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Creating environmental performance indicators to assess corporate sustainability and reward employees

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ABSTRACT

Assessing environmental performance, measuring the circular economy and quantifying decarbonization have become crucial in green management in recent years. Both scholars and practitioners have focused on different strategies to create performance indicators capable of tackling all these aspects. At the same time, companies have started connecting managers' and employees' incentives to the achievement of corporate goals. We analysed a case study of an Italian food company which uses environmental performance indicators to assess corporate sustainability and reward managers and employees. Through a series of interviews with members from all departments, we identified around 200 different key performance indicators, i.e., performance, commitment, control, reactivity, economic, consent, transversal and multifunctional. A final dashboard of around 70 indicators was then created and linked to employees' rewards. A tailor-made methodology was, thus, used to define target for the company's management by objectives, taking into account the trend of each indicator. This is the first attempt to investigate how a company can create an environmental performance indicator system to assess corporate sustainability and reward employees through management by objectives. Our study further extends not only the academic literature, but also provides a practical and operative contribution to all the companies that aim to create a new key performance indicator system. Lastly, we merged the management and strategies for promoting green practices amongst employees through a reward system with the environmental performance of each organisational department by creating a methodology to define management by objectives.

1. Introduction

Our planet is facing unprecedented challenges in terms of the climate which, taken together, pose a threat to our well-being. However, we still have time to take decisive measures. The task may seem daunting, but we can still reverse some negative trends, adapt to minimize damage, restore crucial ecosystems and better protect what we have. To achieve long-term sustainability, and tackle the unprecedented challenges of climate change, we must consider the environment, climate, economy and society as inseparable parts of the same entity. Industrial companies thus play a crucial role in this ecological transition.

Over the years there has been a debate around the need for companies to ensure sustainable development (Kwatra et al., 2020). To conduct business in a sustainable way, companies need to find innovative solutions that respond to the complexity of the context in which they operate (Hu et al., 2021).

Initially, the sustainability of companies was pursued by obtaining environmental certifications issued by third parties such as ISO (International Organization for Standardization) 14,001 (Daddi et al., 2015), Eco-Management and Audit Scheme (EMAS) (Iraldo et al., 2009), European Union (EU) Ecolabel (Marrucci et al., 2021a). Then, the sustainability of the product (or service) during its life cycle, in line with the principles of the circular economy and through the integration of sustainability principles within the business processes, have become the primary objective of companies keen to tackle environmental issues (Bianchi et al., 2022).

However, very few companies have adopted a truly sustainable corporate governance model. To be applied effectively, corporate sustainability has to become part of the corporate culture (Esteban et al., 2017). Very often, however, the creation of a corporate culture oriented towards sustainability involves the consolidation of sustainable practices within the company (Maffini Gomes et al., 2015). For this reason, even in the absence of a corporate culture specifically oriented towards sustainability, small steps need to be taken in order to integrate sustainability within the company's operations.

This, thus, lays the foundations for a real transformation of the

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company culture towards sustainability. The corporate green culture needs to pervade all company areas and departments, from top management to the shop floor (Gupta and Kumar, 2013). However, this requires a high degree of commitment. An organisation must closely observe how critical engagement elements align with performance development and human capital strategies (Dögl and Holtbrügge, 2104). It is well known, in fact, that the most involved employees are also the most productive ones, precisely because they are the most fulfilled (Tian and Gamble, 2018). Managers have started to focus on Green Human Resource Management (GHRM). This term refers to the area of human resources that aims to expand its role in supporting the organisation towards achieving sustainable goals (Renwick et al., 2016). GHRM focuses on the development, implementation and maintenance of all activities that aim to transform employees into key supporters of green objectives. Whether it refers to selection, performance management or training and development, in most cases, research has shown that employee involvement in sustainable initiatives is directly associated with higher levels of engagement within the organisation (Scrima et al., 2014). GHRM consists of different green practices which include also employees' rewards.

Usually, organisations establish reward systems in order to recognise their employees' performance and to motivate them to keep high standards of productivity or service (Singh et al., 2013). Rewards can be monetary, non-monetary and psychological. With the increase importance of green issues, reward systems also have to align to new approaches. To date, most companies have related rewards and incentives to sales and employees' productivity. However, with companies constantly increasing their commitment and environmental efforts, reward systems need to be linked both to the environmental performance of the company and to the environmental performance of each corporate department and each employee.

In addition, the ability to measure and report the environmental performance and impacts generated by the companies is undoubtedly a fundamental element of a corporate strategy targeted at sustainability (Arbolino et al., 2018). However, measuring corporate sustainability is not that easy to. Environmental management systems have tried to provide their own set of environmental indicators, but as proved by Marrucci and Daddi (2021), they are not always able to take into account all the facets of sustainability. In fact, some aspects are not at all easy to measure, since often some data are not directly measurable, i.e., "latent data". This is why it is important to identify indicators, also called KPIs (Key Performance Indicators) that produce measurable data through clear and shareable tools and systems.

