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T5 Modeling and scenario's of ecosystem services for policy support and decision making

Modelling temporal trajectories of ecosystem services resulting from land–use change and land intensification

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The temporal trajectory of ecosystem services (ES) is often driven by changes in land use and management caused by human activities. Land intensification has been a major reason for changes in land use and management in the last decades, resulting in increases in agricultural yields and decreases in biodiversity and most ES. Previous research and models have dealt with how biodiversity declines with land intensification but knowledge is scarce on the impacts of land intensification on ES. In this paper, we explore how changes in land–use intensity influences the production of bundles of ES, using mountain landscapes as examples. We review case studies of ES dynamics in mountain landscapes and combined concepts from existing frameworks to develop a simple model of the delivery of bundles of ES along a gradient of land–use intensity. We classify the selected case studies into three groups of mountain landscape dynamics, depending on the main land–use changes: the two first groups are characterized by an increase in land–use intensity with changes towards either croplands or forest plantations respectively. The third group includes cases of decreasing land–use intensity, in which landscapes can be abandoned, rewilded or transformed from productive to multifunctional landscapes. We propose a simple model linking land–use intensity in ecosystems dominated by trees or grass to the provision of eight groups of ES: three provisioning services (food, timber and energy wood, other products), two regulation services (soil conservation and water regulation, carbon sequestration) and two cultural services (spiritual values, recreation, heritage). The analysis of case studies in terms of land–use intensity helps identifying broad groups of mountain landscape trajectories with common features of ES dynamics and highlighting common trade–offs between ES.

Keywords: Dynamics, model, review, land intensification, trade–offs