitar 51,960 ha atau 4.87%.

Kata kunci: AHP, Kesesuain Lahan, Produktivitas, Analisis Multi Criteria
SUMMARY

MARTINI YULIA, Evaluation of Rubber Plantation Development using Geographic Information System and Multi Criteria Analysis (Case Study in Banyuasin Regency, South Sumatera). Under the Supervision of MUHAMMAD BUCE SALEH AND ANTONIUS BAMBANG WIJANARTO.

Rubber is an export commodity that is able to contribute to the increase in Indonesia's foreign exchange. Foreign exchange earnings from this commodity in 2004 reached U.S. $2.25 billion, which represents 5% of non-oil foreign exchange earnings. National rubber production in 2005 reached approximately 2.2 million tons (Hanspari, 2010). Over the last five years from the year 2005 to 2009, exports of rubber and rubber products would average $ 5.6 billion per year, with a growth of 10 percent. Exports of rubber and rubber products reached USD522.8 million, an increase of 84 percent from the same month in 2009.

Rubber plants originated from tropical areas in the Amazon Basin, Brazil with rainfall 2000 - 3000 mm/year and the rainy days of 120 - 170 days/year (Sutardi, 1981). Rubber trees grow in areas between 10° North and 10° South (Moraes, 1977). Most of Indonesian rubber plantations are located in Sumatera and Kalimantan, with rainfall ranging from 1500 to 4000 mm/year with an average of 0 - 4 months in dry months per year.

Banyuasin is one of the regencies in South Sumatera. Banyuasin area has the potential for agriculture and plantation. From the total area of 11,832.99 km², about 47 percent is agricultural and plantation areas. Contributions to local income of Banyuasin Regency are 35 percent from the agricultural sector, 21% from industrial sector, and 15% from trading. Agriculture of this regency has paddy field of 596,303.36 tons. The productions of oil palm and rubber are 130,228.11 tons and 89,640.50 tons, respectively. Rubber plants are very potential to be developed in this area. Rubber plantations in Indonesia are generally composed of smallholder rubber (85%) and the rest (15%) are state and private plantations. (Bappeda and BPS Statistic of Banyuasin, 2008).

The objectives of this research are to study evaluation of rubber plantation development in Banyuasin Regency using Geographic Information System and to analyze priority development of sub regency for rubber plantation using Analytical Hierarchy Process (AHP). The results of early studies based on the literature, statistic data, physical aspects, aspects of social and economic aspects.

The study covers the period of February 2010 to July 2011. The research location was in the Banyuasin regency, South Sumatera Province. The coordinate geographic position was in latitude 1°18'00” – 4°00'00” South and longitude between104°40'00” – 105°15'00” East. Banyuasin Regency consists of 15 Sub Regency.

The main stages carried out in this study are as follows: (1) analysis of Land Suitability for rubber plantation from available maps (climate, soil, topography and existing land use); (2) productivity analysis of rubber from available data of production in 2009; (3) Rubber area development by using Multi Criteria Analysis (MCA).
The land suitability result shown that all areas in Banyuasin Regency are suitable for rubber plantation. The areas were divided into two parts: highly suitable area (S1), and moderately suitable area (S2). It was found that about 15.4% or 164,201 ha of Banyuasin Regency are highly suitable (S1) and about 84.6% or 904,681 ha are moderately suitable (S2) for rubber plantation. Spatial analysis resulted to suitable area for rubber and the largest area from the total land is moderately suitable (S2).

From the result of classification of plantation and validation using GPS coordinate of rubber areas is about 53,892 ha and oil palm areas about 56,728 ha. The largest area from total of existing rubber areas (S1) in Banyuasin III Sub Regency is about 8,310 ha and for S2 in Banyuasin I Sub Regency about 24,684 ha, then the smallest area from the total of existing rubber areas (S1) in Rambutan Sub Regency about 4.24 ha and for S2 in Banyuasin III Sub Regency about 0.11 ha.

Based on Indonesian Rubber Statistics (2008), high productivity of rubber plantation is more than 1.5 ton/ha/year, the average productivity of rubber plantation in Banyuasin Regency is 1.8 tons/ha/year, the productivity of rubber analysis shows that productivity condition of suitable area planted with rubber in Banyuasin regency divided into four parts: highly suitable areas planted with rubber and high productivity (S1 rubber, high productivity) about 17,183 ha, highly suitable areas planted with rubber and low productivity (S1 rubber, low productivity) about 158 ha, moderately suitable areas planted with rubber and high productivity (S2 rubber, high productivity) about 4,520 ha, moderately suitable about areas planted with rubber and low productivity (S2 rubber, low productivity) about 30,963 ha.

The next analysis was performed using ratings with AHP method to expand plantation areas. This method considered social and economic factors. This analysis has a purpose to determine priorities of sub regency for rubber development. Social factor used several variables such as area of rubber and number of rubber farmer. Economic factor used also two variables i.e. ratio income of rubber with non rubber and ratio cost of rubber with non rubber.

In rating models, each variable should be categorized into several classes (4 – 5 classes). This classes show the conditions of each variables (such as highly suitable, moderately suitable, marginally suitable and not suitable). For number of rubber farmer was classified into very high number of farmers (vhn), high number of farmers (hn), moderate number of farmers (mn), small number of farmers (sn) and very small number of farmer (vsn). This variable is indicated rubber is socially accepted if the number of rubber farmer is greater. For Area of rubber was classified into very large, large, medium, small and very small. This variable is indicated rubber is socially accepted if the area of rubber is greater. Then for ratio income of rubber with non rubber was classified into very high, high, medium, low and very low. This variable is indicated rubber is economically accepted if the income of rubber is greater and for ratio cost of rubber with non rubber was classified into very large, large, moderate, small and very small. This variable is indicated rubber is economically accepted if the cost of rubber is smaller (please see Appendix 5.

Rating models was evaluated all sub regency of Banyuasin Regency i.e. fifteen (15) sub regency. The result of rating models is shown in Table 17, in
Table 17 shows each sub regency has value total ranging from 0 to 1 and shows also that Rambutan Sub Regency, Betung Sub Regency, Rantau Bayur Sub Regency and Banyuasin III sub regency are top four in priorities of sub regency for rubber plantation development, Rambutan sub regency has total value 0.640, Betung sub regency has total value of 0.682, Rantau Bayur sub Regency has total value of 0.593 and Banyuasin III Sub Regency has of value 0.588. That is meaning based on consideration social and economic factors, the top four in priorities of sub regency has positive impact than other sub regency, so considerately Rambutan Sub Regency, Betung Sub Regency, Rantau Bayur Sub Regency and Banyuasin III sub regency as area of priorities for rubber plantation development.

The priorities of sub regency for rubber plantation development are Rantau Bayur Sub Regency about 19,216 ha or 1.8%, followed by Banyuasin III Sub Regency about 6,838 ha or 0.6%, Betung Sub Regency about 7,337 ha (0.7%) and Rambutan Sub Regency about 18,569 ha or 1.7%. The total area of priorities for rubber plantation development is 51,960 ha or 4.87% from areas of Banyuasin Regency.