

Preface

By responding to the request for evaluation of agroecosystem services in France, as part of the national EFESE program supported by the Ministry in charge of the Environment, the work coordinated by the Directorate of Collective Scientific Assessment, Foresight and Advanced Studies, of which this work presents a synthesis, has taken up several challenges.

The first challenge is to have, for more than two years, brought together around forty scientific experts from various disciplinary fields and institutional origins, and mobilised Inra's (now INRAE since 2020) skills in modeling agricultural ecosystems, data engineering and cartography. A summary of a report of nearly 1,000 pages, this work presents the conceptual and methodological advances, and the main results obtained by this multidisciplinary experts committee.

The second challenge is conceptual. The transposition of the notion of ecosystem service to the case of agricultural ecosystems, which are highly managed or even constructed, is not obvious. It therefore required developing an important and original conceptualisation, and making choices in a scientific field where debate is intense. The purposes of agriculture and the plural nature of agricultural practices have led the expert committee to differentiate goods and services, and to distinguish the practices those which build the ecosystem - the installation of planned biodiversity - from those which relate to the provision of exogenous inputs such as water, fertilisers and phytosanitary products and which regulate the potential for ecosystem services. In the same vein, proposals were made to clarify the oppositions between services, disservices, positive and negative externalities of agriculture.

A third challenge lies in the specification of services and the choice of biophysical and economic evaluation methods, the two essential dimensions of the notion of ecosystem service. This specification and this assessment — enriched by previous conceptual reflection, including particular attention to the links between services, benefits and beneficiaries, and an overview of the specificities of French agricultural ecosystems — required profound adaptations of the international typology of ecosystem services (Common International Classification of Ecosystem Services)¹ and a rich and profitable review of evaluation methods. A total of 14 services, which offer good coverage of the categories “regulatory services”, “goods” and “cultural services”, were studied. The use of the finest possible spatial resolution (down to the field), databases on soils, climate and cropping systems, and crop and meadow simulation models, results in an assessment based on both precise and complete throughout the national territory.

1. <https://cices.eu/>

A particular strength of this evaluation, beyond the information it provided to inform public decision-making, is to have fed back into the initial conceptual reflection around the relationship “agricultural practices – biodiversity – service – benefit”. For example, a quantification at the national scale of the share of agricultural production enabled by input ecosystem services and that enabled by the provision of exogenous inputs was carried out. Likewise, this work offers an enlightening comparison of the maps of services provided by agricultural ecosystems and the negative impacts of agriculture relating to similar criteria, such as the regulation of water quality by immobilisation of mineral nitrogen (service) and the amount of leached nitrogen (negative impact). Similarly, the economic assessment prompted critical reflection from the authors on the conditions for applying the methods and the need for a solid biophysical evaluation upstream.

The consideration of service bundles, which is crucial for rethinking the management of agricultural ecosystems, emerged as an additional challenge. This work has given a unique place to the analysis of interactions between services, in which the central role of cultural sequences appears, and which makes it possible to identify major management levers.

The perspectives opened by this work are rich on the conceptual, methodological and cognitive levels. Understanding the role of livestock and the management methods of the agroecosystem in the provision of ecosystem services are of course central to these perspectives. Likewise, the relationship “planned biodiversity – associated biodiversity” and the key role of biodiversity in the provision of services must still be deepened and explained. The results of these investigations, which call for a renewal of approaches, are highly anticipated as the potential impacts are significant.

By meeting all the challenges mentioned above, the expert committee not only responded to the request of the Ministry in charge of the Environment, but it also shared its considerable work and its achievements with the French community gathered in the Inra unifying program on agricultural ecosystem services, which supported the project with great interest. Even more, these experts contributed to advancing the thinking of researchers who invest in the fundamental area of the links between agriculture, biodiversity and the concept of ecosystem service, at the interface between science and society. Before inviting the reader to delve into this work, we would like to thank the 71 members of the working group who contributed to this major project, providing a solid scientific foundation and paving the way for numerous future works on characterisation and assessment of ecosystem services.

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First Inra research programme on agricultural
and forest ecosystem services - EcoServ (2013-2019)