Despite the attention of both practitioners and academics on sustainability measurement (Brink et al., 2020), to the best of our knowledge, there are few studies that relate this activity with managers' and employees' reward systems. Zhou et al. (2015) based its research on Management by Objectives (MBO), but focusing on sustainable urbanization indicators. Only Mio et al. (2015) investigated sustainability as a criterion in establishing the wage levels of managers and directors.

We, thus, address this research gap by creating an *ex-novo* and *ad-hoc* set of environmental KPIs to assess corporate, departments and employees' environmental performance and to create a GHRM reward system. Our research is based on a case study conducted in Mutti S.p.A., an Italian company that specializes in preserved food, particularly in the tomato sector.

The aim of this study was to create environmental KPIs capable of assessing the environmental performance of the companies from a technical, operational and strategic perspective. The aim of these KPIs is to provide a complete information framework on the main aspects of environmental management, representative of its effectiveness and functionality. By evaluating corporate performance, we also aim to create a reward system for employees within the framework of developing and spreading GHRM practices.

The paper is structured as follows. Section 2 provides an overview of the studies published in the field of sustainability measurement and GHRM reward and presents the research questions. Section 3 describes the case study and illustrates the methodology adopted to create the set of KPIs. Sections 4 and 5 present and discuss the results, while Section 6 contains some final remarks.

2. Theoretical framework and research questions

Peter Drucker, one of the most important global management experts, used to say: "*If you cannot measure it, you cannot improve it*". This applied to every facet of the sustainability concept, i.e., economic, social and environment. While from an economic perspective at the micro level (e.g., organisations, companies, etc.), there are classic indicators such as turnover, income and sales (Zhong et al., 2021), the social and environmental perspective still lacks reliable indicators. In fact, there is now a new concept of sustainability for businesses, no longer strictly linked to classic economic parameters, but related to an intelligent and responsible development towards the Earth and its inhabitants.

2.1. Measurement of the environmental performance

Sustainable development, decarbonization, the circular economy are all important themes for companies, but neither practitioners nor academics have been able to create a standardized methodology. As discussed by Pavláková Docekalová et al. (2017) corporate sustainability performance is usually highly nonlinear, vague, partially inconsistent and multidimensional.

However, measuring the environmental sustainability of a company is important for two main reasons. On the one hand it is important to be able to measure the consequences of a company's business from an ecological and social point of view. On the other, the measurability of sustainability is increasingly relevant in the eye of potential investors, partners and, above all, consumers (Scarpellini et al., 2022; Moneva et al., 2023). With regard to the consumer, measurement is even more important as it also helps to prevent absolutism and genericity in statements, which very often border on greenwashing and fake news (Testa et al., 2018a).

Measuring, managing and communicating sustainability are thus fundamental in the pursuit of a corporate strategy. A company should be able to analyse all the elements that make up its strategy and business model and the degree to which these aspects influence sustainability. The greatest criticality for a company that pursues a sustainable strategy derives from the difficulty of correctly measuring and interpreting the effects of its work in terms of environmental performance. In fact, creating KPIs that measure the environmental performance is just the first step. The most difficult part is to create a KPI capable of showing if and how the business' activities have influenced the performance.

In addition to the classic KPIs on environmental performance such as energy consumption, waste production, etc. which have been frequently used also in the academic literature (Myhre et al., 2013; Daddi et al., 2021), scholars often integrate the measurement of environmental performance with perceptual measures collected through questionnaires (Marrucci et al., 2022a). However, the self-reporting approach can be easily subject to social desirability bias and other distortions (Kozlov and Zvereva, 2015).

For these reasons, more scientifically robust methodologies have gained ground in recent years. The water footprint (Chen W. et al., 2021), carbon footprint (Marrucci et al., 2020; Chen R. et al., 2021), ecological footprint (Li et al., 2021) have all been used both by practitioners and academics to assess the impact of companies, organisations and individuals, etc. (Chen et al., 2022). All these methods follow a life cycle approach by adopting a systemic framework of a product, service or organisation to assess its environmental impacts throughout its entire life cycle. However, all these methodologies focus on one single environmental impact such as water, CO_2 emissions and land use without considering and taking a holistic view. In fact, even considering the whole life cycle, by analysing one single aspect, other relevant impacts may also be overlooked. Consequently, organisations may risk pursuing innovative strategies that contribute to reducing carbon emissions, but on the other hand the same strategies increase water consumption, waste production and other environmental impacts. To overcome this barrier, a life cycle assessment (LCA) evaluates and quantifies the environmental impacts of products, services or organisations throughout their entire life cycle. This therefore means from the extraction of the raw materials necessary for the production of materials and energy for the production of the asset up to the stage of their end-of-life disposal (Ryberg et al., 2018). In contrast to the single-impact methodologies, the LCA covers 16 impact categories related to four main areas: resource depletion, human health and safety effects, ecological effects and climate change.

