Dynamics and Trajectories of Rubber Agroforest in Bungo District, Jambi: Assessment for the Potentials of Eco-certification

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TRANSFORMING LIVES AND LANDSCAPES

Introduction

Figure 1. Landscape of Bungo District and Rubber Agroforest

The high pressure of land use change that has occurred in Sumatera, Indonesia, reduces forest cover. However, various land uses that replace forest are considered to be able to preserve some of forest ecological functions. Rubber agroforest, a traditional extensive rubber cultivation system, has the capacity to support species diversity in an impoverished landscape currently dominated by monoculture plantation (Figure 1). Currently, ICRAF conducts a study to observe the dynamics and trajectories of rubber agroforest in Bungo District, Jambi over time and space using remote sensing data and spatial analysis. The outputs are expected to contribute to the discussions towards rubber eco-certification in Jambi Province.

Method

Analysis Land use/ cover Change and Trajectories (ALUCT)was applied to produce time series land use/cover map using Landsat Imagery. There are three stages to produce land use/ cover maps, which are (1) image pre-processing, (2) image classification; and (3) post-interpretation analysis (Figure 2). The core of ALUCT is the hierarchical object based classification. The hierarchy is divided into four levels, and in each level, land cover types are interpreted using spectral and spatial rules (Figure 3). Details and complexity of land cover types increase in each level; therefore, each of them has different set of rules applied. Two types of land-cover change analysis were conducted: area-based change analysis and trajectories analysis.

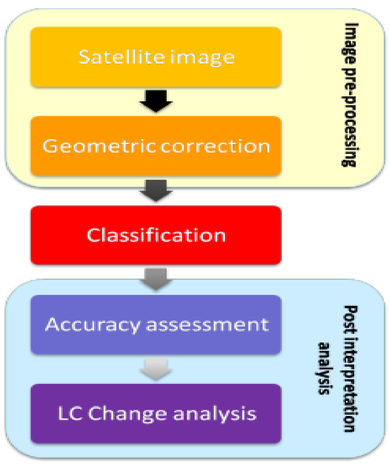

Figure 2. Overal work flow ALUCT

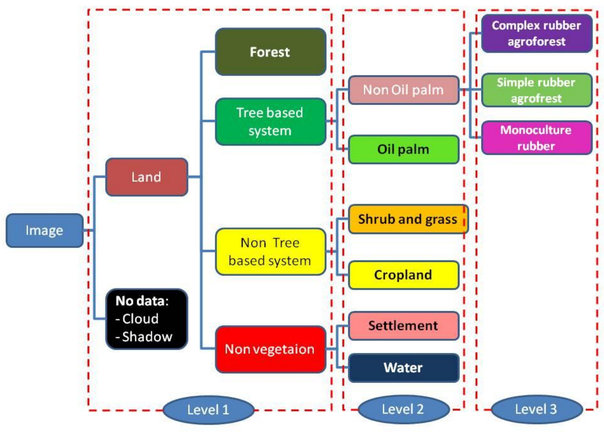

Figure 3. Hierarchical structure

Result and Discussion

One of the crucial phases in ALUCT is defining land cover classification scheme for satellite image interpretation. We defined our land cover classes based on field observation conducted in May 2010. We found that the landscape of Bungo is dominated by four types of land cover: (1) Forest, (2) Rubber agroforest, (3) Monoculture rubber, and (4) Oil palm. Rubber agroforest, based on its vegetation structure, is classified into two classes: complex rubber agroforest and simple rubber agroforest (Figure 4). We conducted accuracy assessment for 2007/08 land cover map using 104 GPS points. The overall accuracy is 81.3%.

