BIODIVERSITY IN LIFE CYCLE ASSESSMENT

Impact Assessment of Land Using Processes on Biodiversity

Factsheet for corporations

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Scope

This factsheet is part of the joint research project *Biodiversity Valuing & Valuation* (www.bio-val.de). BioVal develops solutions to reduce negative impacts on biodiversity through food along the life cycle. Together with companies, it is determined how they can contribute to the promotion of biodiversity along product life cycles, how this can be anchored in management and communicated. BioVal focuses on the food industry, which has a major impact on the protection and conservation of biodiversity due to the use of a wide variety of ecosystems. BioVal works on the overarching research question of how biodiversity can be increased along the food value chain from three perspectives: the societal perspective on values relating to biodiversity, the methodological perspective on assessing the impact of products on biodiversity and the entrepreneurial perspective on biodiversity-enhancing management.

The aim of this factsheet is to give a brief insight into the underlying biodiversity impact assessment method, prepared for the target group of companies.

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GEFÖRDERT VOM

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FONA Sozial-ökologische Forschung

Rationale

Biodiversity plays a crucial role for life on earth. Important ecosystem services such as soil formation or nutrient cycles are significantly influenced by biological diversity. Biodiversity is declining sharply, which is why its protection has become a central topic of environmental policy action. Life cycle assessment has proven itself as a tool for estimating and accounting for emissions and environmental impacts at product level in environmental management. However, a suitable method for estimating effects on biodiversity is not yet common in life cycle assessment.

Goal

The BioVal research project integrates an innovative method for assessing the impact of land-using processes on biodiversity in life cycle assessment and brings it into the corporate context. With this model, the impact on biodiversity can be assessed and used as a new indicator in addition to well established parameters such as the global warming potential (GWP). In this way, key levers for reducing the negative impact on biodiversity along the supply chain can be identified and product balances can be improved in a targeted manner.

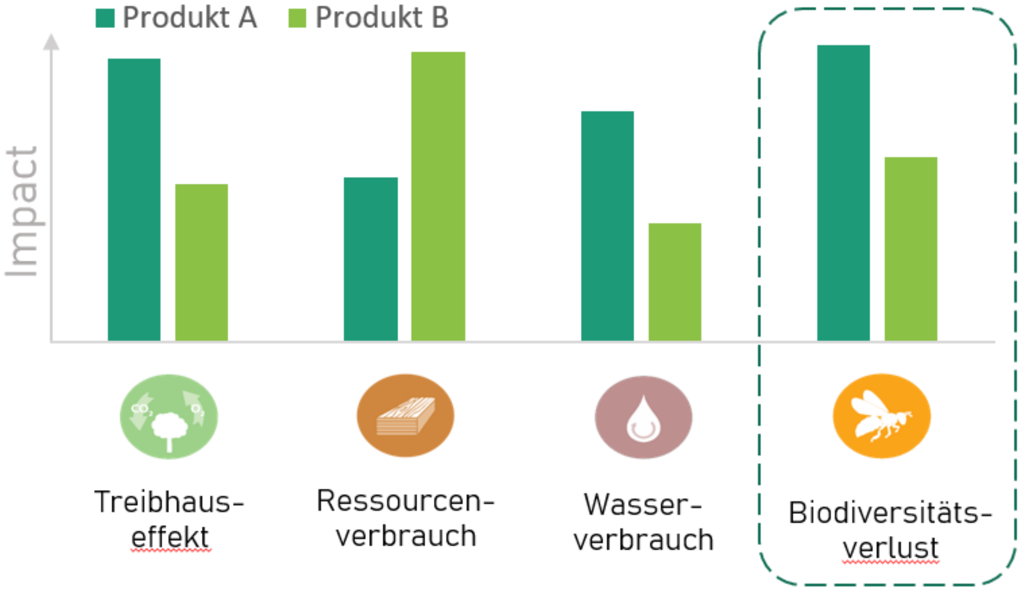

Figure 1: Biodiversity impact potential as impact category in LCA

Method

The method used in BioVal for assessing the impact on biodiversity assumes that human influenced areas, such as agricultural areas, offer habitats for various animal and plant species. To a certain extent, the condition of the area reflects the quality of the habitats and is related to the degree of existing and potential biological diversity on this area. The better the condition of the area, the higher the biodiversity potential. Every intervention, e.g., tillage or the use of fertilizers or pesticides, has an influence on the condition of the considered area and therefore on the habitats. Even factors that are not obvious, such as structural elements, i.e., elements that give the area structure and thus offer a variety of habitats to various animal and plant species, also have an influence on biological diversity.

These parameters are used to determine the influence of a land-using processes, e.g., the cultivation of sugar beet, on biodiversity.

The method according to Lindner et al. 2019/2021 was developed over years and makes it possible to quantify these influences summarize them and form a local biodiversity value. The local biodiversity value depends thus on both the characterization of selected parameters and the type of land use (e.g., fields, pastures, mining).

Since different regions on earth have a fundamentally different degree of biodiversity due to their biogeographical characteristics, a land-using process has a greater global impact in regions with high biological diversity than in regions with low biodiversity. This global "weighting" is included in the method based on ecoregions, i.e., regions that have similar biogeographical characteristics. An “ecoregion factor” is assigned to each of the more than 800 ecoregions. This weighting is particularly relevant in global value chains.

