

Sabina Zaremba-Warnke

Wrocław University of Economics

e-mail: sabina.zaremba-warnke@ue.wroc.pl

ORCID: 0000-0002-9005-5763

Boris Seidel

Technical University Dresden

e-mail: boris.seidel@tu-dresden.de

ORCID: 0000-0003-4558-1593

BIODIVERSITY ASSESSMENT AND SUSTAINABILITY COMMUNICATION IN REGIONAL VALUE CHAINS OF SMES IN THE FOOD SECTOR

OCENA BIORÓŻNORODNOŚCI I KOMUNIKOWANIE ZRÓWNOWAŻONOŚCI W REGIONALNYCH ŁAŃCUCHACH WARTOŚCI MŚP W SEKTORZE SPOŻYWCZYM

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Summary: The aim of this paper is to assess the set of indicators developed by the authors within the framework of the project “Regional value chains in the context of biodiversity and ecosystem services – based on the example of Czech-Polish-Saxon research project collaboration”. The indicators can be used as a tool for evaluating the biodiversity performance of small and medium-sized food enterprises on a micro scale and for sustainability communicating in their value chains. After a short introduction and a literature review, the indicator set for agricultural businesses is presented. Based on qualitative surveys on selected farmers, this set was evaluated with the help of SWOT analysis elements. The survey results showed the weaknesses and strengths of the construction of the indicator set and also the opportunities and threats of its usage. Finally, recommendations for further research are presented, mostly connected with sustainability communication in regional value chains in food SMEs.

Keywords: biodiversity assessment and management, regionalism, sustainability communication, regional value chains.

Streszczenie: Celem artykułu jest ocena zestawu wskaźników opracowanych przez autorów w ramach projektu „Regionalne łańcuchy wartości w kontekście bioróżnorodności i usług

ekosystemowych – na przykładzie czesko-polsko-saksońskiej współpracy badawczej”. Zestaw wskaźników może być wykorzystywany jako narzędzie do oceny poziomu ochrony różnorodności biologicznej małych i średnich przedsiębiorstw sektora spożywczego w skali mikro oraz komunikowania zrównoważoności w ich łańcuchach wartości. Po wprowadzeniu i przeglądzie literatury przedstawiono zestaw wskaźników dla przedsiębiorstw rolnych. Na podstawie badań jakościowych wybranych rolników zestaw ten oceniono za pomocą elementów analizy SWOT. Wyniki badania wykazały wady i atuty konstrukcji zestawu wskaźników, a także szanse i zagrożenia związane z jego wykorzystaniem. W tekście przedstawiono zalecenia dotyczące dalszych badań, głównie związane z komunikacją zrównoważoności w regionalnych łańcuchach wartości w małych i średnich przedsiębiorstwach sektora spożywczego.

Słowa kluczowe: ocena i zarządzanie bioróżnorodnością, regionalność, komunikowanie zrównoważoności, regionalne łańcuchy wartości,

1. Introduction

Against the background of the loss of biodiversity in agriculture on our own doorstep and the growing consumer awareness regarding regional origin and quality, managing natural resources across the entire value chain is becoming more and more relevant for businesses especially in the food sector and even for small and medium-sized enterprises (SMEs) which represent 99 % of all businesses in the EU. They are the backbone of its economy [European Commission 2018]. Regarding the entire food chain (farming – processing – distribution – consumption), agriculture is by far the arena with the greatest impact on biodiversity [Schröter-Schlaack, Heinz 2016]. There is also a promising trend of consumer awareness regarding local food and sustainability consumption at national as well as regional level [AMI 2018]. Geographically close localized food chains have a particular potential to impact biodiversity in a positive way, because they are more capable to enforce direct agreements on quality and production standards with their suppliers. The key point is that SMEs can only manage, improve and communicate biodiversity if they are able to measure this complex issue with the help of practical, meaningful and relevant indicators. However, the existing indicator sets (EMAS, GRI etc.) rarely refer to the aspect of biodiversity and hardly take into account the special needs of SMEs [Schröter-Schlaack, Heinz 2015]. Therefore the authors see a special demand for research in this field.

