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Environmental Management System Adoption: Challenges for Sustainable Development in Algerian Agri-Food Companies

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HIGHLIGHTS

- The study assessed ISO 14001 benefits, emphasising cost savings, waste reduction, pollution control, improved reputation, and enhanced global competitiveness.
- Challenges included high implementation costs, sub-contractor collaboration, and increased management expenses, all contributing to improved satisfaction rates.
- Positive correlations with cost reduction and SME adoption costs, and negative correlations with manager education and product quality was found.

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ABSTRACT

The study, conducted between January and July 2024, identified the benefits and challenges faced by fifty-three ISO 14001-certified agri-food companies in Algeria. The current study's findings indicated that implementing an Environmental Management System (EMS) can result in significant cost savings by effectively managing natural resources, reducing waste, and controlling pollution. On the other hand, the significant challenges to adopt an EMS lie in the need for more collaboration from subcontractors, the fact that the savings achieved do not offset the expenses related to the rigorous implementation of management solutions, and the increase in management and operational costs. However, the implementation process requires significant effort and financial investment, which can be a limitation for some companies with significant positive correlations for parameters influencing the success of the adoption of the EMS system such as lowering costs ($p = 0.0000$), EMS adopting costs ($p = 0.0021$), and EMS maintenance costs ($p = 0.0112$) with EMS adoption. On the other hand, managerial education level ($p = 0.021$) and efforts to improve product quality ($p = 0.010$) exhibited significant negative correlations. Composite reliability values, ranging from 0.780 to 0.990, demonstrated strong internal consistency across the constructs measured.

INTRODUCTION

An Environmental Management System (EMS) is a structured and systematic framework designed to assist organisations in managing and mitigating their environmental impacts (Ferenhof et al., 2014). It encompasses a set of practices, policies, and procedures to minimise environmental footprints while promoting the sustainable utilisation of natural resources. (Voinea et al., 2020). EMSs facilitate the integration of environmental considerations into daily operations, enhancing overall environmental performance

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(Herghiligiu et al., 2019). An EMS involves several key steps : identifying environmental aspects, setting specific environmental objectives and targets, implementing detailed action plans, monitoring environmental performance, and continuously reviewing and improving the system (Carrillo-Labella et al., 2020). EMS standards have been established nationally and internationally as decentralised, voluntary environmental programmes. These standards have emerged in response to economic globalisation and increasing external pressures on companies regarding environmental issues (Testa et al., 2016). According to the ISO Survey of 2022, approximately 529,853 enterprises worldwide are certified to ISO 14001, making environmental management standards one of the most prevalent managerial practices globally, second only to ISO 9001 certification (Hayat & Lohano, 2024; Boulfoul et al., 2022). Adopting an EMS in the agro-industry encounters several substantial challenges. A primary challenge is the insufficiency of financial resources (Padilla-Bernal et al., 2018; Martin, 2020), which obstructs the necessary initial investments to adopt these systems. Numerous agri-food enterprises need more knowledge and competence regarding environmental management systems, impeding the incorporation of sustainable practices into their operations. Moreover, employees and management frequently resist change, as altering entrenched routines can be challenging. The intricacy of regulatory mandates may inundate firms, particularly smaller enterprises, which often need more resources for efficient compliance (Espinosa, et al., 2021). Furthermore, the considerable absence of assistance and direction from governmental and institutional entities deprives firms of the fundamental frameworks necessary for the proper execution of the EMS. The view of an EMS as a liability rather than a valuable asset may encourage agri-food enterprises to use it, thereby hindering their capacity for sustainable growth and environmental stewardship. Recent research indicates that the successful implementation of environmental management systems in the agri-food sector is significantly hindered by inadequate managerial support and commitment, which are critical for addressing these challenges effectively (Ikram, et al., 2021). It is essential to consider the extent to which implementing an environmental management system can help an organisation achieve its efficiency goals and the circumstances under which this is possible.