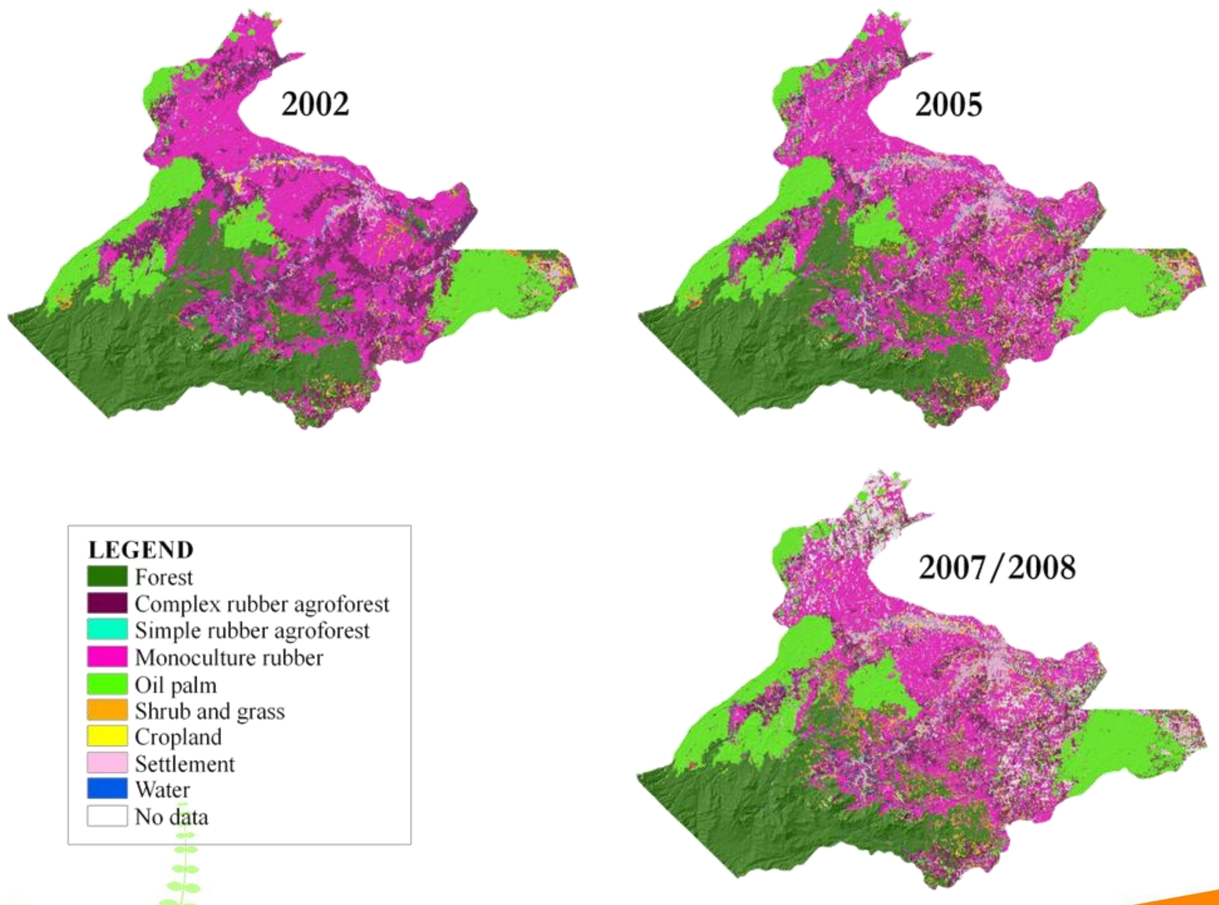

Figure 4. Land cover map 2002, 2005, and 2007/08 of Bungo District

Dynamics and Trajectories of Rubber Agroforest

Four types of trends with different rates can be summarized from this data: (1) decrease of forest cover, (2) decrease of complex rubber agroforest, (3) expansion of oil palm, and (4) increase of monoculture rubber area (Figure 5). Forest cover in Bungo has declined from 31% in 2002 to 25% in 2007/08. On a slower rate, complex rubber agroforest also decreased from 12% in 2002 to 10% in 2007/08. The area of simple rubber agroforest significantly increased from only 1,536 ha in 2002 to 2,669 ha in 2007/08. The combined areas of rubber agroforest increased in 2005-2007/08, from 10.4% to 11%.