The aim of this paper is to assess the set of indicators developed by the authors within the framework of the project “Regional value chains in the context of biodiversity and ecosystem services – based on the example of Czech-Polish-Saxon research project collaboration”. The indicators were assessed as a tool for evaluating the biodiversity performance of small and medium-sized food enterprises on a micro scale and for sustainability communicating in their value chains.

The following research methods were used to achieve the above objective: the subject literature review, including an analysis of the project reports,

and qualitative surveys on selected farmers conducted in August 2019 and the elements of a SWOT analysis.

2. Assumptions for biodiversity assessment indicators

As many cross-industry networks (Biodiversity in Good Company, Business & Biodiversity Campaign, etc.) show, the “value” of the corporate nature is increasingly recognized as a business standard and as a factor of success. According to Schaltegger and Beständig [2010], organizations can generally influence the preservation of biodiversity in the following fields of action: (1) sites and facilities, (2) supply chains, commodities and material, (3) product design, (4) production and manufacturing processes, (5) transport and logistics and (6) personnel. The supply chain plays a decisive role here: “For many industries and products the real challenges lie outside the factory gates, namely with the origins of the raw materials and primary products.” [‘Biodiversity in Good Company‘ Initiative 2015]. This applies in particular to micro enterprises which have less of an impact on the environment through their operations than indirectly through their value chains [Schröter-Schlaack, Heinz 2017; Kramer et al. 2017].

With regard to the “chain” metaphor, there are manifold approaches in economic geographical and economical literature, which can easily lead to confusion and misunderstandings [Kaplinsky, Morris 2000]. These include the Filière concept, the Value Chain concept according to Porter, the Sustainable or Green Supply Chain Management, the Global Commodity Chain, Material Flow Analysis and Life Cycle Assessment [Porter 1985]. In the food sector, the terms “food value chain” or “food supply chain” are commonly used. An auspicious approach for the presented research is the consumer-driven commodity chain concept from Kulke. It acknowledges the special role of consumers as a driving force for changes on the supply side due to rising consumption awareness and diversification, especially in the food industry [Kulke 2007]. Accordingly, the components of a generalized food value chain are presented in Figure 1.

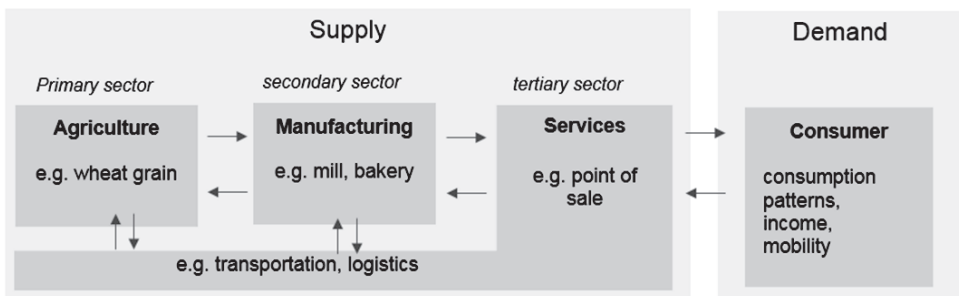


Fig. 1. Food value chain using the example of bread

Source: own illustration based on [Kulke 2017].

Most of the publications in the field of food value chains do not deal with biodiversity issues. An explicit reference to biodiversity is given by Galli et al. [Galli et al. 2016; Galli, Brunori 2017]. However, a concrete quantification was not made here.

Facing the challenge of assessing the biodiversity in agricultural value chains more precisely, a group of authors group at the Institute for Environmental Planning (IUP), Leibniz University Hannover, developed an open source software based on a geographical information system (GIS) called “MANUELA”.¹ It is able to calculate the operational achievements regarding biodiversity, the biotope network and landscape aesthetics in agricultural enterprises. The software has the advantage of providing a sufficiently reliable and quantified assessment of the biodiversity performance by the help of easily ascertainable data. However, the initial implementation in farm businesses is complex and advisory intensive, since many companies, especially smaller ones, do not even use a GIS [Bredemeier et al. 2018].