However, despite the different approach to exploit the synergies between LCA and sustainability concepts such as the circular economy (Primc et al., 2020) and environmental sustainability (Bjørn et al., 2016), the LCA is still a very technical tool that sometimes does not fully grasp all the facets of sustainability. Moreover, as proved by Testa et al. (2016), the diffusion of the LCA is limited since "*nonadopters tend to overestimate the difficulties and underestimate the benefits connected to the implementation of LCA*".

Lastly, despite the different techniques adopted for reporting LCA results (Harding, 2013) and to assess the sustainability of a single activity, production process or product (Hoekstra, 2015), none of the methods take into account the human perspective.

In fact, the success of a company increasingly depends on the organisation of human resources and related strategies to generate a strong sense of stability in the staff (Scarpellini et al., 2017). The success of a working reality is due to the collaboration of the internal resources, thus, of people, who have as a common factor the business idea that must be achieved in order to make profits without compromising the environment. Our first research question was then identified as:

RQ1: How can an organisation measure both its environmental performance and each department's contribution?

2.2. Reward systems for employees

As proved by Daily and Huang (2001), human resource factors such as top management support, environmental training, employee empowerment, teamwork, and rewards systems are key in the implementation of environmental management strategies. For these reasons, GHRM has gained ground among different organisations and has become one of the most important green management strategies. While some GHRM practices such as employees' green training and involvement were already, at least indirectly, part of the environmental management strategy of an organisation, others such as green appraisals and rewards still have limited diffusion. Moreover, even though GHRM practices generally positively contribute to the organisation's performance, each GHRM practice plays a distinct role. As proved by Marrucci et al., (2021b), rewarding only positively influences economic performance, while both performance appraisals and rewarding do not appear to contribute to environmental performance, reputation or circular economy development.

This discrepancy is most likely due to the fact that organisations have mainly focused their attention on economic performance and how to improve it, while environmental performance has received less attention (Kurniawan et al., 2021).

However, performance appraisals and rewarding are strongly linked. In fact, one of the main barriers of both practices is measuring and gaining data on environmental performance across different organisational departments, who have very different ways and dynamics with regard to environmental performance. Therefore, they require specific KPIs.

Our study aims to overcome this issue by developing a monitoring tool that simultaneously assesses the organisations' environmental performance and environmental target of specific organisational departments which can be used to create a reward system within the framework of GHRM. By developing a multilevel monitoring system, the aim was to create a set of KPIs that measure and thus, understand, how each department contributes to achieving of the corporate targets. The casual link between organisational departments and corporate environmental targets can thus be better identified. We, thus, formulated our second research question as:

RQ2: Can a measurement system be used to create a reward system?

3. Case study profile and methodology

3.1. Case study: Characteristics and profile of Mutti

Mutti S.p.A. is an Italian company that specializes in preserved food, particularly in the tomato sector. In 2020, Mutti had an annual revenue of around 465 million euros with around 285 million tonnes of products sold and around 325 employees.

The company was founded in the 1950 s and since the early 2000 s Mutti has set updifferent projects related to the company's environmental sustainability. Mutti is an ISO 14001 certified-organisation and has also obtained ISO 45001 and SA8000 in addition to other sector-specific certification such as traceability of the supply chain, food safety, etc.

Due to its collaboration with the WWF Italy, between 2010 and 2015, Mutti saved over one billion litres of water (-4.6 %), directly involving more than 60 growers in Italy and preventing the release into the atmosphere of about 20,000 tons of CO_2 (-27 % per unit of product), thanks to energy efficiency measures and the use of energy from renewable sources. Since its core business is strictly related to natural capital, Mutti also carried out various initiatives related to biodiversity and environmental regeneration. However, despite these successful practices, they decided to focus on our specific project due to its potential to merge together environmental monitoring and employee reward systems.

3.2. Research method

According to Cornwall and Jewkes (1995), action or participatory research can be defined as participants and researchers cogenerating knowledge through collaborative communication. By merging the experience and knowledge of academics and practitioners, action research creates a simple, practical, repeatable process of iterative learning, evaluation, and improvement which leads to increasingly better results (Coughlan and Coghlan, 2002). In fact, one of the main characteristics of action research relates to the collaboration between researchers and members of organisations aimed at solving organisational problems.