The primary aim of this study is to evaluate the advantages and obstacles associated with implementing the ISO 14001 standard. This research examines the key advantages of adopting an EMS, emphasising its contribution to reducing environmental risks, improving environmental protection within the agri-food industry, and promoting the advancement of environmental standards across the sector. The study seeks to identify challenges associated with implementing an environmental management system, including inadequate collaboration from subcontractors, cost savings that fail to compensate for the expenses incurred during the stringent implementation of management solutions, and a rise in management and operational costs.

METHODOLOGY

Data was collected using a structured questionnaire based on a comprehensive literature review of similar studies in other countries. To conduct this research, the questionnaire was designed with the help of consultants specialised in developing environmental management systems. The survey concerns fifty-three agri-food companies that represent all the ISO 14001-certified companies at the national level. The list of these companies was collected from the Algerian Institute of Standardization (IANOR) and the Ministry of Industry. Then, each company was called to confirm their willingness to participate in the study on adopting the EMS. Before drafting the research questionnaire, a preliminary survey was conducted among agri-food companies to assess the feasibility of the questionnaire and closely observe their production methods, addressing the main concerns related to the adoption of this system within these companies. This questionnaire facilitated the collection of opinions and information on adopting this system and managers' experiences in the food sector. During visits to the targeted food processing companies, the questionnaire was distributed to the company managers, followed by face-to-face interviews conducted over several sessions to ensure the accuracy of the responses. The face-to-face interview allowed participants to freely discuss their knowledge of adopting environmental management systems in Algerian agri-food companies. The survey included questions about the certification process, the reasons for pursuing certification, the benefits gained, and the challenges encountered during certification.

Furthermore, we asked the respondents to give us advice and suggest recommendations for companies wishing to obtain ISO 14001 certification. In this study, all statistical analyses were conducted using SPSS: the statistical package for social sciences, version 25. Initially, the software was used to statistically analyze the variables using descriptive statistics. Pearson's correlation analysis characterized the food companies that adopted the ISO 14001 standard. Subsequently, Cronbach's alpha, a standard coefficient, was employed alongside correlation analysis to evaluate relationships among key parameters influencing the successful implementation of the EMS within agri-food companies.

RESULTS

Characteristics of the companies

As shown Table 1, our sample comprises exclusively private sector enterprises, with no state-owned companies in the agri-food industry holding ISO 14001 certification. All individuals surveyed held positions as directors or managers. Our findings on company establishment reveal that over 50 per cent of enterprises fall within the 10 to 20-year age bracket. This trend is significantly influenced by the reforms that have been in place since 2000. In terms of legal status, a majority of companies are multinational (50%) or limited liability corporations (LLC) (33%). Conversely, a minority (17%) identify as joint stock companies (JSC), primarily due to the financial obligations imposed by shareholders, contrasting with the aforementioned legal statuses. Notably, a significant proportion of enterprises (77.8%) operate within a collective framework. Enterprises attribute their membership to its favourable impact on securing funding for their operations. Seventy per cent (70%) of the companies surveyed in our study meet these criteria. Additionally, a significant majority of companies fall into the category of large corporations, characterised by more than 500

Table 1. Main characteristics of the selected agri-food companies

Characteristics		Percentage
Contact person:Position held in the company	Managing Director	100
Agri-food companies' sector	Public sector	0
	Private sector	100
Year of company establishment	Less than 5 years	5,1
	Between 5 and 10 years	25,7
	Between 10 and 20 years	50,0
	More than 20 years	7,1
Legal status of the company	JSC	17
	LLC	33
	Multinational	50
Group membership	Yes	67
	No	23
Employees	1-250 employees	17
	250-500 employees	32
	500 employees	51
Revenue	Between 20 MDZD and 200 MDZD	17
	Between 200 MDZD and 2 billion DZD	17
	Between 2 billion DZD and 5 billion DZD	33
	≥5 billion DZD	33
Has the company already called on the services of quality institutions ?	IANOR	100
	ALGERAC	35,7
	ONML	92,9
	INAPI	85,7
Has the company already received support from cooperation programmes such as ?	SMEs I & SMEs II	7,1
	UNDP	7,1
	UNIDO	14.3
	DIVECO	14.3

