



Selecting agri-environmental indicators for monitoring and assessment of environmental management in the example of landscape parks in Poland



Kubacka Marta*, Bródka Sylwia, Macias Andrzej

Department of Landscape Ecology, Faculty of Geographical and Geological Sciences, Adam Mickiewicz University, Poznań, Poland

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ABSTRACT

The objective of this article is to assess the condition of and hazards to the natural environment in selected landscape parks in Poland with respect to the impact of agricultural management using the DPSIR method. Our proposed set of indicators, based on generally available and applicable data, shows at the local scale, in a simple way, the condition of functioning of the balance between the natural environment and agricultural management and it assesses the level of repair works in the context of the records of the environmental protection program. The highest negative impact of agricultural management in the areas studied is noticed in the soil environment as well as the contexts of biodiversity and landscape. On the other hand, the lowest influence of agricultural economy was noted in the cases of the atmosphere and hydrosphere. The results of the aggregated indicators also showed lower or higher dependencies between the coverage and the use of the area in landscape parks and the condition of particular elements of the environment and the landscape.

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1. Introduction

Over the past 60 years, European agriculture has undergone a period of rapid intensification achieved through an increased application of chemical fertilisers and pesticides, combined with implementation of best management practices, mechanization, irrigation, and with the use of improved seed varieties (Gaudino et al., 2014; Tilman et al., 2002). A low external-input and organic cropping system can provide a good compromise between intensity (level of input used per unit of surface) and efficiency (quantity of product obtained per level of input used) in the agricultural economy (Michos et al., 2012; Pointereau et al., 2012; Alluvione et al., 2011). This is particularly significant for legally protected areas in which human activity is admissible.

Agri-environmental instruments are needed to support the sustainable development of rural areas and to respond to society's increasing demand for environmental services. The current trend of indicator-based sustainability evaluation (i.e. measurement of environmental and governance performance) and differences in decision-making problems are discussed by Hřebíček et al. (2013). Moreover, they showed that the sustainable development indi-

cators can provide an early warning, sounding the alarm in time to prevent economic, social and environmental damage, which is very important in the example of landscape parks and other naturally protected areas. To help improve measurement of the environmental performance of agriculture, the OECD has established a set of agri-environmental indicators, with development of the indicators in cooperation with Eurostat and FAO. These indicators inform policy makers and society about the state and trends in agri-environmental conditions and can provide a valuable aid to policy analysis (OECD, 2012; FAO, 2010; EEA, 2005).

The major objective of our research is the assessment of the condition of and hazards to the natural environment in the selected landscape parks in Poland with respect to the impact of agricultural management using the DPSIR method. Comprehensive assessment of the natural environment should consider structural and functional links which occur between the components of that environment and human activity (Macias and Bródka, 2014). One method which makes the knowledge about these dependencies more orderly and integrated is the DPSIR method. An additional advantage of this method is that it puts the aforementioned dependencies into cause and effect relationships. The sets of environmental indicators prepared so far in Poland, concerning agricultural management at the level of pressure, condition and reaction, were most often considered irrespective of one another and they were quite general in nature (Borys, 2011; Kistowski,

* Corresponding author.

E-mail address: marta.kubacka@amu.edu.pl (M. Kubacka).

Table 1

The assessment of the scope of problems of the environmental protection program for selected voivodeships of Poland from the point of view of agricultural management.

The scope of the program problems	Voivodeship									
	Dolno-śląskie	Kujawsko-pomorskie	Lubelskie	Łódzkie	Mazowieckie	Podlaskie	Pomorskie	Śląskie	Świętokrzyskie	Wielkopolskie
Diagnostic part—the analysis of the environmental condition and hazards										
Assessment of agricultural production space	++	++	+++	++	+	+	++	++	+	++
The occurrence of protected areas prior to the change of use for non-agricultural purposes (soils with high valuation class)	+	+++	+++	+	+	+	++	+	+	++
Demand for water for agricultural purposes and water deficit	+++	+++	++	+++	++	+++	+	+++	+++	++
Risk of soil erosion	+++	+++	+++	++	+	+	+	+	+	++
Soil chemical contamination	+++	++	++	++	++	++	+	+++	++	++
Water degradation, including areas at risk of contamination, coming from agricultural sources	+++	+++	+++	+++	+++	+++	++	+++	++	+++
Biosphere degradation and the impact on naturally valuable areas	++	+++	++	+	+	++	+	+	+	+
Agricultural waste generation, including hazardous waste (the amount of waste and its structure by type)	++	++	++	++	++	++	+	++	+	+
Directional part—proposed solutions in the area of environmental protection										
The implementation of the code of good agricultural practice	+++	+++	+++	+++	++	+++	+++	+++	+++	+++
Soil protection prior to the change of use for non-agricultural purposes (soils with high valuation class)	+	+++	+++	+++	+	+	++	+	+	++
Protection of soils against erosion	+++	+++	+++	++	++	+	++	+	+	++
Protection of soils against chemical contamination	+++	++	++	++	+	+++	+	+	+	++
Degraded soil reclamation	+++	+++	+	++	++	++	++	+	+	+
Improvement in water quality by the reduction of contamination from agricultural sources	+++	++	+++	++	++	+++	++	+++	++	+++
Little retention support at agricultural areas, development of agricultural melioration	+	++	+++	++	+	++	++	+	+++	+++
Forestation of soils with low agricultural suitability	++	++	+++	+++	++	+	+	+	+++	++
Protection of biodiversity at agricultural areas	+	++	+++	+	++	+	++	+	++	+++
Agricultural waste effective management (also hazardous waste)	+	+++	+	+++	+	+	+	+	++	+
Energetic use of raw materials and agricultural waste	+	+	+	++	++	+++	+	+	+++	++
Ecological and integrated agriculture development support	+++	+	+++	+++	+++	+++	+++	+++	+	+++
Development of water and soil monitoring	++	++	++	++	+	+	++	+	+	++
Farmers' ecological education	++	+	+	++	+	++	+	++	++	+++

Source: Own work. Clarifications: The meaning of program content: +++—high, ++—medium, +—low.

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