In this case study, we used action research involving all the activities of Mutti. At both employee and Top Management levels, including all the company's departments, we established a system of ecological indicators system which could also be used by the human resource management. The action research project lasted one year and helped reveal how Mutti handles its environmental aspects and assesses its performance. During the project, the researchers participated in numerous meetings with the head of sustainability, together with departments heads and managers, Top Management and employees. A member of the project team worked at the company daily throughout the project.

3.3. Methodology

To identify the critical areas aimed at improving of environmental performance and greater sustainability, we examined the entire company system including all the various functions. In fact, by stimulating each company's departments, we ensured that environmental sustainability becomes the paradigm of all their decision-making processes and activities. In order to prepare a set of environmental performance indicators that could also be used for a reward system, the various company functions and departments were firstly mapped. Since the Top Management was composed of the company owner and the heads of the main departments, we did not include the Top Management in our analysis. We thus focus, on all the other 16 departments, i.e., Continuous Improvement, Control Administration Finance, Engineering, Industrial department, Logistics and Purchasing, Maintenance, Marketing, Planning, Production, Quality Assurance and Research & Development (R&D), Quality Control, Safety and Environment, Sales Overseas and Continental Europe and Sales South Europe.

Data and information were collected between June and October 2020 through two series of interviews with the heads and the main employees of each department. The first round of interviews (June and July) was used to identify the data available for each individual function. We outlined the procedures adopted for managing the environmental impacts derived from their business activities, also identifying the environmental aspects which were most focused on. At the end of this first round, we came up an initial proposal of indicators.

The second round of interviews (September and October) was used to share the indicators with the functions, review them and select them based on a series of parameters such as accessibility of data and information, relevance and ability of the department to affect the performance of the indicator.

We conducted semi-structured interviews following a protocol based on the academic literature on indicator systems and environmental performance (Czúc et al., 2021; Zong et al., 2022). Before starting the interviews, we briefly explained our research and guaranteed anonymity. However, we did not specify that the indicator would be used to create an MBO method to reward employees. The aim was thus to prevent misleading responses by the participants who might have disclosed information or rejected some indicators that had not achieved a good performance and, thus, stopped them receiving a good reward.

The recordings were also checked in order to reduce interviewee hindsight bias, memory lapses and other biases typical of qualitative research. All interviews were quite informal and narrative in nature in order to reassure the interviewees and ensure that all the different facets of sustainability implementation would be covered.

Almost all of the respondents also provided information on other topics related to sustainability as the managers have multidisciplinary expertise. These digressions helped us to obtain an overview of the company's sustainability efforts. In addition, at the end of the interviews, we asked for further general comments on sustainability. To build robust KPIs, where possible, we integrated the interviews with secondary data from archival sources (e.g., reports, procedures, operating instructions, etc.). To elaborate the multilevel KPIs some essential characteristics in mind have been kept in mind while evaluating the key metrics. KPIs should be attributable, i.e., managers should be able to influence the performance measured by the indicator and comparable over time. The indicator also needs to be collected and calculated in a way that enables the information and data to be verified. They should be easy to understand and use and cost effective, guaranteeing a good balance the cost of collecting information with its usefulness.

The goal was to define a strategy to measure the environmental sustainability of the company through the development of a system of environmental performance indicators that serves several purposes at the same time. In order to identify the KPIs, the most important aspect was the relationships between organisational departments and corporate targets. The KPIs for each department had to be strongly linked with the corporate target since it is exactly at the department level that leverages are activated to effectively contribute to company's sustainability.

In order to build a representative system of the company's environmental reality and its effectiveness and functionality, the indicators were divided into six macro-categories:

- Performance KPIs: environmental performance of the company in terms of the results in reducing or minimizing the consumption of natural resources and the emissions of pollutants;
- Commitment KPIs: commitment of the company to the management and improvement of environmental sustainability;
- Control KPIs: ability to prevent emergencies and accidents, in terms of both the conditions/status of the production process, plants and site, and the external environment;
- Reactivity KPIs: company's ability to capture and respond promptly and adequately to events and stimuli (positive and negative);
- Economic KPIs: company's ability to generate costs or benefits in relation to the commitments and objectives established;
- Engagement KPIs: ability to create the consensus and involvement of interested parties, in terms of relations with institutions, customer satisfaction and complaints received.

Two rounds of interviews were organized with the aim to define data and information available for each department in order to understand the procedures, practices and methods adopted for the management of the environmental impacts deriving from their business activities. Specifically, the first round of interviews had the objective of listing the corporate activities under the control and management of the function, identifying the environmental aspects affected by these activities and defining the information/data available to the interviewee in order to be able to elaborate a first proposal of indicators, to be resized and refined later. Subsequently, with the second round of meetings, the intention was to share the indicators that emerged from the previous interviews with the various functions, with the aim of reviewing and selecting them on the basis of a series of parameters such as accessibility of data and information, relevance of the monitored value and ability to affect the performance of the indicator. A further operational step led to the preparation of a system for assessing the environmental relevance, relevance for the local context and the regulatory relevance, always declined from an environmental point of view, of each indicator.