This indicated bottleneck is a general issue in small and micro-businesses. In contrast to large enterprises, SMEs are faced with various limitations regarding the consideration of environmental aspects in decision-making processes [Johnson, Schaltegger 2016]. In view of this, there are three main criteria which the indicators for SMEs should fulfill [Schröter-Schlaack, Heinz 2015]:

1. **Meaningfulness:** first of all, indicators have to fulfill their purpose in terms of content. For example, impact-related indicators should cover as far as possible all drivers of biodiversity loss.

2. **Relevance:** the various functions of indicators – generation of information, internal control and external reporting – are considered in this criterion. It is crucial whether SMEs have any influence on a certain indicator. It is also clear that the indicators of a cross-industry set have a different relevance for different companies.

3. **Practicability:** theoretically meaningful indicators only become meaningful when they are applied in practice. As many existing indicators are not used by SMEs, the criterion of practicability is of great importance. These include:

- data collection effort,
- implementation costs (time/personnel costs),
- previous knowledge in economics or sciences,
- simplicity and user-friendliness of the indicators.

Thus the management of biodiversity in value chains by SMEs is a quite challenging task, however it can offer opportunities for business success through a reduction of costs, promotion of the company’s reputation, an increase of sales and prices, a mitigation of risks regarding suppliers and other stakeholders, a stimulation of innovations and the development of new business models [Schaltegger, Beständig 2010].

¹ The name “MANUELA” is an acronym for German “Managementsystem Naturschutz für eine nachhaltige Landwirtschaft” (“Management System Nature Conservation for a Sustainable Agriculture”).

As one can see in the literature, numerous approaches to integrating biodiversity into entrepreneurial decision-making processes already exist. However, there is still no proven instrument to a biodiversity-related value chain management in SMEs, especially in microenterprises that meets the criteria of meaningfulness, relevance and practicability.

3. Presentation of the project and indicator set for agriculture

Against this background, in a joint project² called “Regional value chains in the context of biodiversity and ecosystem services – based on the example of Czech-Polish-Saxon research project collaboration” led by NETSCI Professor Kramer GmbH, conducted in the period from 2015 to 2017 in cooperation with the UFZ Leipzig, IUP Hannover, Wrocław University of Economics, the Jan Evangelista Purkyně University in Usti nad Labem and LANU³ helped to close this research gap; 60 SMEs from the tri-border region of Poland, the Czech Republic and Germany in six different industries contributed to the project.

The annex to the final report contains guidelines for six branches (agriculture, forestry, wood processing, food processing and gastronomy, tourism and beekeeping) which provide a suitable starting point for the operationalization of biodiversity aspects in businesses. This applies in particular to micro-enterprises that do not yet have an environmental management system. Of particular relevance to this work are the sets of indicators for the agricultural sector [Kramer et al. 2017]. The core indicators are:

- *share of small structures* – landscape elements and small structures such as hedges or field trees provide valuable retreat and reproduction space for plants and animals and thus assume an important ecological function,
- *structural diversity* – for the assessment of structural diversity, thresholds for the width and length of hedges and field lines are used according to the MANUELA software,
- the *use of machinery* is determined as the sum of crossings made with agricultural vehicles in the period after the harvest of pre-culture up to and including harvesting the main fruit,
- *nitrogen fertilization level* – the expression of this indicator is expressed for every crop type in kilogram nitrogen (N) per hectare and year,
- *fruit species diversity* – is measured by the number of different main crops in a year of cultivation.

The authors chose to depict these items with the help of a star diagram as shown in Figure 2. According to Kramer et al., the biodiversity performance can be

² The project was funded by the Deutsche Bundesstiftung Umwelt (DBU) (German Federal Environmental Foundation).

³ Saxony State Foundation for Nature and the Environment.

evaluated as “low” (1), “middle” (2) and “high” (3) using the farm business-related indicators mentioned above [Kramer et al. 2017]⁴.

