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OPTIMAL SET OF AGRI-ENVIRONMENTAL INDICATORS FOR THE AGRICULTURAL SECTOR OF CZECH REPUBLIC

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Abstract

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Current trends of agri-environmental indicators evaluation (i.e., the measurement of environmental performance) and farm reporting are discussed in the paper focusing on the agriculture sector. From the perspective of agricultural policy, there are two broad decisions to make: which indicators to recommend and promote to farmers, and which indicators to collect to assist in agriculture policy-making. We introduce several general approaches for indicators to collect to assist in policy-making (European Union, Organization for Economic Cooperation and Development and Food and Agriculture Organization of the United Nations) in the first part of our paper and given the differences in decision-making problems faced by these sets of decision makers. We continue in the second part of the paper with a proposal of indicators to recommend and promote to farmers in the Czech Republic.

agri-environmental indicators, corporate performance, economic indicators, social indicators, governance indicator

At an international, national, regional and community level, along the value chain, and at farm or commodity levels, many institutions and experts have invested years in developing a multitude of sustainability assessment frameworks, standards and indicator sets. More than one hundred countries have established national strategies for sustainable development, with sustainability targets and aligned indicators. (Hřebíček, Valtinyová, Křen *et al.*, 2013). The food industry has adopted the concept of corporate responsibility reporting; methods quantifying environmental impacts of products and services are now widely being used, social standards are available, and several tools exist to measure farm-level sustainability (GRI, 2012).

Sustainable development indicators are indicators that measure progress made in sustainable growth and development of organizations, regions and countries or the sector of economic activity. They can provide an early warning, sounding the alarm in time to prevent economic, social and environmental damage. In recent years, the concept of "sustainability indicators" has become prominent also in agricultural science (Bockstaller *et al.*, 2009; Piorr, 2003). The idea is that particular characteristics of resources and agro-system management are being monitored and recorded, with the intention that this information serves as an aid for decision-making by farmers and/or policy-makers on the local, regional, national or international levels. The effects of agriculture on the environment are being created by the individual farms, it is therefore necessary to optimize the tools at the level of individual farms.

National or international decision-makers are seeing indicators in international forums from a different perspective. For example, we can mention the indicators proposed by the European Union (EU) and the European Environment Agency (EEA), the Food and Agriculture Organization of the United Nations (FAO), the Organisation for Economic Cooperation and Development (OECD) and the World Commission on Environment and Development (WCED) summarized by (Hřebíček, Valtinyová, Křen *et al.*, 2013).

Two main groups of indicator users can be distinguished. Decision and policy-makers and administration-needs aggregated indicators which provide them with a complex view (information about the state or development) and are used as the support for the development of an environmentally just policy for the agricultural sector. The second group of users, farmers, practitioners, managers of farms and agricultural enterprises, has a direct impact on the performance of the farm and manages its interaction with the environment. They need fairly detailed information and simple methods on how to determine sustainability indicators, which can be used here for identifying the risky points in environmental performance and sustainability of the farms. The FAO developed the Sustainability Assessment of Food and Agriculture systems (SAFA) guidelines (FAO, 2012) in the same spirit of codes of practice, guidelines and other recommended measures to assist the achievement of fair practices in food and agriculture production and trade on a local and regional level. The SAFA guidelines are the result of an iterative process, built on the cross-comparisons of codes of practice, corporate reporting, standards, indicators and other technical protocols currently used by food and other companies and organizations that implement sustainability tools.

The structure and methodology of the SAFA Guidelines draw specifically upon: ISO 14040:2006, the ISEAL Code of Good Practice (ISEAL Alliance, 2010), the Reference Tools of the Global Social Compliance Programme (GSCP, 2010), the Sustainability Reporting Guidelines (G3.1, 2011), (G4, 2012) and its Food Sector Supplement (GRI, 2012) of the Global Reporting Initiative (GRI, 2006). The SAFA Guidelines will be revised and finalised in 2013 in order to improve their practicality, applicability, usefulness and soundness.

The guiding vision of SAFA is that food and agriculture systems worldwide are characterized by environmental integrity, economic resilience, social well-being and good governance.

Recent years have seen some progress in the realization of a socially, economically and environmentally sustainable development (Hřebíček *et al.*, 2012; Kocmanová, Dočekalová, 2012; Soukopová, Bakoš, 2010). Many stakeholders in the agriculture sector have contributed to this progress by improving agricultural productivity, protecting human and natural resources and conceiving and implementing frameworks, standards and indicators for assessing and improving sustainability and farm performance across the agricultural sector and along the value chain (Langeveld *et al.*, 2007; Valtýniová, Křen, 2011; Zalidis *et al.*, 2004).