Furthermore, the system of indicators was shared with the head of the IT Department who manages most of the company data, asking to evaluate each indicator based on the accessibility and availability of the data and information.

4. Results

After the first round of interviews, we obtained a list of 304 KPIs, which in the second round was reduced to 208 KPIs, as shown in Tables 1 and 2.

4.1. Creation of the multilevel KPIs system

Despite this first trimming, the overall number of the KPIs was still too high. We needed to create a dashboard to enable immediate feedback, but at the same time to guarantee an in-depth analysis of the situation. For this reason, we reduced the number of KPIs even further considering their relevance and data accessibility.

In terms of relevance, we considered environmental relevance, local context and legal compliance. Each of these "sub-relevance" aspects were evaluated using a 5-point Likert scale from "Very low" to "Very

Table 1
First trimming of the KPIs according to the six macro-categories.

Macro-category	1° round	2° round
Performance	85	65
Commitment	71	53
Control	47	39
Reactivity	39	19
Economic	30	24
Engagement	32	9
Total	304	208

Table 2
First trimming of the KPIs according to the company's department.

Department	1° round	2° round	Department	1° round	2° round
Quality control	13	8	Human resources	27	20
Industrial department	13	11	Sales South Europe	12	7
Logistic and purchasing	35	20	Sales Overseas and Continental Europe	4	5
Safety and environment	30	27	Continuous improvement	6	5
Maintenance	18	11	Marketing	14	9
Production	30	18	Engineering	8	9
Agricultural services	24	15	Planning	26	10
Control Administration Finance	16	13	Quality Assurance and R&D	28	20

high". The average of the three aspects provided us the final results, and thus the final ranking.

As regards data accessibility, we asked each department whether the data was already available or not yet available, could be obtained or not accessible at all.

All KPIs were assessed using these two criteria and considering the discussion done during the interviews. This led a dashboard of 57 KPIs divided into seven top indicators, nineteen 1st level explanatory indicators, seventeen 2nd level explanatory indicators, nine transversal indicators and five multifunctional indicators (Fig. 1).

The top indicators are representative of the main business management areas and linked to various environmental aspects (Table 3).

1st level explanatory indicators are linked to top indicators and they influence how the top indicators behave. By acting on 1st level explanatory indicators, departments can influence the top indicators. On the other hand, 2nd level explanatory indicators are linked to the 1st level, but they are only indirectly linked to the top indicators. They allow departments to carry out in-depth analyses of the situation connected with the trends of the other indicators.

Transversal indicators are indicators which are managed by just one department, but are connected to more than one environmental aspect. Multifunctional indicators, on the other hand, are managed by more than one department and affect more than one environmental aspect.

All the KPIs are linked to each other. In order to increase the performance of the Top Indicators, the company and its employees need to improve 1st level and 2nd level explanatory indicators. Even the transversal and the multifunctional indicators affect the outputs of the Top Indicators. In this way the entire structure of the company should work in synergy to achieve the final targets. The list of the KPIs can be found in the appendix.

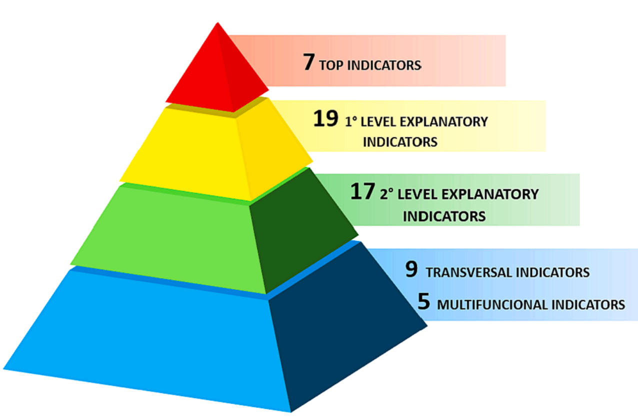

Fig. 1. Final structure of the KPIs dashboard.

Table 3
Top Indicators of the dashboard.

Top indicator	Unit of measure	Environmental aspect
Total energy consumption/finished products	Gj/tonnes	Energy consumption
Total water consumption/finished products	m^3/tonnes	Water consumption
Built-up area/Turnover	m^2/€	Land use
Destroyed products/finished products	tonnes/tonnes	Waste production
km travelled by road/finished products	km/tonnes	Air emissions
Recycled packaging/finished products	tonnes/tonnes	Packaging
Expenses for environmental initiatives/year	€/year	/

4.2. *Setting MBOs connected with the KPIs*

After defining the structure and the content of the dashboard, we developed the methodology to set the MBOs connected to the KPIs. The company decided to create MBOs for the top indicators and the 1st level explanatory indicators. The annual target of each MBO is calculated by a weighted average of the performance of the last three years: 50 % of the weight is assigned to the best performance, 25 % to the other two years. Every year the target is updated according to the performance reached in the previous year and eliminating the oldest year. Table 4 shows the target set for each top indicator.

