Paying for conservation: a bioeconomic analysis of land use effects on the viability of an endangered species, Eryngium alpinum

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Abstract

Land management is critical for biodiversity conservation in mountain grasslands. It should be both ecologically effective and economically efficient. We provide an economic analysis of different options (spring and autumn grazing, mowing and abandonment) and their effects on population viability of a rare plant species, *Eryngium alpinum* (Apiaceae), in two French mountain grassland sites (Fournel and Pralognan).

Using data collected in a ten-year, individual-based demographic study, we estimated the effects of land management options on the population growth rate and simulated the effect of combinations of options. Income earned through each option was estimated using data on associated costs (price of consumables, working time, wages) and benefits (forage production, quality and price), and we assessed the economic effects of agri-environment subsidies

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(AESs). We also simulated the effects of increased frequencies of extreme climatic events (such as the 2003 heatwave).

Spring grazing was the worst option for *E. alpinum* demography but the best in economic terms, as it provided net positive incomes. Autumn grazing was the best option, resulting in positive growth rates and incomes. Mowing was the second best option for demography but resulted in economic losses for farmers. Abandonment provided zero income and was not favourable to population growth.

In Fournel, AESs allowed for economically and ecologically near-optimal combinations of management options. In Pralognan, alternating years of grazing with mowing resulted in an acceptable compromise, with positive growth rates and incomes, but AESs were not sufficient to cover the opportunity cost of spring and autumn grazing.

Simulations with increased frequency of extreme climatic events resulted in negative growth rates in Pralognan.
The conservation effectiveness and economic efficiency of grassland management could be improved by alternating practices over several years. However, existing agri-environment subsidies are barely sufficient to increase uptake of the most favourable land management options for biodiversity.