Origin : Our team collected and analysed the data through a survey

employees and a turnover exceeding 5 billion Algerian dinars (DZD), constituting 51 per cent of the total. Conversely, medium-sized enterprises, employing between 250 and 500 individuals, represent the smallest segment at only 32 per cent. This distribution suggests that Algerian sized medium agri-food companies are effectively establishing themselves in the local market, influenced by financial constraints faced by domestic firms. Unlike other quality services, all enterprises consult IANOR institute, National office of legal metrology (ONML)and Algerian national institute of industrial property (INAPI) are closely followed, with consultation rates of 92.9 per cent and 85.7 per cent, respectively. In contrast, Algerian accreditation body (ALGERAC) has a lower consultation rate of 35.7 per cent compared to the top two organisations. Furthermore, a small fraction of companies have engaged in collaborative initiatives, which involve stringent criteria that are difficult to meet, reducing corporate participation likelihood. Ultimately, the State plays a crucial role in supporting businesses by offering financial assistance to enterprises implementing ISO 14001 certification, as evidenced by a substantial proportion (66.66%) in our sample. These subsidies are intended to promote the adoption of SME system certifications within agri-food companies, to mitigate environmental impacts, including water, soil, and air pollution. The company's moderate engagement with cooperation programs shows higher involvement in the United Nations Industrial Development Organization (UNIDO) and Diversification and Economic Cooperation (DIVECO) (14.3% each) compared to the Small and Medium Enterprises Support Program (SMEs) I & II and the United Nations Development Programme (UNDP) (7.1% each). This suggests a stronger alignment with industrial and economic diversification initiatives, while support from SMEs and UNDP appears to be underutilized. Enhancing participation in these programs could unlock additional growth opportunities.

Benefits of Implementing Environmental Management Systems

As shown in Table 2, data shows the key benefits of implementing the EMS. The most significant advantage, reported by over 98 per cent of respondents, is the reduction of environmental risks, encompassing air, soil, and water pollution. This outcome is largely attributed to companies' robust contributions to environmental protection and their strong compliance with industry environmental standards, achieving performance ratings exceeding 94 per cent. The most significant responses collectively highlight financial benefits : waste segregation enables cost-neutral or cost-positive disposal (88.67%), production costs are reduced through optimisedordering and minimised waste (90.56%), and an improved corporate reputation enhances overall business competitiveness (81.13%). Secondary benefits, such as

Table 2. Benefits of implementing an EMS in the agri-food companies

Responses	Disagree (%)	Somewhat agree (%)	Strongly agree (%)
Mitigating environmental risks, including air, soil, and water pollution.		1.89	98.11
Enhancing environmental protection within the broader society.		3.78	96.22
Advancing environmental standards throughout the industry.		5.66	94.33
The separation of waste results in disposal outcomes that are either cost-neutral or financially advantageous.		11.32	88.67
Minimizing production costs through streamlined procurement processes and strategies for reducing waste.		9.43	90.56
Enhancing the company's reputation to bolster its overall competitiveness		18.86	81.13
Reducing environmental claims		24.52	75.47
Enhancing the working environment for staff to increase morale	32.07	67.92	
Adherence to employers' pre-qualification criteria	37.73	62.26	

reduced environmental claims (75.47%), enhanced workplace morale (67.92%), and adherence to pre-qualification criteria (62.26%), indicate EMS's comprehensive advantages. Collectively, these findings emphasize that EMS adoption not only promotes environmental sustainability but also drives economic efficiency and operational resilience, solidifying its value for companies in the agri-food sector.

Obstacles to EMS implementation in agri-food companies

Table 3 provides a comprehensive overview of the responses addressing obstacles outlined in the questionnaire's implementation segment. The evaluation divides the challenges to EMS implementation into two categories : primary obstacles and secondary constraints. According to the data in Table 3, the respondents highlighted the key challenges to EMS implementation in the agri-food sector, which include: inadequate cooperation from subcontractors (90.56%), insufficient cost savings to justify the comprehensive adoption of management strategies (94.33%), escalating management and operational costs (98.11%), and a lack of customer support (90.56%). The less significant barriers in adopting an EMS include an increased documentary workload (81.3%), the time needed to enhance environmental performance (83.01%), challenges in coordinating environmental performance across multiple levels of subcontractors (79.24%), a shortage of trained staff and expertise (88.67%), lack of enforcement by regulatory authorities (69.81%), and insufficient technological support within the company (71.69%).