For each top indicator, the department in charge must present to the Top Management an action plan with all the activities identified for achieving the target and consequently the MBO. However, in each action plan, the department in charge must also explain all the 1st level and the 2nd level explanatory indicators connected with the top indicators. In this way, the Top Management can promote cooperation among different departments. In fact, in order to plan the action for the achievement of the targets set for the other KPIs, the department in charge of the top indicators should cooperate with the department in charge of the other indicators. In addition, thanks to the multifunctional KPIs, in some cases this need for cooperation is strictly linked to the performance of the KPIs and not only to the planning of the activities.

Table 4
Target set by the company for the Top Indicators.

Energy consumption - Total energy consumption/finished products - Maintenance				
	2018	*2019*	*2020*	*2021*
Value (Gj/tonnes)	2.10	2.24	2.22	
Target	–	–	–	2.17
Water consumption - Total water consumption/finished products - Production				
	2018	*2019*	*2020*	*2021*
Value (m^3/tonnes)	4.76	5.10	5.34	
Target	–	–	–	4.99
Land use - Built-up area/Turnover – Industrial department				
	2018	*2019*	*2020*	*2021*
Value (m^2/€)	2.01	2.00	1.84	
Target	–	–	–	1.92
Air emissions - km travelled by road/finished products - Logistic and purchasing				
	2018	*2019*	*2020*	*2021*
Value (km/tonnes)	29.97	30.12	31.55	
Target	–	–	–	30.20
Waste production - Destroyed products/finished products - Planning				
	2018	*2019*	*2020*	*2021*
Value (tonnes/tonnes)	5.31	7.56	5.01	
Target	–	–	–	5.72
Packaging - Recycled packaging/finished products - Quality Assurance and R&D				
	2018	*2019*	*2020*	*2021*
Value (tonnes/tonnes)	99.2	99.2	99.0	
Target	–	–	–	99.2
Environmental initiatives – Expenses for environmental initiatives/year - Human Resources				
	2018	*2019*	*2020*	*2021*
Value (€/year)	€ 65,000	€ 65,000	€ 90,000	
Target	–	–	–	€ 75,500

5. Discussion

Our research is, we believe, the first attempt to investigate how a company can create an environmental performance indicator system to assess corporate sustainability and reward managers and employees through a "sustainability-oriented" MBO programme. Our study further expands not only the academic literature, but also provides a practical and operative contribution to all those companies that wish to create a new KPIs system. Lastly, we merge together GHRM practices and strategies, specifically the reward system, with the environmental performance of each organisational department by creating a methodology to define MBOs.

We believe that this study has many benefits. Despite the attention to the circular economy, measuring its level of diffusion is still being debate by both academics and technicians (Sassanelli et al., 2019). Environmental certifications are still not sufficiently linked with circular economy and barely contribute to its promotion (Marrucci et al., 2019). Moreover, as suggested by Marrucci et al., (2022b), even the adoption of LCA may be not enough to avoid "circular-washing". Our study provides a tailor-made methodology to assess environmental impact, the diffusion of the circular economy and attempts to combat climate change. In fact, our KPI system is made up of several KPIs that analyse the performance of the company from different perspectives.

One of the first obstacles to creating environmental performance indicators to assess corporate sustainability and reward employees is the difficulty of measuring sustainability related factors, which would make the adoption impractical. One of the causes of this difficulty of measurement is the need for additional information in the monitoring phase, which is not as easily accessible as financial information (Bodini et al., 2012). Kolk and Perego (2014) highlighted that linking sustainability targets to bonuses and, therefore, holding someone responsible for environmental sustainability might be counterproductive since the complexity of defining sustainability boundaries might lead to a lack of reliability.

Environmental sustainability, circular economy, decarbonization are all difficult to measure due their multidimensionality. While this multidimensionality allows organisations to pursue different strategies such as managing waste and CO_2 emissions responsibly, reducing water and energy consumption, mitigating environmental effects of production methods, boosting awareness raising initiatives among their employees, etc., at the same time it hampers the monitoring of green KPIs. In addition, not only the measurement, but above all the calibration of targets are problematic. These issues are the most likely reasons for the slow adoption of MBOs linked to sustainability aspects among companies.

Even when quantitative measures are available, it might not be clear which ones to use and how to strike a balance between being overly simplistic and excessively complex. This heterogeneity hampers the creation of a universally accepted standard, which would be helpful to set targets, monitor the progress towards the target, and reward/punish compliance/non-compliance. Our study provides a holistic approach that captures all the facets of sustainability and guides a company by avoiding the creation of isolated incentives and further complication of reports.