These indicators were developed on the basis of the MANUELA software and enable farms to record the biodiversity performance on-site. For agricultural businesses that do not have their own geographic information system (GIS), there is also a simplified assessment without the use of that software, which is of particular interest of this paper.

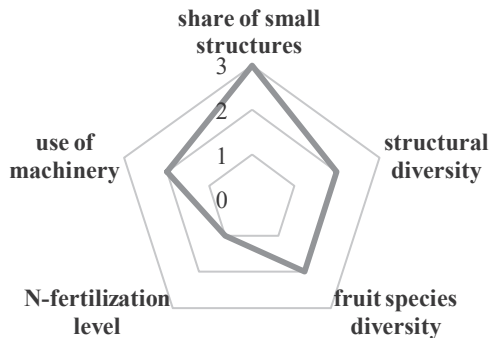


Fig. 2. Evaluating the “biodiversity performance“ visualized through exemplary values

Source: own illustration according to [Kramer et al. 2017, Annex I, p. 9].

However, the authors emphasize that the sets of indicators have only been tested, but not used in practice so far. Therefore they see a further demand of research in analyzing the possibilities and limitations of such a valuation tool in greater detail [Schröter-Schlaack, Heinz 2017]. Thus there is a need for empirical case studies and further specification of the indicator system.

4. SWOT analysis of indicator set for agriculture

An important step for further development is to evaluate the indicator set from a practical business view in order to examine the advantages and disadvantages, therefore a SWOT analysis is an appropriate method. This instrument includes internal, organizational analysis: *Strengths* (S) and *Weaknesses* (W) and an external environmental analysis *Opportunities* (O) and *Threats* (T) [Ghazinoory et al. 2011].

To evaluate the indicator set with a SWOT analysis, a survey of eleven local farmers from the Polish part of the Nysa Euroregion was carried out which have small farms and are interested in organic production. The aim was not representativeness in form of a quantitative approach, but rather to gain the opinion of expert practitioners from the project environment through qualitative semi-standardized measures. The farmers received the descriptions of indicators and the study was

⁴ The value “0” could be set if there is no data available.

conducted using a questionnaire containing statements about the construction and usability of indicators. The questionnaire was structured using a five dimensional Likert-scale with the responding values: (1) “completely agree”, (2) “rather agree”, (3) “undecided”, (4) “rather disagree” and (5) “completely disagree”. The farmers could also add other aspects and give explanations and comments. For S (strengths) and W (weaknesses), the questions were based on the requirements to practicability and relevance according to Schröter-Schlaack and Heinz [Schröter-Schlaack, Heinz 2015]. O (opportunities) and T (threats) were related to the “business cases for biodiversity” according to Schaltegger and Beständig [Schaltegger, Beständig 2010]. Depending on the answer, the value can be clearly assigned to the four SWOT-categories as shown in Table 1.

Table 1. Structure of the SWOT-Survey

	Content and criteria	SWOT-categories related to responding value
Operational/ practical view	Six Questions regarding “practicability” and “relevance” according to [Schröter-Schlaack, Heinz 2015]	value (1) and (2) → Strengths value (4) and (5) → Weaknesses
Strategic/long-term perspective	Five Questions considering “business cases for biodiversity” according to [Schaltegger, Beständig 2010]	value (1) and (2) → Opportunities value (4) and (5) → Threats

Source: own illustration.

The analysis of the results presented in Table 2 allows to determine the **S** and **W** of the structure of the indicator set and the **O** and **T** related to the effects of their application. The analysis was based on the majority of the responses.

The strengths of the set of indicators include:

- low data collecting effort (A1⁵),
- fairly low implementation costs (time / staff) of the set of indicators (A2),
- understanding the indicators without a high level of prior knowledge (A3),
- simplicity and user-friendliness of the indicator set (A4),
- possibility to influence the set of indicators through the company (A5) and
- relevance of these biodiversity aspects for the business (A6).

As weaknesses, the respondents pointed out that two indicators from the set do not cover all the significant aspects of the company’s activities related to biodiversity. The authors of the set of indicators for agriculture were aware of this weakness – it manifests itself when using a simplified set of indicators, instead of the MANUELA software. However, thanks to the simplification of the set of indicators, the number of strengths of the whole set is increased. Generally it can be considered that the construction of the indicator set has mainly strengths.