METHODS AND RESOURCES

In this part, we mention the most important approaches in the area of collecting and evaluating individual indicators, and this bearing in mind corporate reporting, the environment and sustainable development.

The current trends of research in the area of corporate performance evaluation and corporate sustainability reporting in the Czech Republic were discussed by Hřebíček and Soukopová (2008), Hřebíček *et al.* (2009, 2011), Chvátalová, Kocmanová and Dočekalová (2011), Kocmanová *et al.* (2011), and Ritschelová *et al.* (2009). These papers reflect the overall global world trends of this area (Bassen, Kovacs, 2008; Bockstaller *et al.* 2009; G3.1, 2011; G4, 2012; Priorr 2003; Schaltegger, Wagner, 2006). Usually, organizations are monitoring, collecting and aggregating Environmental, Economical, Social and Governance (ESG) corporate data and information into the Key Performance Indicators (KPIs) (Bassen, Kovacs, 2008), (Garz, Schnella, Frank, 2010), (Hřebíček *et al.*, 2011a) which present Corporate Sustainability Indicators.

Sustainability Assessment of Food and Agriculture systems

The Sustainability Assessment of Food and Agriculture systems (SAFA) are processed according to SAFA (2012). This vision encompasses the primary production in agriculture, forestry and fisheries, through manufacturing, and up to the point of sale to the consumer. A SAFA is an assessment based on selected sustainability themes' and sub-themes' indicators of performance, which apply to a food company or a production site that forms part of a supply chain rooted in primary production. The SAFA Guidelines (SAFA, 2012) provide a holistic interpretation of the major themes of sustainability (Framework) and a template for agriculture and food sustainability assessment. The target audience of a SAFA assessment is small and large-scale companies, organizations and other stakeholders that participate in the food and agriculture value chain. This includes primary producers, food manufacturers, distributors and retailers. The SAFA Guidelines are based on certain core methodological principles including Bellagio Stamp (IISD, 2009; Pinter *et al.*, 2012). Additionally, SAFA draws upon the ISO norms for Life Cycle Assessment (ISO, 2009), the ISEAL Code of Good Practice version 1.0; (ISEAL Alliance, 2010), the Reference Tools of the GSCP (2010) and the Global Reporting Initiative (GRI) Sustainability Reporting Guidelines version 3.1 (GRI 3.1 2011).

The SAFA proposed indicators focus on performance rather than management systems and on policy development. Key indicators for each subtheme are proposed in order to facilitate measuring progress towards sustainability. The individual dimensions are shown in Tab. I.

The SAFA approach is realized step by step in the six phases. The final output of a SAFA is the Performance Report, which contains both a descriptive and an analytical review of the sustainability of the assessed entities based on all six steps, see Fig. 1.

I: *SAFA Dimension, Themes and Sub-themes [Source (SAFA, 2012)]*

Dimension 1: GOOD GOVERNANCE	
Themes	**Sub-Themes**
G1 Governance structure	Corporate ethics; Due diligence
G2 Accountability	Holistic audits; Responsibility
G3 Participation	Stakeholder dialogue; Grievance procedures; Conflict resolution
G4 Rule of law	Commitment to fairness, legitimacy and transparency; Remedy, restoration and prevention; Co-responsibility; Resource appropriation
G5 Holistic management	Sustainability in management; Certified production; Full-cost accounting
Dimension 2: ENVIRONMENTAL INTEGRITY	
E1 Atmosphere	Greenhouse gases; Air pollution
E2 Freshwater	Water quantity; Water quality
E3 Land	Organic matter; Physical structure; Chemical quality; Land degradation and de-sertification
E4 Biodiversity	Habitat diversity; Ecosystem integrity; Wild biodiversity; Agricultural biodiver-sity; Threatened species
E5 Materials and energy	Non-renewable resources; Energy supply; Eco-efficiency; Waste reduction and disposal
E6 Animal welfare	Freedom from stress; Species-appropriate conditions
Dimension 3: ECONOMIC RESILIENCE	
C1 Investment	Internal investment; Community investment; Long-ranging investment
C2 Vulnerability	Stability of supply; Stability of demand; Liquidity and insurance; Employment; Stability of production
C3 Product safety and quality	Product information; Traceability; Food safety; Food quality
C4 Local economy	Value creation; Local procurement
Dimension 4: SOCIAL WELL-BEING	
S1 Decent livelihood	Wage level; Fair trade practises; Capacity building
S2 Labour rights	Employment; Forced labour; Child labour; Freedom of association and bargain-ing; Working hours
S3 Equity	Non-discrimination; Gender equality; Support to vulnerable people
S4 Human health and safety	Physical and psycho-social health; Health resources; Food security
S5 Cultural diversity	Indigenous knowledge; Food sovereignty

