

Title

Economic valuation of land use change: farming and forestry in Flanders

Theme & subtheme

2. Natural resources, ecosystem services and environmental quality

2.3 Ecosystem services : debating, valuing, preserving and providing

Summary

When faced with the choice to allocate open space to farming or sustainable forestry, private landowners try to maximize their private benefits of marketed ecosystem services. The objective of our study is to investigate for the densely populated and urbanized region of Flanders to what extent the inclusion of non-marketed ecosystem services would alter the land use decisions by private landowners in favour of sustainable forestry.

We map the economic value of food and timber production, global climate regulation and recreation under two alternative scenarios, using spatial data about soil characteristics, land cover, land use regulations, demography and other socio-economic parameters.

The aggregated valuation maps indicate where and to what extent the net social benefits of sustainable forestry outweigh those of current agricultural land use. However, the current institutional setting does not provide the appropriate incentives to motivate private land users to shift their land use to sustainable forestry.

Abstract

Introduction

Demographic , economic and technical developments have caused in Flanders a gradual increase of urban area and built infrastructure, triggering an increased competition for the remaining open space. Although agriculture is still the dominant land use, its relative coverage has gradually decreased and is expected to continue to do so in the decades to come. In this context the opportunity cost of forest expansion is often considered too high. As a result, it is becoming increasingly difficult to achieve policy targets to extend and reconnect forested areas in Flanders and reduce environmental pressures on them. When faced with the choice to allocate open space to farming or to sustainable forestry, private landowners have little incentive to choose the latter if they solely base their cost-benefit calculations on the private benefits of marketed ecosystem services like food and timber production.

Study objective

This study investigates where and to what extent the inclusion of the economic value of non-marketed ecosystem services in the cost-benefit calculus of private landowners would alter private land use decisions in favour of sustainable forestry. It is our objective to demonstrate, in a spatially explicit way, the importance of the social benefits of ecosystem services that are commonly considered to be externalities in standard market transactions.

Research method

The study is based on a spatially explicit cost-benefit analysis of two alternative land uses, being agriculture and sustainably managed multifunctional forest (Bateman, 2009; Bateman et al., 2005). The study area is the area that is currently used for professional farming (6450 km²) within Flanders (13.522 km²), the northern member state of Belgium. We calculate the quantity and the economic value of the actual supply of two marketed ecosystem services, food production and timber production, and two non-marketed services, global climate regulation and recreation (Broekx et al., 2013; De Nocker et al., 2010; Meersmans et al., 2008; Van Gossum et al., 2014; Van Reeth et al., 2015; Vandekerckhove et al., 2014). The quantification and economic valuation take spatially explicit data (10 x 10 m grid) into account like soil characteristics for modelling soil suitability for agriculture and forestry as well as carbon sequestration in soils and biomass, vegetation, land cover and land use regulations, accessibility, population density and other socio-economic parameters to generate value based maps of ecosystem service supply and use. The valuation also accounts for transfer payments like agricultural subsidies.

Results

The aggregation of the individual ecosystem service valuation maps for the two alternative land use scenarios indicates where and to what extent the combined timber, carbon and recreation value of sustainable forestry would outweigh the combined farm income and carbon and recreation value of the current agricultural land use. Based on the valuation of the marketed ecosystem services of food and timber production alone, the benefits of the current agricultural land use outweigh those of an alternative sustainable forestry scenario in every location of the study area. If the subsidies to farmers are excluded from farm income, the benefits of farmers are still positive under the current agricultural land use albeit lower than when the subsidies are included. If the value of the non-marketed ecosystem service global climate regulation is included in the analysis the social benefits of the forestry alternative become positive on the more sandy soils where the economic value of food production is lower. If also the value of the non-marketed ecosystem service recreation is added the forestry scenario shows net social benefits in a much wider area, especially in areas closer to densely populated centres (with a higher demand for green space for recreation) that have a lower farm productivity. In the most productive farming areas that are relatively far away from densely populated centres, a land use change towards sustainable forestry would still result in a net social loss, based on these four ecosystem services.

