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Beyond monetary measurement: How to evaluate projects and policies using the ecosystem services framework

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ABSTRACT

In this paper we focus on how to achieve better decision support when decision-makers use the ecosystem services (ESS) framework to broaden their evaluations. We contribute to the debate on valuation of ecosystem services by inquiring into how the ESS framework relates to the judgement and measurement provided by Cost-Benefit Analysis (CBA) and Multi-Criteria Analysis (MCA) evaluation techniques. We argue that Multi-Criteria Cost-Benefit Analysis (MCCBA), which is a carefully designed combination of CBA and MCA, provides a good starting point for the evaluation of projects or policies involving changes in agricultural and natural ecosystem services.

The main characteristic of this MCCBA approach linked to ESS framework is its threefold evaluative endpoint structure to account for (i) basic health, (ii) economic welfare, and (iii) higher well-being. The third endpoint includes concerns about the well-being of nature. The MCCBA approach utilises highly standardised cardinal or ratio scale measurements, in particular we use two existing measurements, known as Disability Adjusted Life Years for basic health, and monetary Net Present Values for economic welfare. We also introduce one new measurement: Threat weighted Ecological Quality Area to account for nature's well-being. We argue that evaluation of projects or policies involving many different ecosystem services should use these three endpoint measurements.

1. Introduction

Increased agricultural productivity has over time facilitated economic development in which larger and larger urban concentrations play a pivotal role (McCann and Acs, 2011; Strijker, 2005). One could even say that increased agricultural productivity has facilitated the development of a socio-economic system 'away from nature' (Buijs et al., 2010). And although high productivity increases in agriculture, as in forestry and fisheries, build on natural processes and conditions, they too seem to shift agriculture 'away from nature', since agriculture faces an increasingly tense relationship with biodiversity and ecology (Björklund et al., 1999; Stoate et al., 2009). The ecosystem services (ESS) framework, as highlighted by other contributions to this special issue,

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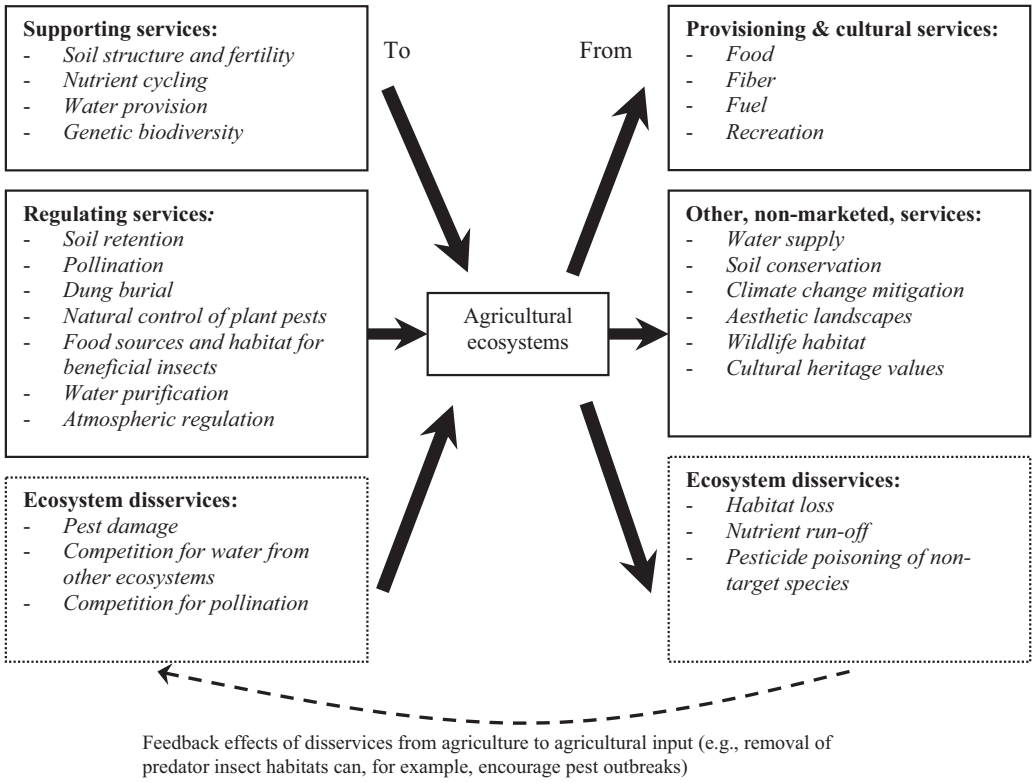

Fig. 1 – Ecosystem services and disservices to and from agriculture.
***Source:* Zhang et al. (2007).**

denotes the benefits that people derive, directly and indirectly, from nature (Turner et al., 2010). In a way, the ESS framework can be seen as a means of reconnecting urban and agricultural systems to nature, by informing decision-makers of the many and complex interrelations between these systems and nature.

The authoritative *Millennium Ecosystem Assessment* (MEA, 2005) distinguishes 30 ecosystem services[3] which specify these links between nature and human well-being and assigns them to four distinct categories: (i) provisioning services, such as the production of food, timber, fibre, and water; (ii) regulating services, such as the regulation of climate, floods, and disease; (iii) cultural services, such as knowledge, spiritual and recreational benefits; and (iv) supporting services, such as nutrient cycles, soil formation and crop pollination. Zhang et al. (2007) depict a more detailed picture of 27 services related to agriculture that also includes six disservices (Fig. 1).[4] If we consider farm level management options (Ribaudo, 2008), this picture becomes even further elaborated.

Significantly in support of our aim is that the ecosystem service framework is designed to assist decision-making (Fisher et al., 2009; MEA, 2005). Decision-making typically involves a choice between alternative project variants or policy options, say, A, B, and C to X in Table 1 (Belton and Stewart, 2002). Deciding which option is best requires an evaluation of the different impacts of the policy options. Basically, the ESS framework broadens the scope of evaluations by encouraging decision-makers to consider a wider range of impacts and thus a larger number of impacts. If a decision-maker who would normally consider a certain set of policy options (Table 1: A, B, and C, to X) and a certain set of impacts (1, 2, and 3 to Y), were to also use the ESS framework, this implies that the set of Y impacts under scrutiny in the decision process is enlarged to Y *plus* the amount of ESS considered. For example, a farmer who needs to decide on a new crop might normally consider impacts on, say, his income, future market possibilities and daily workflow; however, using the ESS framework would also alert him (see Zhang et al. (2007) to impacts on pollination, natural control of plant pests, water purification, etc. Likewise, a regional agricultural policy maker deciding on a new subsidy scheme for small farmers might normally consider, say, number of farmers affected, impact on their living standard, erosion impacts, and changes in land ownership; however, using the ESS framework would stimulate him to consider, with MEA, the impacts of the new scheme on a broader range of regulating services (i.e., climate regulation, waste treatment, disease regulation, etc.) as well as cultural services (impacts on cultural diversity, spiritual and religious values, aesthetic values, social relations, cultural heritage values, and recreation). If the decision-maker follows Zhang et al. (2007), there may be 27 ESS; if the MEA is followed there may at least

[3] Without claiming to be complete. We therefore sometimes speak of '30+' ecosystem services.

[4] Zhang et al. limit cultural services to recreation and rank the others under the heading of *other, non-marketed services*. Like MEA, their list is more illustrative than complete.