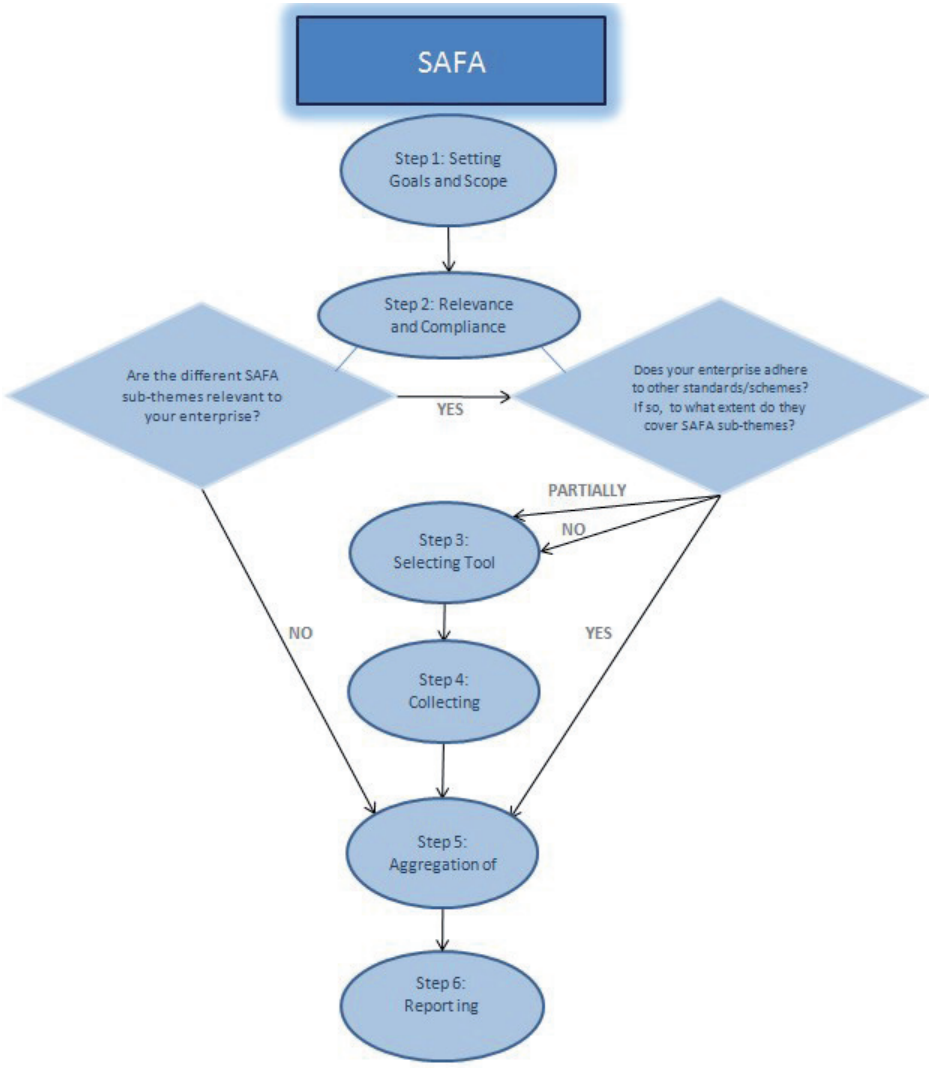
Sustainability is a complex topic and even with the aggregation of the 200 plus indicators and 64 subthemes, understanding all this data can be challenging and difficult to communicate internally or externally. Data visualizations can, however, make all of that much easier, allowing one to see the concepts and relationships. In Fig. 2 is a visualization of the SAFA sustainability performance ratings, which is depicted in the polygon of a hypothetical enterprise.