On the whole, the effective incorporation of a reward system that promotes sustainability objectives may need the companies to undergo a significant organisational shift. To pursue this strategy, sustainability should be sufficiently embedded within the organisations by integrating of sustainable business practices into operational decision making. In fact, a positive relationship has been found between environmental strategy and the adoption of environmental performance measures for decision-making (Hourneaux et al., 2014). However, such an organisational shift should include not only the Top Management, but the employees at various hierarchical levels.

Our research found that incorporating sustainability targets in executive compensation schemes or definitions of MBOs can contribute to the diffusion of the circular economy. Berrone and Gomez-Meja (2009) showed that in order to improve their environmental performance companies should link CEOs incentive compensation to environmental targets. However, since employees' commitment and effort have been proved to be pivotal for promoting the circular economy (Marrucci et al., 2022c), MBOs and incentives should be set, not only for the Top Management, but at least for each department head.

In fact, rewards motivate employees through goal-oriented bonuses or performance improvement incentives. Nevertheless, traditional rewarding does not lead managers to invest and commit in socially responsible activities. Managers are therefore unlikely to pursue these practices unless appropriate incentives are in place. MBOs are a useful tool for the decentralization of responsibility and authority with the aim of obtaining the maximum participation of all employees in the achievement of company results. MBOs actively involve employees and empower them, increasing their satisfaction and commitment at work. Managers can indirectly have a better perception of the corporate climate. Thanks to our KPI system, the interactions between managers and collaborators can help maintain better relationships within the organisation and increase synergies to solve problems and share useful proposals.

Nevertheless, MBOs may have some disadvantages. MBOs may encourage certain managers to pursue them by any means. In addition, a reward system can encourage managers with leadership skills to focus their energies primarily on achieving individual goals, neglecting normal activity.

Lastly, the adoption of MBOs connected to environmental performance may lead to window dressing, i.e., the manipulation of statements and reports to show more favourable results for a period. This may lead to the symbolic adoption of green practices to gain legitimacy, without substantively committing to them. One of the risks of adopting environmental MBOs is that it could be used as an additional way to pay Top Management without concretely promoting a holistic approach towards sustainable performance, given that non-financial performance measures, including sustainability metrics, are easy to manipulate and hard to verify. This approach may consequentially lead to greenwashing by the company, i.e., conveying a false or misleading impression about environmental impacts (Testa et al., 2018b). Our study overcomes this risk by expanding the MBOs to all the department heads without limiting them to the Top Management and providing voluntary disclosure on the KPI system.

6. Conclusions

Our study investigates the creation of an environmental performance measurement system aimed at supporting employees' rewarding by defining MBOs. The results of our research show the creation of a tailor-made KPIs dashboard that captures all the facets of the circular economy and specific characteristics of a company. At the same time, our study highlights the difficulties connected to the definition of the MBOs.

We believe that our results provide useful implications both for scholars and practitioners. From a practical perspective, we widen the debate on the contribution of reward systems on environmental performance. Furthermore, we provide a performance measurement system that can lead to the enhancement of organisation performance suggesting weakness and strengths and providing a useful strategy to gain a stronger and more widespread diffusion of sustainable practices. By rewarding employees based on their contributions to environmental performance, companies can foster a culture of sustainability and incentivize employees to adopt sustainable practices in their day-to-day work.

From an academic perspective, we contribute to the literature by suggesting a methodology to link a company's environmental performance to employees' MBOs.

Even though our study focuses only on one company, it investigates for the first time reward systems and MBOs' connection with environmental performance filling a literature gap, different results might emerge if the same approach is replicated in other organisations. In particular, while specific indicators may vary depending on the sector, the underlying principles of measuring, monitoring, and rewarding environmental performance can be adapted and implemented elsewhere. Moreover, by aligning their practices with sustainability indicators, companies can also contribute to shaping supportive policies and standards that drive sustainability across industries and territories. In our case, the company created a set of incentives offered to employees to support a sense of ownership and accountability for individuals, business units and corporate goals. However, the company did not expand the MBOs to every employee, only the department heads. Moreover, the reward was in the form of an economic bonus. Further studies should consider the non-financial and intangible benefits including job security, career development and personal recognition.

The main limitation of our study is probably the most important point of a future research agenda. The adoption of a system like this requires at least three years of application before it is possible to concretely assess its effectiveness and efficacy. A future longitudinal study could evaluate the practical contribution of creating environmental performance indicators and employees' MBOs on environmental and financial performance of the company.

