



EJE TEMÁTICO: Incorporación de los Servicios Ecosistémicos en la Toma de Decisiones

**EMBRAPA RESEARCH NETWORK ON ECOSYSTEM SERVICES IN
BRAZIL**

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RESUMEN

Presiones humanas han causado la degradación de los recursos naturales y la reducción de la biodiversidad en el planeta, porque están aumentando la demanda de agua, fibras, alimentos, energía y materias primas. Es necesario conciliar los componentes económicos, sociales y ambientales en un escenario de cambio climático. Por lo tanto, la preocupación por este tema aumenta en todos los sectores de la sociedad. Durante las últimas décadas, distintas instituciones de investigación y de educación han realizado muchos estudios acerca de los recursos naturales en los biomas brasileños, pero sin un enfoque conceptual y metodológico de servicios ecosistémicos. Desde la Evaluación de los Ecosistemas del Milenio, investigaciones con el objetivo de comprender los servicios ecosistémicos se han incrementado en todo el mundo. La Empresa Brasileña de Investigación Agropecuaria (Embrapa) también ha seguido esta tendencia y en 2014 aprobó una red con más de 60 proyectos con el título: Servicios Ambientales en el Paisaje Rural. El objetivo aquí es presentar el estado del arte de las investigaciones sobre los servicios ecosistémicos relacionados con la agricultura en Brasil desarrolladas por esa red, y identificar cómo los resultados esperados pueden contribuir a la expansión de los servicios ecosistémicos en zonas rurales.

ABSTRACT

Human pressures have caused degradation of natural resources and reduction of biodiversity on the planet with serious consequences to humanity, because of the increasing demands for water, fibers, food, energy and raw material. It is necessary to reconcile economic, social and environmental components in a scenario of climate change. Therefore, concerns about this issue have increased in all sectors of society. Many data on natural resources in the Brazilian biomes were obtained by research, education, government and non-government institutions in recent decades, but without a conceptual and methodological focus turned to ecosystem services. Research aiming at understanding ecosystem and environmental services has increased worldwide since the Millennium Ecosystem Assessment. Brazilian Agricultural Research Corporation (Embrapa) has also followed this trend and in 2014 approved a network of projects entitled Environmental Services in Rural Landscape Arrangement with over 60 related projects. The purpose of this paper is to present the status of research on ecosystem and environmental services related to agriculture in Brazil developed by Embrapa, and to identify how the expected results may contribute to the expansion of environmental services in rural Brazil.

PALABRAS CLAVE

Servicios ecosistémicos, Herramientas de apoyo en las decisiones, Red de investigación.

KEYWORDS

Ecosystem Services, Support Decision Tools, Research Network.

INTRODUCTION

Over-exploitation of natural resources in economic development processes has led to the destabilization of ecosystems and reduction of ecosystem services in many regions of the world. Human pressure on ecosystem services is related to the dynamics of land use and land cover, changes in biogeochemical cycles, the destruction and fragmentation of environments, the introduction of new species and the interference of human activities on the climate (SALA et al., 2000).

Socio-cultural and environmental impacts are consequent phenomena of development processes (MATTOS e HERCOWITZ, 2011), which result in degraded landscapes with scarce natural resources (RODRIGUES et al., 2009). On the other hand, society can change the landscape in order to preserve it, to obtain environmental benefits, and environmental services. In this case, environmental services are understood as "environmental benefits of intentional intervention of society in the dynamics of the ecosystems" (MURADIAN et al., 2010).

In this context, studies that clarify the relationship between ecosystem services and human well-being and those focusing on ecosystem services maintenance are very important in current and future scenarios. And the formation of research networks and the discussion forums on this subject are relevant alternatives to achieve concrete results, as, by means of them, a work can be promoted in a synchronized and organized way by using information of the Brazilian biomes in different databases.

Embrapa, which is the national public agricultural research institution in Brazil, is increasing its activities in this field and already has several research groups focused on ecosystem and environmental services in all Brazilian biomes. A research network entitled Environmental Services in Rural Landscape Arrangement was created to integrate and exchange experience among research groups, external partners and farmers.

The purpose of this paper is to present the status of research on ecosystem and environmental services related to agriculture in Brazil, especially the groups and research fields developed at Embrapa, and to identify how the expected results may contribute to the expansion of environmental services in rural Brazil.