Application

To carry out biodiversity impact assessments, the following information is required:

1. Which types of land-using processes are considered (e.g. fields, pastures, mining)
2. Where is process applied? In which country? In which region?

Based on this information, it is determined which management parameters must be collected. In Table 1, the required parameters for the land use class "Arable" are listed as an example. Some parameter values are not always easy to gather. Basic parameters, which are usually recorded in agriculture, are marked in green in Table 1. The parameters marked in yellow usually require estimates, while the parameters marked in red are in most cases covered based on databases. In any case, the following applies: the more precisely the data is collected, the more precise the result will be, from which more targeted measures can be derived.
In the last step, the calculated biodiversity value is offset against the area used. Based on the resulting biodiversity effect for the product, improvement measures can finally be derived.

Table 1: Management parameter for land use class 'arable'

Criterion	Parameter [Unit]	Description
Accompanying flora	Diversity of accompanying flora [Amount/ha]	Number of plant species that are not among the cultivated species
	Occurence of Red List Species [%]	Temporal share of the occurrence of Red List species
Structural diversity	Structuring elements [%]	Area percentage of structuring elements
	Field size [ha]	Average field size
Tillage	Tillage [Liter/ha]	Diesel consumption for tillage
	Ground cover [%]	Area percentage of uncovered ground
	Crop rotation [Points]	Crop rotation evaluation
Fertilizer application	Intensity of fertilization [kg N/ ha a]	Application of nitrogen
Pesticide application	Application of pesticides [Amount/a]	Application rate of pesticides (e.g., herbicides, fungicides, insecticides)

Scientific framework

The biodiversity impact assessment method presented above is based on years of scientific research and incorporates current scientific findings (for more information, see e.g., Lindner et al. (2014), Lindner (2016), Lindner et al. (2019), Lindner et al (2021)). It is based on the scientific consensus on

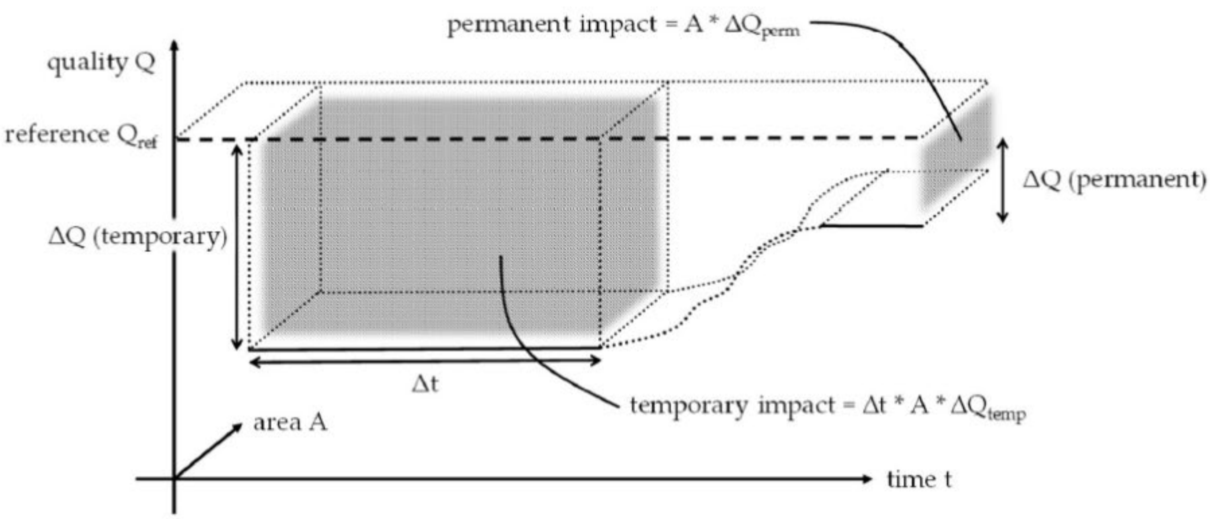

Figure 2: Quantification framework for land using processes (Koellner et al. (2013), iCanals (2007))

the integration of land-use processes in life cycle assessment, the so-called Land Use Framework (see i Canals (2007) and Koellner et al. (2013)).
The Land Use Framework (Figure 2) specifies how impacts of land-using processes on various quality characteristics of areas are calculated. This standard is already being adopted by software and database providers, so that the method presented above is basically compatible with current software. The effect of the land-using process is calculated by multiplying three parameters: the temporary difference in quality (ΔQ), the occupied area (A) and the occupation time (Δt).

$$Impact = \Delta\mathrm{Q} * \Delta\mathrm{t} * \mathrm{A}$$

ΔQ depicts the quality difference between the current condition of an area and a desirable reference condition. Lindner et al. 2019/2021 characterize the quality of the area as a biodiversity value, so that the biodiversity impact of land-using processes can be quantified using the above-mentioned method. The two parameters area and occupation time can be determined relatively well and are already incorporated in current databases as area occupation measured in area time (area multiplied by time).

Source

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