RESULTS AND DISCUSSION

Based on the analysis of the existing solutions, with regard to the situation in the Czech Republic (Valtýniová/Křen, 2011), and in concurrence with the research in the area in question, the following descriptive indicators have been compiled. These indicators uniformly describe the situation in the area of the environment, the social sphere, the economy and Corporate Governance. This segmentation is described as a part of the GRI (GRI, 2012). What is however important is the image of the individual partial indicators, and their application in the field in question, for more details see Tab II.

For the adequate assessment of agricultural companies, in connection with the objective traceability of the individual input data for the determination and calculation of the set indicators, only those agricultural companies (with the ISO 14000 certification) have been selected for the purposes of the primary research. This approach has enabled the unification of requirements with the expected results, i.e., to ensure the traceability of the data needed in the organization. Subsequently, the development team has suggested and created a web-application which automates the whole process. Be it the collection of data required for the calculation of indicators (questionnaire) for the assessment of this data for the set of companies (Fig. 3) and create thus a comparison test for the assessment of companies, i.e., their benchmark. This comparison test is displayed in Fig. 4.

For obtaining cogent results it is necessary to obtain a representative data sample. At present, the requested data-collection is being performed, in companies of the selected area, with the aim of strengthening the data baseline. As soon as the data from an adequate number of companies is accessible (in the order of tens), it will be possible to form conclusions about a concrete situation in the given company, in the form of comparing it with the data that are already accessible (benchmark). This is the aim of the subsequent phase of the solution.



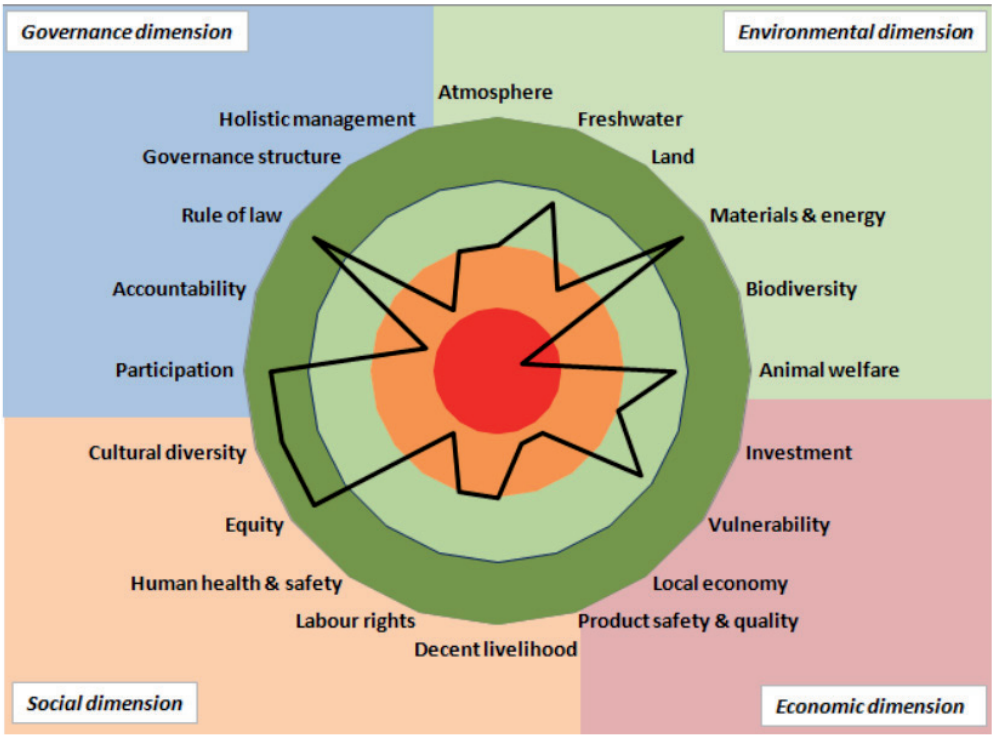
1: *SAFA step by step [Source (SAFA, 2012)]*

For the purposes of a more effective data-collection, it is possible to expand the presently developed application by importing requested data in the generally acceptable format (after discussing this with the selected companies). Here, the adequate transport format seems to be XBRL; this version has already been analysed in the earlier publications of the authors. Only in the case of an automation of the whole process in concordance with the needed number of assessed companies may we formulate the required conclusions quickly and effectively. These are the contents of further research.