Discussion and conclusions

The results show that the inclusion of non-marketed ecosystem services into private land use decisions potentially has a significant impact on land use, and consequently also on the landscape. They also show that, apart from ecological arguments, there are also sound socio-economic arguments for an increase of the forested area. However, the current institutional setting, that promotes maximizing the private benefits of marketed ecosystem services, does not provide the appropriate incentives to motivate private land users to shift their land use from farming to sustainable forestry. This reality is key to understand current reluctance and resistance among private land users and their interest groups to accept forest expansion in the rural area. Mapping the economic value of ecosystem service bundles in a spatially explicit way has a high policy relevance as

it helps to better understand and predict land use decisions by private land users. In this way it can also help in identifying opportunities to increase the social benefits of land use. The use of this sort of analyses could inspire spatial policy as well as sectoral policies.

The results are still amenable for further improvement due to data gaps with regard to the considered ecosystem services, for instance farm location, crop yields, benefits of cattle production, quantity and value of timber harvests, soil characteristics and recreation data. The results have been presented to staff from the Flemish Agency for Nature and Forest as well as the Department of Agriculture and Fisheries. Both have declared their interest and willingness to cooperate with our research team to update and improve the methods and input data for the ecosystem service quantification and valuation. Also the amount of services included in the analysis should be further increased. Future work will therefore also focus on including other ecosystem services in the analysis (e.g. erosion control, water purification and flood regulation). Finally, the development of more realistic land use and policy scenarios is a priority as well.

References

- Bateman I. (2009). Bringing the real world into economic analyses of land use value: Incorporating spatial complexity. *Land Use Policy* 26:30-42.
- Bateman I.J., Lovett A.A., Brainard J.S. (2005). *Applied Environmental Economics. A GIS Approach to Cost-Benefit Analysis*. Cambridge: Cambridge University Press.
- Broekx S., De Nocker L., Liekens I., Poelmans L., Staes J., Van der Biest K., Meire P., Verheyen K. (2013). Raming van de baten geleverd door het Vlaamse Natura 2000-netwerk. Studie uitgevoerd in opdracht van het Agentschap voor Natuur en Bos (ANB/IHD/11/03) door VITO, Universiteit Antwerpen en Universiteit Gent. Brussel. 2013/RMA/R/87.
- De Nocker L., Michiels H., Deutsch F., Lefebvre W., Buekers J., Torfs R. (2010). Actualisering van de externe milieuschadetekosten (algemeen voor Vlaanderen) met betrekking tot luchtverontreiniging en klimaatverandering. Studie uitgevoerd in opdracht van MIRA, Milieurapport Vlaanderen. Brussel. MIRA/2010/03. 122 p.
- Meersmans J., De Ridder F., Canters F., De Baets S., Van Molle M. (2008). A multiple regression approach to assess the spatial distribution of soil organic carbon (SOC) at the regional scale (Flanders, Belgium). *Geoderma* 143:1-13.
- Van Gossum P., Danckaert S., Spanhove T., Wils C. (2014). Hoofdstuk 11: Ecosysteemdienst voedselproductie. In: Stevens M., Demolder H., Jacobs S., Schneiders A., Van Gossum P., Van Reeth W., Peymen J. (editors). *Natuurrapport - Toestand en trend van ecosystemen en ecosysteemdiensten in Vlaanderen Technisch Rapport*. Brussel: INBO.
- Van Reeth W., De Smet L., Broekx S., Spanhove T., Van Gossum P., De Nocker L., Vandekerckhove K. (2015). Economische waardering van landgebruik: een gevalstudie (rapport in voorbereiding). Brussel: Instituut voor Natuur- en Bosonderzoek.
- Vandekerckhove K., De Keersmaecker L., Demolder H., Esprit M., Thomaes A., Van Daele T., Van der Aa B. (2014). Hoofdstuk 13: Ecosysteemdienst Houtproductie. In: Stevens M., Demolder H., Jacobs S., Schneiders A., Van Gossum P., Van Reeth W., Peymen J. (editors). *Natuurrapport - toestand en trend van ecosystemen en ecosysteemdiensten in Vlaanderen Technisch Rapport*. Brussel: INBO.