MATERIAL AND METHODS

The survey was based on various documents and databases on ecosystem service research. The survey was done to identify the research production on the theme, giving greater emphasis to ecosystem services in rural areas. The documents consulted included:

- the survey held by Balvanera et al (2012) on the status of Ecosystem Services in Latin America (LA);
- the survey presented by Prado (2014) referring to various initiatives and research groups in Brazil and available databases on ecosystem studies;
- the survey in Scopus Base to check the Brazilian scientific production on the theme, 2004-2014;
- the database of projects developed by Embrapa or in partnership with Embrapa - IDEARE System / Embrapa.

RESULTS AND DISCUSSION

The research directly related to ecosystem and environmental services has increased in Brazil. The survey in Scopus Base in 2014 showed that the Brazilian scientific production on the theme is 16th in the world ranking.

Since the creation of Embrapa in the 1970s, the research on conservation of natural resources has been increasing consistently. More recently, research focusing particularly on ecosystem and environmental services has grown. We found great interest and investment of the institution on these themes when researchers exclusively dedicated to the topic were hired in 2006. The different research groups, which had been working in all the Brazilian biomes, began to interact and exchange experiences, so that justified the creation of a project network in 2014. Operating in all biomes and at different scales, Embrapa, through its research units, has produced data and knowledge on ecosystem and environmental services in all its dimensions. There are over 60 ongoing projects and planned activities for the next 10 years. This research network was made official in 2014, as a network of projects of Embrapa researchers and partners, which was named Environmental Services in Rural Landscape Arrangement (Arrangement SA). The network aims to develop knowledge and tools to support programs and policies for the restoration, maintenance and expansion of environmental services and to strengthen sustainable production systems based on rural landscapes. This network interacts with other networks, which work on related topics, in Embrapa, in several universities, as well as national and international research centers, comprising other specific research networks by biomes or themes. One purpose of Arrangement SA is to make links between different research groups on the theme of Ecosystem and Environmental Services, promoting the exchange of experiences, the establishment of common protocols and methodologies, seeking joint solutions to the organization and dissemination of the data and knowledge produced, as well as seeking training and integration opportunities in related public policy discussions.

Arrangement SA identified the reduction and degradation of ecosystem services in rural areas as the fundamental research problem to be addressed and where all the research questions converge. Three major network fields of action were prioritized: assessment and integrated analysis as decision support; development and adaptation of methods and tools; organization of information and transfer / communication. The impacts expected from this work will occur from specific results of Arrangement SA, as well as from the results of the projects that comprise it, as follows: i) reference / conceptual framework on ecosystem and environmental services in Brazil; ii) tools to support the organization of data in databases on ecosystem and environmental services; iii) set of indicators to measure, report and verify initiatives on environmental services and validation of rural production systems as providers of ecosystem services; iv) methodologies developed and improved for characterization, monitoring and valuation of ecosystem and environmental services; v) technologies and processes to enhance the generation of ecosystem and environmental services in rural landscapes; vi) mechanisms of valuation and compensation of direct and indirect ecosystem services; vii) development of human resources and internalization of the concept of ecosystem services at Embrapa; viii) generation of the training support material on the subject in accessible language to technicians, producers and decision makers; ix) prospecting institutional demands related to environmental services and support public policy instruments; x) guidelines for certification processes; xi) conducting national and international events on the subject; among others.

Some results have been obtained by different groups and projects of Arrangement SA and are available in order to support the maintenance and recovery of ecosystem and environmental services in

rural areas. Some of these results refer to indicators and methods obtained to verify the impact of conservation management on ecosystem services (PARRON et al., 2014 – in press), to subsidize ecosystem payment programs (PRADO et al., 2013; TURETTA et. al., 2014), to evaluate the degradation of ecosystem services due to different land uses, as carbon stocks (BERENGUER et al. 2014) and biodiversity (MOURA et al. 2013), to identify vulnerable areas (THOMPSON and FIDALGO, 2013) or priority areas for conservation (RODRÍGUEZ-OSUNA et al, 2014.) in watersheds, and to strengthen cultural services as a source of income in rural areas and to value ecosystem services (PEDREIRA et al., 2014a; PEDREIRA et al., 2014b).

CONCLUSION

The Environmental Services in Rural Landscape Arrangement, created in 2014 by Embrapa research groups, is comprised of a set of projects, which work in different biomes in order to contribute to the conservation and expansion of ecosystem services in rural areas. Opportunities arise from this Arrangement to bring science closer to decision makers; to support public policies; to promote training; in addition to promoting the exchange of knowledge and experience among Embrapa, education and research institutions and other partners.

There are great challenges to set forth a network of projects. However, the results that may be achieved will help a lot to expand the scope and importance of the topic, with high potential to benefit Brazilian society.

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