In conclusion, we believe that sustainable incentives and defining MBOs connected with environmental performance is a useful governance mechanism to improve sustainability and also signal a company's commitment towards it to stakeholders and investors, especially if aligned with sustainability reporting. Unfortunately, its adoption is still relatively low, and few empirical data are available. Moreover, not only setting the target, but also defining the KPIs requires a great deal of effort. Future studies could support companies in identifying which environmental aspects are significant for them, decide which targets to set and how to monitor them, and how to quantify them in terms of compensation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Appendix

1st level explanatory indicators **Department**	**KPIs**
Logistic and purchasing	km travelled within the group/t of product sold to third parties
Logistic and purchasing	km travelled by road/t of incoming packaging
Logistic and purchasing	km travelled for supply by road/t of incoming tomato
Engineering	Asset value or market value or no. of old replaced implants or parts of implants sold on the market or reused in other establishments of the group/Asset value or market value or no. plants or parts of decommissioned plants
Planning	t of new packaging destroyed/t of purchased packaging
Production	t of waste produced from raw tomato sorting/t of raw tomato
Control Administration Finance	t of destroyed goods passed through the shop/t of goods that go to the shop
Planning	t of product subject to commercial alert/t of finished product
Sales South Europe	t of product sold with a later expiry date/t of the same product with the closest expiry date
Sales Overseas and Continental Europe	t of product with neutral packaging or multi-country label/t of product
Sales Overseas and Continental Europe	No. of geographic macro-areas covered by customers with sales channel of expiring products (shop)/Total geographic macro-areas
Quality Assurance and R&D	No. of compliant pieces/total No. of finished product
Safety and environment	m^3 of water drawn in the plant/t of finished product
Agricultural services	m^3 of water consumed in the fields/t of raw tomato
Production	Total number of washes per production line/h of production
Production	No. of rinses per production line/Total of rinses and washes per production line
Production	No. of hours for extraordinary line stops/t of finished product
Planning	No. of midweek recipe changes per production line/No. total recipe changes per production line
Planning	Number of midweek format changes/Total number of format changes
2nd level explanatory indicators	
Department	**KPIs**
Logistic and purchasing	No. of environmental criteria included in the technical specifications for the selection of logistics and transport services/Total number of criteria included
Engineering	No. of upgrades or adjustments made in order to postpone the decommissioning of the plant/year
Control Administration Finance	€ of packaging destroyed/€ of total packaging purchased
Agricultural services	t of seeds and skins/t of raw tomato
Agricultural services	t of rotten or unripe tomatoes and other impurities/t of raw tomato
Safety and environment	t of hazardous waste/t of waste produced
Safety and environment	t of waste sent for disposal/t of waste produced
Safety and environment	t of recycled waste/t of waste produced
Planning	t of product sold at the shop/t of finished product
Planning	t of product given to charity/t of finished product
Sales South Europe	Average time to sell product subject to deadline alert
Sales Overseas and Continental Europe	t of product subject to 15 months alert sold in the year/Total product subject to 15 months alert
Production	m^3 of water consumed for oven cooling/t of product processed in the oven
Production	m^3 of steam per production line/t of finished product per production line
Safety and environment	Kg of escaped refrigerant gas/total kg of refrigerant gas
Planning	No. actual recipe changes/No. of planned recipe changes
Planning	No. of actual format changes/No. of planned format changes
Transversal indicators	
Quality Assurance and R&D	t of finished product with environmental certifications/t of finished product

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(*continued*)

1st level explanatory indicators Department	KPIs
Quality control	No. of exceedances of the precautionary threshold for each parameter relating to water discharge/No. of tests carried out for each parameter relating to water discharge
Industrial department	No. of measured flows of environmental interest/Total no. of flows
Continuous improvement	No. of investment proposals made with strong environmental relevance/No. total investment proposals made
Marketing	€ invested for environmental communication/total € invested for communication
Human resources	Number of hours of specific environmental training provided/Total number of hours of training provided
Human resources	No. of staff with environmental MBO/Total no. of staff with MBO
Agricultural services	t of chemicals/t of raw tomato
Agricultural services	% of crops on surface at medium–high risk/t of raw tomato
Multifunctional indicators	
Logistic and purchasing Production Quality Assurance and R&D Safety and environment	No. of audits (I or II type) carried out by the function with environmental objectives/year
Industrial department Logistic and purchasing Maintenance Production Safety and environment	No. of suppliers of products or services used in the plant with environmental certifications/Total No. of suppliers
Agricultural services Industrial department Logistic and purchasing Production Quality Assurance and R&D Safety and environment	Average days for the closure of an environmental non-compliance that emerged from an inspection
Maintenance Production	t of chemicals used in the plant/t of finished product
Agricultural services Industrial department Logistic and purchasing Maintenance Production Quality control Safety and environment	No. of environmental criteria included in the technical specifications for the selection of suppliers/Total number of criteria included

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