

SUSTAINABILITY AND VALUATION OF ECOSYSTEM SERVICES

Sérgio Gomes Tôsto – tosto@cnpm.embrapa.br

Lauro Charlet Pereira – lauro@cnpma.embrapa.br

Ademar Ribeiro Romeiro – ademar@eco.unicamp.br

João Alfredo de Carvalho Mangabeira – manga@cnpm.embrapa.br

The planet's population is totally dependent on its ecosystems and ecosystem services offered. The planet's capacity to support its diversity of species, including humans, is large, but essentially limited. In this context, the environmental issue has been often discussed from a strategy based on the concept of ecosystem services and their valuation must be understood as an essential tool in organizing information, addressing both the direct process of decision making and the provision of subsidies in the formulation of public policies that contribute to the sustainable management of environmental resources. This study was developed in Araras city, Sao Paulo, Brazil, which has a strong tradition of agricultural exploitation, with the intensive use of agricultural inputs and a large agricultural mechanization as well as excessive deforestation that already point to the presence of serious environmental problems. This scenario may represent a situation of environmental unsustainability and put at risk the supply of ecosystem services. Thus, this work sought to answer the following question: (i) Is the occupation of lands in Araras city done sustainably? Methodologically, we used the concept of sustainable scale recommended by the Ecological Economics, establishing the capacity of land use in the city and defining an environmental sustainability index with the support of Multicriteria for Decision Aid - Constructivist method (MCDAC), making use of MMacbeth software (Bana Costa et al., 1995). We also used valuation methods of Environmental Economics to quantify and value ecosystem services of riparian forests, carbon sequestration by the soil through the roots and phytomass, loss of surface water due to flowage and provision of ecosystem services (production). Three scenarios were defined: (1) current land use, (2) current land use with recovery of Permanent Protection Areas¹ (PPA) and (3) land use in accordance with the APP and Legal Reserve² (LG) use and recovery capacity. A sustainability index was defined for each agricultural explored activity in the city and considering soils management and conservation criteria, pesticides use, fertilizer use and legal observation of PPA and RL occupancy. The same methodological procedure was applied to the three idealized scenarios. The results show an improvement in the sustainability indexes

¹ Protected areas by Brazilian environmental law as river margins, mountain tops, slopes, etc.

² Mandatory legal reserve areas with possible economic exploitation corresponding to 20% of the property area in the studied region.

of scenarios as we move from the first to the third scenario. Economically there is also an increase in the value of ecosystem services with the exception of the third scenario because of a large provision loss of ecosystem services. This work shows that although ecosystem services have been quantified in a reductionist way, it is clearly important to consider them in formulating sustainable environmental public policies.

There is no denying that the valuation efforts have achieved a political and institutional framework for the issue of sustainability. The various academic papers, government policies supported by these concepts, sustainable management diffused by the economic agents, legal disputes, finally, a series of demonstrations are examples of the growing space occupied by the search for a more sustainable use of natural resources. Therefore, one can say that there has appeared a creative social dynamic resulting in the emergence of interesting efforts of global, regional and local level and that they directly or indirectly benefited from the adoption of a more integrated view of natural resources valuation processes which search for sustainability.

However, these efforts, both valuation and discussions on the operationalization of the sustainability concept, has required more explicit and constant reasoning of evaluation processes, which involves, firstly, sketching the pre-analytic vision that involves.

In the case of ecological economics, the first component of this pre-analytical vision is the definition as a science system, that is, which cares about the understanding of complete systems, not only with their parts, a common practice of traditional science. A system means a set of interdependent parts connected by energy exchanges of matter and information (COSTANZA et al., 1997). Recognizing the fundamental relationship between systems as the object of ecological economics involves review and adopts a series of principles, fundamentals and parameters of economic theory. Daly (1992) postulated such parameters through the concepts of scale, allocation and distribution. The integration of various approaches proposed by different knowledge areas, points out to consider the problems associated with sustainability. In this emerging interpretive approach, which considers simultaneously the objectives of ecological sustainability, distributive justice and economic efficiency are goals postulated by ecological economics (Costanza, 2001).

In socioeconomic systems, the economic activity of production allocates resources in order to satisfy human needs. For ecological economics, is also desirable an efficient allocation of resources, however, this allocation have to meet the limits set by the interaction between human systems and natural systems, in other words, the limits of resource usage defined by the sustainable scale. Thus, the aim is an efficient allocation in a broader sense

than that defined by traditional economics. There is no question that the efficiency is obtained when greater benefits are reached with the lowest possible cost. Nevertheless, the allocation of values for the purpose of computing costs and benefits must be done, considering to include not only all the elements of the systems but also take into account, as the limit, the factors related to the scale of natural resources use.

However, an efficient allocation is not enough when the sustainable development is taken as a goal, because the benefits must be equitably distributed. Therefore, a fair distribution becomes obligatory. Thus, this parameter affects the allocation of resources inter and intra generations. At the present, the use of huge amounts of resources by a few while others are having difficulties to meet their most basic needs is a distribution problem. As unfair as this distribution is the one that exists between the present and future generations. The current use of resources cannot deny to future generations the reach the same levels of welfare.

In general, one can say that there is a positive relationship between levels of environmental sustainability and the provision of ecosystem services. Thus, measures that will result in higher sustainability levels will also provide a greater availability of ecosystem services, which enable us to assert that there will result an improvement in the population welfare.

In the course of this work which was supported in pre-analytic vision of ecological economics, efforts have been made in order to integrate ecological and economic values obtained. However, it has to be noted that due to the pioneering nature of this study, additional research need to be developed, required to analytical conceptual and methodological development that could guide in a most appropriate way to achieve the objectives of environmental, social and economic sustainability.

The theoretical framework developed in this work must be improved in order to incorporate other environmental variables and to include other analysis dimensions as social, economic and institutional. There is no doubt that there is still a long path to be traveled, and that criticism of the traditional systems of valuation alone are not enough, since they must provide guidance to new theoretical constructs, applications and broader methodologies. The opened paths by modeling, the application of advanced multicriteria methods, the integration of values and the construction of indicators, supported on theoretical constructs of ecological economics must be pursued by ecological economists in order to their real contribution get spaces in public policymaking.

Use of this interpretative scheme for Araras city and its agricultural area allowed operationalizing some fundamental and relevant concepts for ecological economics. It has limits due to its pioneering nature, but also points towards the need for more empirical works be developed in order to conceptual, methodological and practical advances, supported in the theoretical body of ecological economics, can be performed to contribute effectively to the science development and for sustainable use of natural resources.

Therefore, it is concluded that the adoption of pre-analytic vision of ecological economics is crucial to progress in this area. Thus, the consolidation of broader valuation models have to consider the alternatives here discussed, considering the aspects related to sustainable scale, a process of monetary valuation more aware of their limitations and potential and the possibilities of a fairer resources distribution between present and future generations. It is hoped that this study has clearly scored the potential of ecological economics allowing identifying the gaps where there is need for deeper theoretical and conceptual studies and practical applications, so necessary to the process of intervention in reality.

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