Own deployment

In (Kocmanová, Dočekalová, 2012) a methodology was created designed for multi-factor measurement of corporate performance. This work is focused on the manufacturing (by NACE), which processes the production of agriculture, forestry, fisheries and aquaculture, mining or products of other manufacturing activities. It is therefore a secondary production which is based on agriculture, which is the major source. The agricultural sector has an impact on the overall culture and landscape, with all sorts of other impacts on the environment. The agricultural sector of the Czech Republic having been dealt with (Valtýniová, Křen, 2011), the methodology described here focuses on measuring corporate performance. The structure of the work is not fully optimized for FAO, which is a major creator of indicators at the international level.

For an adequate assessment of enterprises dealing with agricultural production, it was necessary that the current methodology be adequately modified, in order to take into account the specifics of the sector. This requirement was taken into account in the already established model shown in (Kocmanová, Dočekalová, 2012), which, however, is not focused on the desired area. Furthermore, the experience of the Czech agricultural sector has been published in the methodology (Valtýniová, Křen, 2011) and



2: *SAFA substainability polygon [Source (SAFA, 2012)]*

the internationally established indicators for agricultural enterprises have been presented in SAFA guidelines.

The resulting methodology is presented in Tab III. Its breakdown deals with the breakdown used in the SAFA guidelines. Unlike in (Valtýniová, Křen, 2011), the domain of Corporate Governance was added. Compared to (Kocmanová, Dočekalová, 2012), there were large reductions and conversely new indicators were introduced specific only to the agricultural sector.

We classified the indicators by the degree of obligation and applicability:

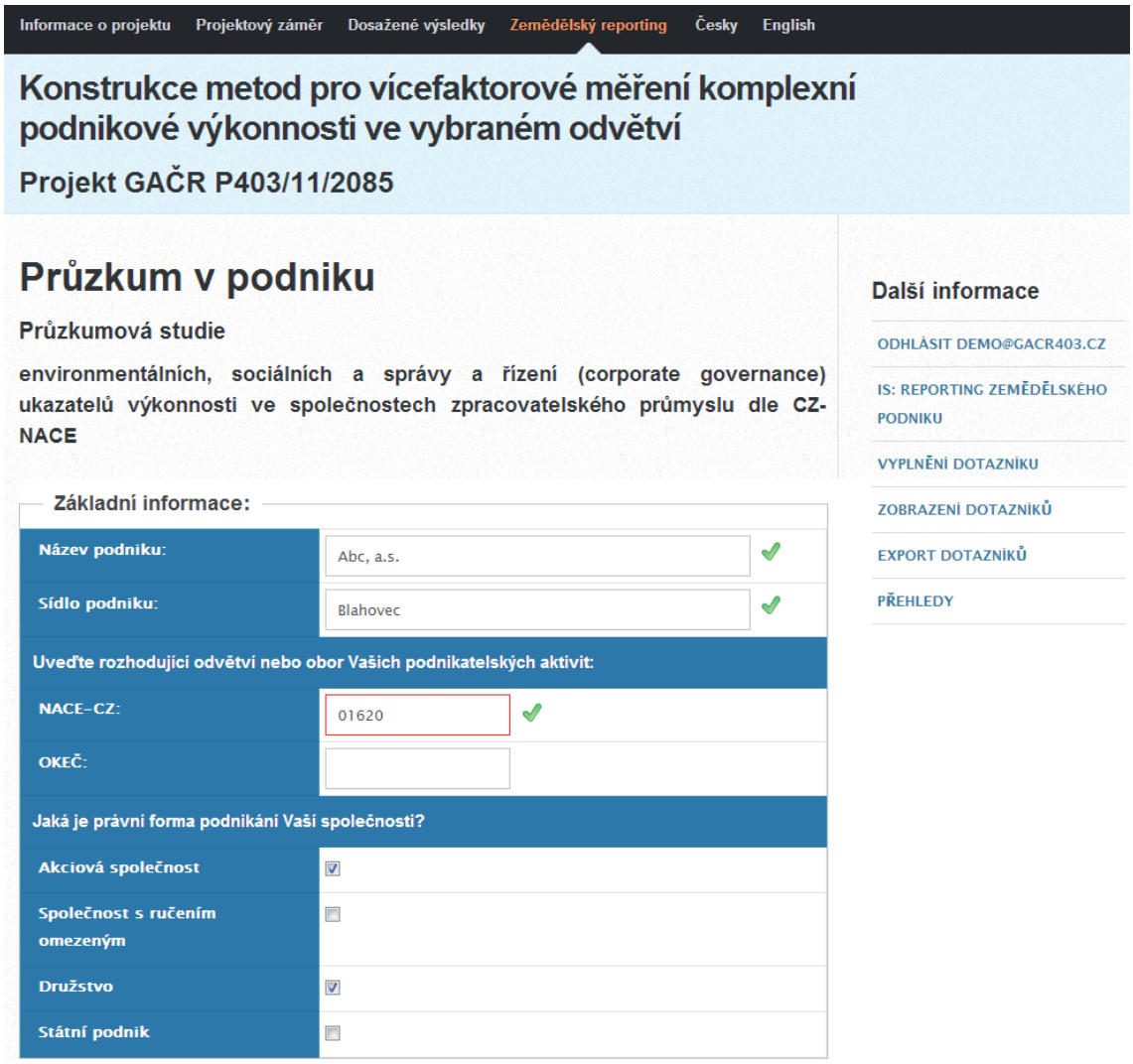
- **Recommended indicators:** applicable for all assessments.
- **Recommended flexible indicators**: at least one indicator per group is recommended, in addition to the recommended indicators.
- **Optional indicators**: are optional and can improve the overall score for the relevant sub-theme, but do not replace recommended indicators.
- **Alternative indicators**: alternative indicators can be in addition to or substitute recommended indicators if justified and documented.
- **Pre-qualifying indicators**: high scores in these identified indicators permit the rest of the sub-themes to be skipped. These are specific to greenhouse gasses, air pollution, water quantity, water quality, eco-efficiency.