Reliability assessment of EMS consistency

As presented in Table 4, the reliability of all variables exceeded the recommended threshold for Cronbach's alpha (0.70), confirming strong internal consistency across the constructs. Cronbach's alpha values ranged from 0.780 to 0.990, indicating robust reliability for the variables measuring EMS adoption in agri-food companies. The highest Cronbach's alpha and CR values (0.990 and 0.980, respectively) corresponded to EMS implementation costs and lowering of costs, suggesting excellent internal consistency. These results indicated that the data used in this study were reliable and consistent, ensuring the robustness of the findings related to EMS adoption in the agri-food sector.

Relationship between factors and environmental management systems

The analysis of the relationship between specific parameters and the implementation of an EMS in food companies, as presented

Table 4. Results of the reliability tests

Responses	Cronbach's Alpha	Composite Reliability
Lowering of costs	0.980	0.980
EMS Implementation Costs	0.990	0.990
EMS Maintenance Costs	0.940	0.940
Manager level education	0.930	0.980
Manager age	0.880	0.880
Improve product quality	0.780	0.780

Table 3. Barriers encountered to EMS implementation in agri-food companies

Responses	Significant (%)	Highly significant (%)
Insufficient collaboration from subcontractors	9.44	90,56
The cost savings do not offset the expenses of rigorously implementing managementsolutions.	5.67	94.33
Rise in managerial and operational expenses	1.89	98.11
Lack of customer support	9,44	90,56
Increased documentary workload	18.7	81.30
Time allocated to enhancing environmental performance	16.99	83.01
Coordinating environmental performance among subcontractors at multiple levels is challenging.	20.76	79.24
Lack of trained staff and expertise	11.33	88.67
Governmental failure to enforce the law	30.18	69.81
Lack of technological support within the company.	28.31	71.69

Table 5. The relationship between specific parameters and the implementation of an ems in food companies

Parameters	Estimated path coefficient	Standard deviation (STDEV)	P values
Lowering of costs	0.578	4.012	0.0000
EMS adopting Costs	0.141	1.507	0.0021
EMS Maintenance Costs	0.164	1.599	-0.0112
Manager level education	-0.246	2.422	0.021
Improve product quality	-0.203	2.422	0.010

in Table 5, reveals significant findings. The correlation analysis shows a strong and positive relationship between cost reduction and EMS implementation, with a highly significant path coefficient of 0.578 and a p-value of 0.000, indicating a robust effect. In contrast, the costs associated with EMS adoption (path coefficient of 0.141, p = 0.0021) and EMS maintenance (path coefficient of 0.164, p = -0.0112) exhibit less significant but still noteworthy impacts on the EMS adoption process. Additionally, managerial education level (path coefficient of -0.246, p = 0.021) and efforts to improve product quality (path coefficient of -0.203, p = 0.010) show negative correlations, suggesting that higher education levels among managers and a focus on quality improvement may hinder the EMS adoption process. The results underscore the importance of cost-reduction strategies as a major driver for the successful implementation of EMS, while also highlighting potential challenges linked to adoption and maintenance costs, as well as managerial factors.

