B05 – Historical analysis on the spatial pattern of land use in the Jambi province - methods, results and tools

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BACKGROUND

Land use/land cover (LULC) in a forested tropical landscapes is very dynamic. Particularly, the transformation of tropical forest is alarmingly high and becomes a considerable impact on the global carbon cycle and biodiversity preservation. Agricultural expansion is the major issue causing deforestation in the tropics (FAO, 2010). Jambi Province, where the study takes place, was in the first rank of deforestation rate for the period of 2011/2012 among other provinces in Sumatra island (MoF, 2014). Understanding the transformation of forested tropical landscape into existing mosaic landscape is essential. Moreover, information about historical LULC which locally assesses the transformation systems (i.e. secondary forest, jungle rubber, oil palm, and rubber) is important. Such information might contribute knowledge to the stake holders.

OBJECTIVES

The main objectives of this study are:

1. To produce an analysis of particular LULC change in transformation ecosystem of Jambi Province between 1990 and 2013.
2. To produce spatial pattern analyses of the target transformation systems (i.e. secondary forest, jungle rubber, oil palm, and rubber plantation) between 1990 and 2013 within the study area.
3. To identify driving forces of deforestation.

METHODOLOGY

Four different maps produced for the years 1990, 2000, 2011 and 2013 are used. Principally, visual interpretation techniques using Landsat images were done to map the LULC. The maps at four points in time were elaborated by Forest Resources Inventory-Remote Sensing Laboratory of Forestry Faculty, Bogor Agricultural University (IPB). All the study area are covered by five scenes of Landsat images. They are composed by following path/raw; 124/61, 125/61, 125/62, 126/61, and 126/62. In order to accomplish the LULC mapping for the years 1990, 2000, 2011, and 2013, several collections of Landsat TM, Landsat ETM+, and Landsat ORI/TIRS have been used. Furthermore, additional data such as ground truth, Rapid Eye images from 2013, and the land cover classification system as commonly used by the Ministry of Forestry of Indonesia (MoF, 2008) have been used as guidance.

PRELIMINARY RESULTS

The LULC maps that have 24 classes were aggregated into 9 classes (i.e. primary forest, secondary forest, agriculture, jungle rubber, rubber plantation, oil palm plantation, plantation forest, shrub/bush, and others) for further analysis.
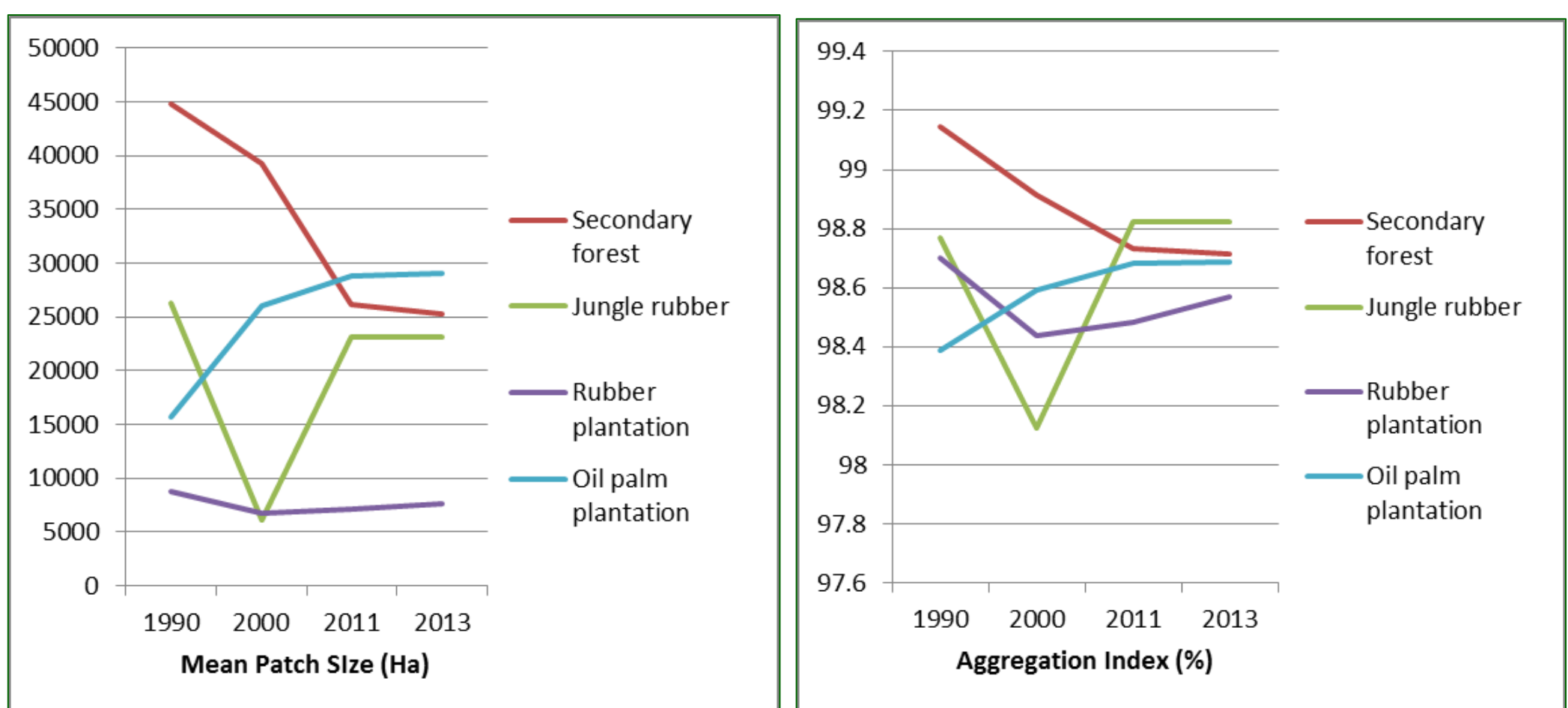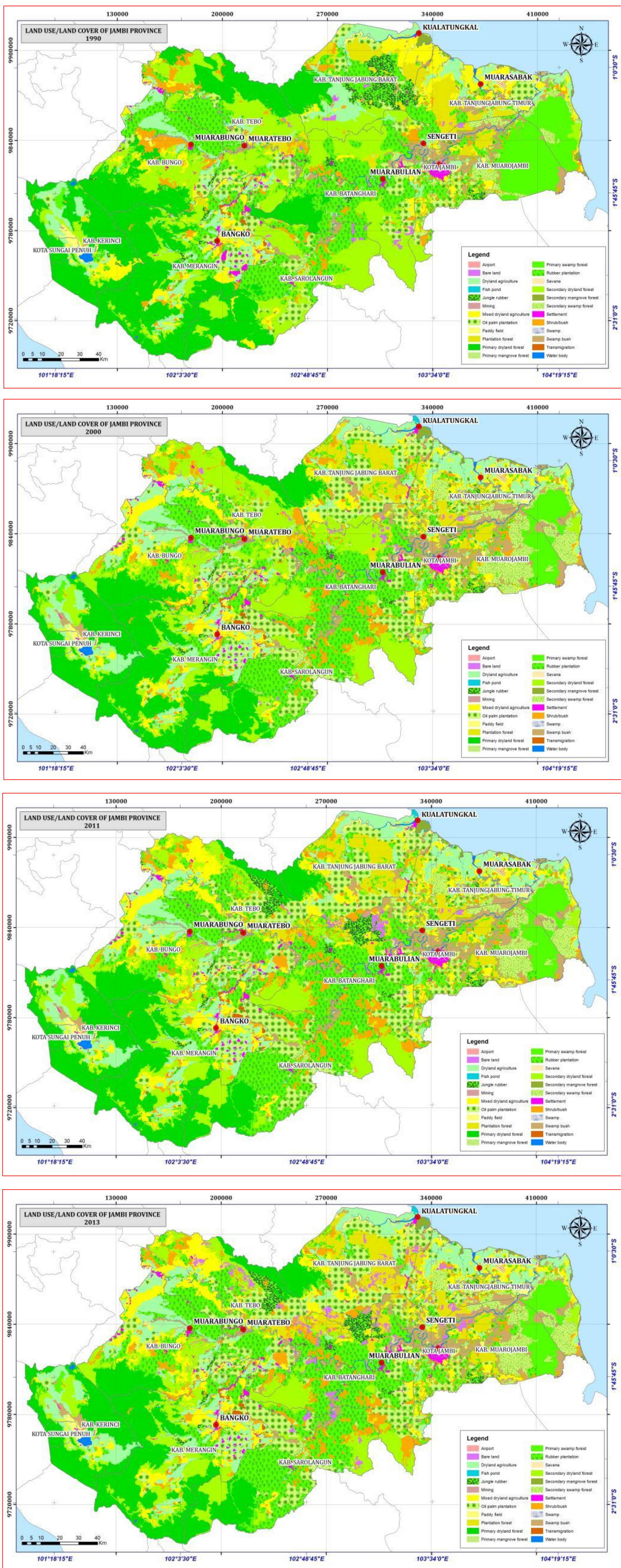