The main source of modification of recommended indicators was the methodology shown in Table III.

The result is a multi-factor performance evaluation methodology applicable to the Czech agricultural enterprises. Before its deploying, it was discussed in several businesses in the area with regard to the accessibility and availability of required data. Now there is a possibility, owing to the data obtained from a particular undertaking in connection with the applied methodology, to perform a benchmarking of the given company and thus to determine its current state, the state of corporate performance, in comparison with other companies in the area (model example in Fig. 3). As a result, the state of a company can be assessed vis á vis its long-term sustainability. Before we could proceed to this step (determination company's benchmark), it was necessary to process a large number of descriptive data of the enterprises from the sector. Certain restrictions of the chosen methodology are an obvious link to the selected segment. To assess the business in other areas would be to do a similar research – compilation benchmarking – taking into account the specifics of this area. Based on the obtained methodology, not only the situation of the company can is assessed vis á vis its current location but also recommendations with a view to its development can be formulated. From the evaluation we may see which indicators deviate from the optimal values, and accordingly, which business areas need increased attention. This issue of analysis of the current situation of the company is in conjunction with the recommendations regarding to its stabilization. Especially suitable for the improvement on the level calculated indicators in the solution process. In its final form, the software which is being developed, will be capable not only of assessing the status of the

II: *List of indicators [Source (Kocmanová and Dočekalová, 2012)]*

Domain	Indicator	Title	Unit
Environmental	EN01	Environmental protection investment	CZK
	EN02	Environmental protection expenditure	CZK
	EN03	Total agricultural air-emissions	t
	EN04	Total agricultural greenhouse gas emissions	t
	EN05	Total annual energy consumption	MWh
	EN06	Total consumption of renewable energy	%
	EN07	Consumed materials	t
	EN08	Recycled input materials	%
	EN09	Total annual water consumption	m^3
	EN10	Total annual waste-production	t
	EN11	Total annual production of hazardous waste	t
Social	SO01	Community	CZK
	SO02	Contributions to municipalities	CZK
	HR01	Discrimination	Number
	HR02	Equal opportunity	Number
	LA01	The rate of employee turnover	Number of individuals
	LA02	Training and education expenditure	CZK
	LA03	Occupational diseases	Number
	LA04	Number of deaths	Number
	PR01	Customer loyalty	%
	PR02	Marketing communication	-
	PR03	Health and safety of customers	CZK
Corporate Governance	CG01	Company information	-
	CG02	Responsibility of CG	-
	CG03	Standardization of CG	-
	CG04	Ethical behaviour	-
	CG05	Codex of CG	-
	CG06	Payments to CG	CZK
	CG07	Membership of CG	%
	CG08	Equal opportunities	%
	CG09	Compliance with legal norms	CZK
Economic	EE01	Value added	CZK
	EE02	Value added to / vis á vis personal costs	%
	EE03	Market share	%
	EE04	Earnings after taxes	CZK
	EE05	Earnings before taxes	CZK
	EE06	Earnings before interest and taxes	CZK
	EE07	Return on equity	CZK
	EE08	Return on assets	CZK
	EE09	Return on sales	CZK
	EE10	Return on investment	CZK
	EE11	Return on capital employed	CZK
	EE12	Turnover size	CZK
	EE13	Operating cash flow	%
	EE14	Expenditure on R&D	CZK
	EE15	Number of employees	Number