⁵ Symbols A1-A6 and B1-B5 are used in Table 2 for criteria of SWOT analysis.

However the analysis of the impact of measuring indicators on the main benefits relevant to the relationship with the external environment of the company showed many threats. The respondents believe that the use of most indicators will not contribute to:

- a long-term reduction of costs (B1),
- a long-term increase of sales opportunities (B3),
- a stimulation of innovation or developing new business models (B5).

Table 2. SWOT analysis for the indicator set

Criterion	Indicator										Sum of S,W,O,T	
	share of small structures		level of nitrogen fertilization		use of machinery		diversity of cultivated species		structural diversity		Σ S	Σ W
	S	W	S	W	S	W	S	W	S	W		
A1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	5	0
A2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4	1
A3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4	1
A4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	5	0
A5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	5	0
A6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3	2
	O	T	O	T	O	T	O	T	O	T	Σ O	Σ T
B1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-	5
B2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3	2
B3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1	4
B4	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3	2
B5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1	4

* Key: A1 – low data collecting effort; A2 – fairly low implementation costs (time / staff) of the set of indicators, A3 – understanding the indicators without a high level of prior knowledge, A4 – simplicity and user-friendliness of the indicator set, A5 – possibility to influence the set of indicators through the company, A6 – relevance of these biodiversity aspects for the business., B1 – long-term reduction of costs, B2 – positive impact of measuring indicators on the promotion of the company's image, B3 – long-term increase of sales opportunities, B4 – mitigation of risk related to stakeholders, B5 – stimulation of innovation or developing new business models.

Source: own study.

Such an assessment should be considered as a threat because it reduces the entrepreneurs' motivation to use the indicators. Yet the positive impact of measuring indicators on the promotion of the company's image (B2) and mitigation of risk related to stakeholders (B4) should be treated as opportunities to increase the motivation of entrepreneurs to use the indicators.

It is worth pointing out that the identified opportunities relate primarily to the benefits of sustainability communication, and threats may be the result of the lack of sufficient knowledge of entrepreneurs of the positive impact of communicating

sustainability in the value chain on the long-term opportunities to increase sales and enterprise development. Thus in the next chapter the main requirements of sustainability communication are presented.

5. Key aspects of sustainability communication in the regional value chains of SMEs in the food sector

Sustainability communication (SC) with various target groups in the 21st century is an extremely important aspect of a company's operation, because sustainability becomes an important criterion for the assessment of enterprises' activities by stakeholders. The basis for SC is transparency of all company's activities, which requires fairness and full social responsibility. SC is based on informing about the product's features, the company's activities and the problems of sustainable development as well as caring for credibility. That is why SC is not a one-sided persuasive message, but an open, honest dialogue with the consumer, whose aim is to adapt to the changing expectations of the stakeholders [Hopfenbeck, Roth 1994; Belz, Peattie 2009; Emery 2012; Godemann, Michelsen 2011; Pieńkowski et al. 2018].

SC plays a crucial role in raising the level of social responsibility of the target groups and providing information about the company's activities in this area as well as benefits for the client and society. It is also an instrument to weaken the barrier of the high costs of a sustainable product, because it shows customers that the price also includes the social costs of the company's operations and of the use of its product, and that other customers also accept the higher sustainability costs.

Since communication is often associated with stimulating unsustainable consumption and lifestyle, manipulation and *green washing*, SC requires concentrating on public relations (PR) instruments with the emphasis on honest dialogue with stakeholders. In the group of PR instruments, internal communication is particularly important because only socially involved managers and employees of enterprises can ensure the continuous improvement of sustainability as well as credibility, which are key factors for the success of sustainable enterprises [Hopfenbeck, Roth 1994; Belz, Peattie 2009; Emery 2012; Pieńkowski et al. 2018].

In SC, the challenge is also the diversification of the content of messages addressed to various stakeholders groups. Figure 3 presents the four main types of sustainability messages. Depending on the communication objectives, it is recommended to combine different types of messages, e.g. LOVE and ACT.