Figure 2. Mean Patch Size (MPS) and Aggregation Index (AI) of the four target transformation systems in 1990, 2000, 2011 and 2013

The secondary forest has declined within studied period (Figure 3) and largely transformed into oil palm and rubber plantation (Table 1). The spatial pattern shows that the MPS of secondary forest declined with disaggregated process while the MPS of oil palm was increased in the aggregated manner.

Figure 3. The Composition of Land Use/Land Cover of Jambi Province from 1990 to 2013

Table 1. LULC Change (%) from 1990 to 2013 in Jambi Province (rounding errors)

No.	LULC 1990	LULC 2013									Total 1990	Loss
		1	2	3	4	5	6	7	8	9		
1	Agriculture	12.40	0.02	1.15	0.01	0.00	0.34	0.04	0.43	0.21	14.59	2.19
2	Jungle rubber	0.13	0.41	0.04	1.15	0.00	0.04	0.00	0.17	0.03	1.98	1.56
3	Oil palm plantation	0.55	0.00	5.59	0.19	0.00	0.15	0.00	0.23	0.16	6.88	1.29
4	Plantation forest	0.25	0.03	0.37	2.00	0.00	0.19	0.30	0.36	0.22	3.72	1.72
5	Primary forest	1.60	0.32	0.28	0.00	16.78	1.23	5.57	1.12	0.24	27.15	10.37
6	Rubber plantation	1.52	0.11	1.46	0.36	0.00	13.07	0.04	0.39	0.46	17.42	4.35
7	Secondary forest	1.37	0.71	2.87	0.97	0.00	3.41	6.84	2.06	0.48	18.70	11.86
8	Shrub/bush	0.94	0.00	0.22	0.01	0.00	0.07	0.13	5.80	0.15	7.32	1.52
9	Others	0.06	0.00	0.21	0.04	0.00	0.10	0.00	0.00	1.83	2.25	0.41
	Total 2013	18.83	1.61	12.19	4.73	16.78	18.60	12.92	10.56	3.78	100.00	
	Gain	6.43	1.19	6.60	2.73	0.00	5.54	6.08	4.75	1.95		

References:

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Figure 1. Land Use/Land Cover Maps of Jambi Province

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