DISCUSSION

The adoption of an EMS, particularly ISO 14001, is a strategic tool for enhancing competitiveness, increasing market share, and driving sustainable growth (Bravi et al., 2020). The data in Table 2 highlights ISO 14001's effectiveness in improving organizational performance and fostering sustainable practices, particularly in companies without prior systems (Ahmed & Mathrani, 2023) ; Carrillo-Labella et al., 2020). Compliance with regulatory requirements reduces costs, while additional benefits, such as reduced waste production, enhance profitability and efficiency (Oliveira et al., 2016; Watson & Emery, 2004). Financial advantages include cost savings and improved competitiveness, appealing to environmentally conscious consumers willing to pay premiums for eco-friendly products (Ociepa-Kubicka et al., 2021). However, reduced environmental claims (75.47%) and improved working conditions (67.92%) are viewed as less impactful, consistent with Bielski et al., (2021) findings. While EMS implementation primarily drives financial and environmental benefits, further research is needed to explore the prioritization of profitability factors. Managers prioritise these aspects due to their significant impact on the benefits of adopting an EMS (Hillary, 2004).

The analysis of obstacles to EMS implementation in agri-food companies reveals key challenges, particularly in monitoring subcontractors' environmental performance, as highlighted by Kashakova et al., (2022). The study shows that increased management and operating costs are seen as significant barriers, with stakeholders questioning the return on investment for EMS adoption. These findings align with Castka & Balzarova (2018), who point out the high costs of obtaining and maintaining ISO 14001 certification, including external audits, staff training, and continuous improvement initiatives. Small and medium-sized enterprises are particularly affected by these financial and time burdens. Furthermore, the time-consuming nature of auditing, data collection, and staff training diverts resources away from addressing environmental concerns, reducing operational efficiency. The challenge of reshaping employees' mindsets and the extended training process also contributes to the complexity of EMS implementation, as noted by Carrillo-Labella et al., (2020).

The reliability assessment of SME consistency in implementing EMS in the agri-food industry reveals several key factors. Cronbach's alpha coefficients confirm the high reliability of variables related to EMS, including cost savings, implementation, and maintenance costs (Hair & Alamer, 2022). Composite reliability (CR) values, ranging from 0.780 to 0.990, further support the reliability of the data. A CR value above 0.70, as suggested by Kok Wei & Li (2013), confirms satisfactory reliability for all assessed variables. Well-educated managers and younger executives significantly contribute to the successful adoption of EMS due to their openness to innovative practices. Moreover, the primary motivation for adopting systems like ISO 14001 is to enhance environmental performance and gain access to international markets (Davydova & Sharno, 2023). However, high operational costs and insufficient financial support pose challenges, particularly for SMEs in Algeria (Figurek & Thrassou, 2023). The age of executives also impacts EMS adoption, with younger leaders being more receptive to new environmental practices (Turyakira et al., 2014). Finally, integrating EMS with product quality improvements provides dual benefits, enhancing both environmental performance and competitiveness (Granly & Welo, 2014; Journeault et al., 2021).

The correlation analysis of factors influencing the adoption of EMS in agri-food companies highlights the roles of lean and green management approaches. Lean management improves operational efficiency by eliminating inefficiencies, while green management focuses on reducing environmental impacts and promoting sustainability (Viles et al., 2021). ISO 14001 adoption shows improvement in both economic and environmental performance, reducing costs related to energy, raw materials, waste, and environmental impact (Santos et al., 2016; Zimon et al., 2022). For example, companies significantly reduce hazardous waste and water usage (Shah et al., 2019). The standard's systematic management of materials and energy leads to operational cost reductions, preventive maintenance, and regulatory compliance, which can prevent fines (Yu & Ramanathan, 2015). ISO 14001 also enhances organizational commitment through training and documentation of environmental procedures (Waxin et al., 2020). However, challenges remain in balancing the benefits and difficulties of its implementation (Boiral et al., 2018).

CONCLUSION

The study highlights the potential benefits of adopting an EM Swithin agri-food companies, particularly in terms of cost savings and environmental protection. However, the implementation of EMS presents challenges, particularly regarding the significant

investment required in terms of time, resources, and management effort. While cost reduction and effective waste management contribute to successful EMS adoption, the findings also point to the barriers posed by high implementation and maintenance costs, especially for small and medium-sized enterprises. Additionally, the study identifies managerial education levels and the focus on product quality as factors that could hinder the successful adoption of EMS. Therefore, overcoming these challenges will require strategic planning and investment to ensure that the benefits of EMS can be fully realized.

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