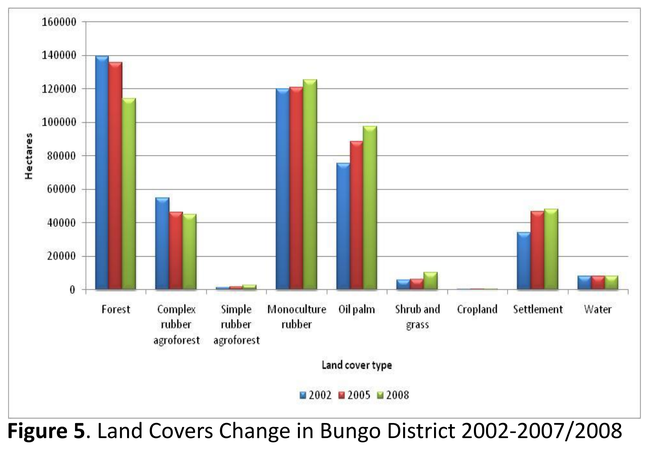

Figure 5. Land Covers Change in Bungo District 2002-2007/2008

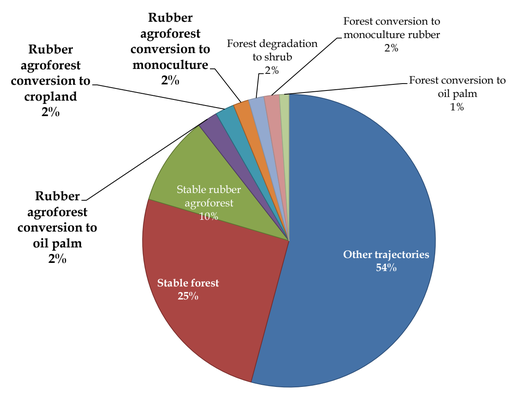

Figure 6. Trajectories of Landcover Types in Bungo 2002-2007/2008

Summary of trajectories (Figure 6) shows that the proportion of conversion to oilpalm is higher from rubber agroforest than from forest area. This information suggests that eventhough the total rubber agroforest area in Bungo increased, possibility of conversion to oil palm and rubber agroforest also increased, which means that in the future, the areas of rubber agroforest are still under threats of oil palm and monoculture rubber expansion.

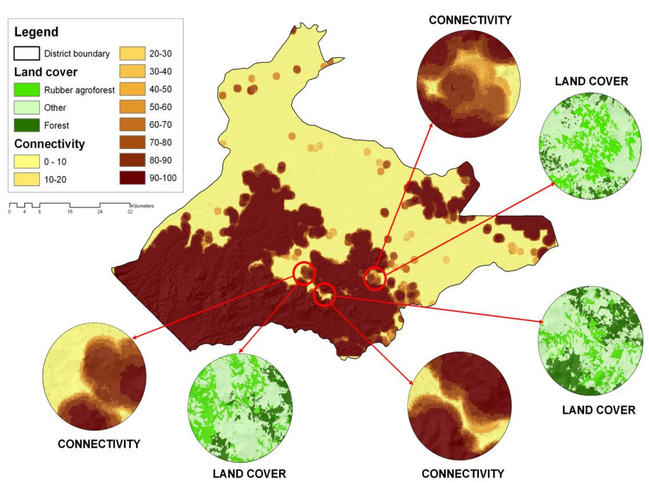

Figure 7. Connectivity Index of Forest Patch and Location of Rubber Agroforest

The role of rubber agroforest as Biodiversity corridor

One type of biodiversity-related ecosystem service from rubber agroforest is the potential to serve as a biodiversity corridor for the remaining forest patches. The results of the connectivity assessment indicate that the existence of rubber agroforest is crucial to ensure the connectedness of forest. The value of 100 is perfectly connected and 0 is completely fragmented (Figure 7).

Current threats on rubber agroforest

We overlaid landcover map 2007/2008 with land allocation maps with current location of complex rubber agroforest (Figure 8). In total, 47062.89 ha (47%) of complex rubber agroforest area falls under the allocated lands for oil palm. These areas are currently the most vulnerable patches of rubber agroforest in Bungo district due to the potential expansion of oil palm plantations.

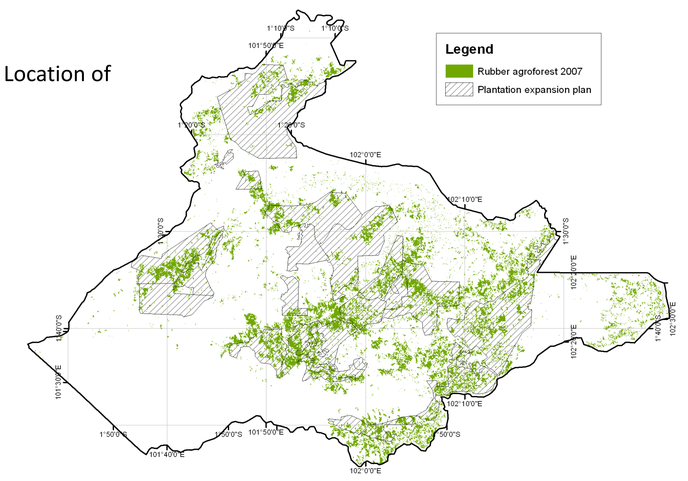

Figure 8. Land Allocation for Plantation Expansion and Location of Rubber Agroforest

Conclusion

Our analysis shows that rubber agroforest areas in Bungo District, Jambi, are currently undergoing high pressure from the expansion of monoculture plantation. The species-rich complex rubber agroforest system is currently decreasing, some of which is converted to oil palm in 2005-2007/08. Simple rubber agroforest shows quite significant increase in terms of transition rate, eventhough from the landscape perspectives the total area is not significantly larger than complex rubber agroforest. Current spatial planning of Bungo district also puts some pressure to rubber agroforest area, where 47% of complex rubber agroforest is currently allocated for oil palm plantation expansion.

Recomendation

- Rubber agroforest patches that serve the function as biodiversity corridors are potentially recommended to be prioritized for eco-certification process.
- Eco-certification is perceived as potential, if not the only, mechanism to conserve rubber agroforest considering the vulnerability under the threats of oil palm expansion.

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