

The Impact of Human Intervention on Net Primary Productivity for the South-Central Zone of Chile

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Abstract : The sustainable management of available natural resources is a crucial question for policy-makers, economists, and the research community. Among several, land constitutes one of the most critical resources, which is being intensively appropriated by human activities producing ecological stresses and reducing ecosystem services. In this context, net primary production (NPP) has been considered as a feasible proxy indicator for estimating the impacts of human interventions on land-use intensity. Accordingly, the human appropriation of NPP (HANPP) was calculated for the south-central regions of Chile between 2007 and 2014. The HANPP was defined as the difference between the potential NPP of the naturally produced vegetation (NPP₀, i.e., the vegetation that would exist without any human interferences) and the NPP remaining in the field after harvest (NPP_{eco}), expressed in gC/m² yr. Other NPP flows taken into account in HANPP estimation were the harvested (NPP_h) and the losses of NPP through land conversion (NPP_{luc}). The ArcGIS 10.4 software was used for assessing the spatial and temporal HANPP changes. The differentiation of HANPP as % of NPP₀ was estimated by each landcover type taken in 2007 and 2014 as the reference years. The spatial results depicted a negative impact on land use efficiency during 2007 and 2014, showing negative HANPP changes for the whole region. The harvest and biomass losses through land conversion components are the leading causes of loss of land-use efficiency. Furthermore, the study depicted higher HANPP in 2014 than in 2007, representing 50% of NPP₀ for all landcover classes concerning 2007. This performance was mainly related to the higher volume of harvested biomass for agriculture. In consequence, the cropland depicted the high HANPP followed by plantation. This performance highlights the strong positive correlation between the economic activities developed into the region. This finding constitutes the base for a better understanding of the main driving force influencing biomass productivity and a powerful metric for supporting the sustainable management of land use.

Keywords : human appropriation, land-use changes, land-use impact, net primary productivity

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