3: *Aspects of the project – an electronic questionnaire*

company (already realized), but also of generating the appropriate recommendations with regard to its sustainability or stabilization of his condition (in the process of implementation and verification of the conclusions generated).

In the framework of the project, after performing the resulting implementation in agriculture, the ability to extend the catchment area outside agriculture to other sectors (specification according to NACE) is considered. The creation of a comparative benchmark for other sectors is dependent, with regard to the automation of the processed data, on the availability of a suitable source of databases describing specific businesses. The assessment of the availability of data and the difficulty of obtaining them, or also the adaptation of the selection of indicators, must precede the study's calculation of the benchmark. Therefore, even this process cannot be fully automated. This is caused by the fact that individual areas are often very specific. However, the automation of data-processing can greatly simplify this process.

SUMMARY

The paper is focused on the field of agricultural companies (farms), bearing in mind their influence on the environment and sustainability. The emphasis is placed on the assessment of present options in the area of collecting and evaluating data, and this with the support of Global Reporting Initiative guidelines, as well as with the support of the Sustainability Assessment of Food and Agriculture systems methodology. We analyse the individual difficulties of their introduction and their final implementation for the Czech farmers in practices. Based on their breakdown, including their descriptive frameworks, the optimal sets of agro-environmental indicators have been developed, sets that are applicable in the Czech Republic's agriculture. This optimal set has been discussed before

4: *Example output report*

their implementation in chosen farms. The suitability of these set indicators is being attested at present on a sample of selected agricultural companies. For the purposes of a more effective data-collection in farms a special web information system was developed and it is possible to expand its developed application by importing requested data in the generally acceptable format and incorporate this into farm information system after discussing this with them.

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III: *List of indicators*

Domain	Indicator	Title	Unit
Corporate Governance	G1.1	Corporate ethics	yes/no
	G1.2	Due diligence	yes/no
	G2.1	Holistic audits	yes/no
	G2.2	Responsibility against corporate ethics	yes/no
	G3.1	Stakeholder dialogue procedure	yes/no
	G3.2	Grievance procedures	yes/no
	G3.3	Conflict resolution procedure	yes/no
	G4.1	Mechanisms for adequate remedy,	yes/no
	G4.2	Code of Conduct	yes/no
	G5	Certified production	yes/no
Environmental	E1.1	Total agricultural air-emissions	T
	E1.2	Total agricultural greenhouse gas emissions	kg of CO_2-eq
	E2.1	Total annual water consumption	m^3
	E2.2	Total water pollution (NO_3, PO_4 etc.)	Ppm
	E3.1	Soil organic matter	%
	E3.2	Soil erosion	ha/year
	E4.1	Habitat diversity	yes/no
	E4.2	Agricultural biodiversity	yes/no
	E5.1	Renewable material use	t or m^3
	E5.2	Total annual energy consumption	MWh
	E5.3	Total consumption of renewable energy	%
	E5.4	Total annual waste production	t
	E5.5	Total annual production of hazardous waste	t
	E5.6	Reused / recycled waste production	%
	E6.1	Animals have adequate housing conditions	yes/no
Economic	C1.1	Internal investment	CZK
	C1.2	Community investment	CZK
	C2.1	Supplier contracts	CZK
	C2.2	Liquidity and insurance	CZK
	C3.1	Product information	yes/no
	C3.2	Food safety	yes/no
	C3.3	Food quality	yes/no
	C4.1	Tax payment	CZK
Social	S1.1	Wage level	CZK
	S1.2	Training and education of employee	number
	S2.1	Employee with contracts	number
	S2.3	Collective agreement	yes/no
	S2.3	Working hours	number
	S4.1	Equity and non-discrimination	yes/no
	S4.2	Gender equality	yes/no
	S4,1	Human health support	yes/no
	E4.2	Health insurance support	CZK
	E5.1	Indigenous knowledge	yes/no

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