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Vicente Guadalupe  
*Universidade Federal do Amapá*

Eleneide Doff Sotta  
*Empresa Brasileira de Pesquisa Agropecuária*, eleneide.sotta@embrapa.br

Valdenira Ferreira Santos  
*Instituto de Pesquisas Científicas e Tecnológicas do Estado do Amapá*

Leonardo José Gonçalves Aguiar  
*Universidade Federal de Pelotas*

Lucieta Martorano  
*Empresa Brasileira de Pesquisa Agropecuária*

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Understanding landscape dynamics as support of decision-making processes using Dinamica-EGO software

Vicente Guadalupe\textsuperscript{a}, Eleneide Doff Sotta\textsuperscript{b}, Valdenira Ferreira Santos\textsuperscript{c}, Leonardo José Gonçalves Aguiar\textsuperscript{d}, Lucieta Martorano\textsuperscript{b}

\textsuperscript{a} Universidade Federal do Amapá, \textsuperscript{b} Empresa Brasileira de Pesquisa Agropecuária, \textsuperscript{c} Instituto de Pesquisas Científicas e Tecnológicas do Estado do Amapá, \textsuperscript{d} Universidade Federal de Pelotas.

Presenting author: eleneide.sotta@embrapa.br

Abstract: Land Use and Land Cover (LULC) changes, and specially deforestation, are an expression of the interaction of economic, political and social factors in relation to the natural resources which may have profound effects on the functioning of the ecosystems. LULC models generally incorporate the most relevant elements of a coupled human-environment system and are important aids in decision-making processes in land use planning and management for sustainable development. This study aimed at analysing the main driving forces of deforestation in the North-eastern Amazon, as well as the context-specific factors that determined particular forest cover dynamics from 1985 to 2008, in order to anticipate potential forest cover changes. Forest conversion caused by three main land-uses (pastures, annual crops and mineral extraction) was analysed by simulating spatial landscape dynamics using the Dinamica EGO software. We used data from a multitemporal analysis of deforestation classified for change of land use and land cover (LULC), covering a period of 23 years. Deforestation was largely driven by the expansion of pasture and annual crop areas, which represented 70 - 99% of the total area of forest conversion in all periods. We identified four socio-economic variables that had a strong influence on forest transition: i) distance to old deforestation; ii) distance to urban centres; iii) distance to secondary roads; and iv) distance to rural roads. Landscape dynamics in the study area was heavily dependent on cattle ranching and annual crops activities. Proximity to urban centres and to the road network were the stronger spatial determinants of forest conversion. The method used was useful for pointing the most important drivers of change in the landscape and can support current and future state governments to adapt the development policy to be consistent with forest sustainability, while improving and expanding the essential structure for the development of the region.

Keywords: land use land cover; deforestation; drivers; cattle ranching; agriculture; tropical forest.