The presented indicators of the impact on the protection of biodiversity in regional value chains in the food industry allow an enterprise to meet the above mentioned requirements of SC.

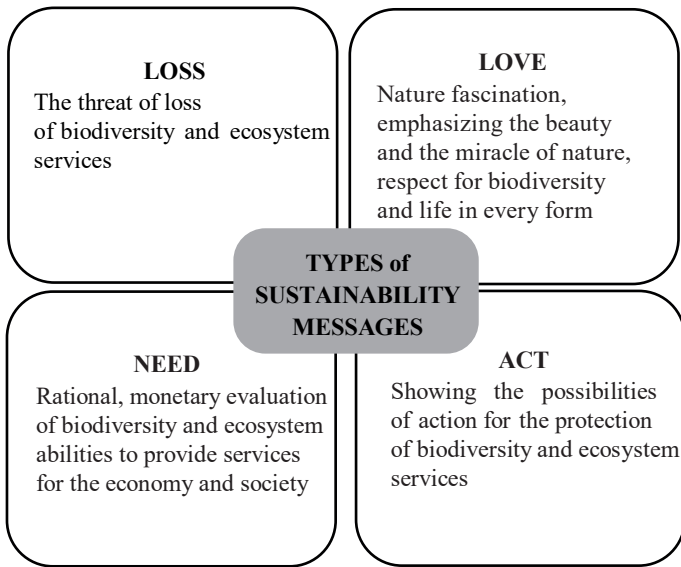


Fig. 3. Types of sustainability messages

Source: own illustration according to [Kramer et al. 2017, p. 23].

The indicators allow to achieve the goals of internal communication because they facilitate the concise information about the most important aspects of the company's impact on biodiversity and their constant control by employees. The results of the indicators also enable to present the sustainability of the company to its external stakeholders.

The calculation and presentation of the results of the indicators also ensure the transparency, actuality, relevance and completeness of information and comparability of achievements. The measurability of most indicators also allows to include the "NEED message" in SC, which is particularly important in the dialogue with such stakeholders as suppliers and other collaborators, regional authorities, non-governmental organizations, local community and educational institutions. The use of indicators is also an opportunity for the company to present in a clear way the regional value chain for groceries.

6. Conclusions and recommendations for further research

Building regional value chains for food products is one of the tools for the implementation of sustainable development at regional level. However the benefits of such a chain for the regional community and the natural environment are fully disclosed under the condition that it is possible to assess the impact of individual enterprises and the entire value chain on the region's sustainable development.

Therefore, an indicator set for assessing the company's impact on biodiversity, developed during this project, may be especially helpful to agricultural enterprises.

The research on the usefulness of the indicator set showed that as the main benefits of using indicators, the entrepreneurs declared the promotion of the company's image and better relations with stakeholders. These results confirmed in practice the thesis that the success of using the indicators will be determined by the level of sustainability of both the entrepreneurs and other participants of the regional value chain. If there is an appropriate demand on the market for sustainable regional food products contributing to the protection of ecosystem services, then the entrepreneurs will be motivated to cooperate within the value chain and to communicate sustainability together.

However, to create a system of SC in the value chain based on the presented indicators, further research is necessary, the main objectives of which should be:

- conducting further in-depth open interviews (also on the German side) to get more detailed suggestions for improvement from companies regarding the set of indicators,
- specifying the indicators for different types of farming businesses (arable land, grassland, permanent crops) in order to raise the relevance for businesses,
- developing a simple system for the communication of product's and company's sustainability based on the presented indicator set; this can be, for example, a rating approach based on colours or points,
- development of indicators to assess the impact on the sustainable development of the region throughout the whole value chain of food products,
- checking the conditions (including the need and costs) of a joint sustainability communication by all participants in the value chain, including the division of tasks between individual entities,
- checking the conditions for jointly promoting a cross-border regional food brand for the Nysa Euroregion.

The research on the above aspects is planned by the project team as part of subsequent research projects.

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