

REVIEW

Environmental Planning Strategies for the Sustainability of the Agricultural Sector

Estrategias de Planificación Ambiental para la Sustentabilidad del Sector Agropecuario

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ABSTRACT

Introduction: the research approached the Environmental Management System (EMS) as an essential tool to regulate the productive and administrative practices of agricultural enterprises in the municipality of Colón. The EMS was considered to comprise an organizational structure oriented to the rational use of natural resources, promoting corporate social responsibility. It was intended to generate awareness among producers about the economic, social and ecological benefits of applying sustainable practices in their production units.

Development: during the development of the study, theoretical background and practical experiences in environmental management were analyzed. The case of the La Esmeralda farm, where a model based on ISO 14001 was partially implemented, and the work of Yépez, which emphasized community participation and the strategic approach, were highlighted. Contributions related to decision-making in agricultural enterprises were also reviewed, in which the need to adopt a strategic, ecological and social vision to face the challenges of the current environment was evidenced. The importance of variables such as bioethics, eco-efficiency and environmental training in strengthening the productive sector was recognized.

Conclusions: the research concluded that integrating environmental management into the agrarian sphere offered multiple benefits, including reduced environmental impact, institutional strengthening and access to demanding markets. It was also determined that the success of this integration depended on collective commitment, environmental education and strategic planning, key elements for achieving sustainable development in the municipality of Colón.

Keywords: Environmental Management; Sustainability; Agribusiness; Decision Making; Strategic Planning.

RESUMEN

Introducción: la investigación abordó el Sistema de Gestión Ambiental (SGA) como una herramienta esencial para regular las prácticas productivas y administrativas de las empresas agrarias en el municipio Colón. Se consideró que el SGA comprendía una estructura organizativa orientada al uso racional de los recursos naturales, promoviendo la responsabilidad social empresarial. Se pretendió generar conciencia en los productores sobre los beneficios económicos, sociales y ecológicos de aplicar prácticas sostenibles en sus unidades de producción.

Desarrollo: durante el desarrollo del estudio, se analizaron antecedentes teóricos y experiencias prácticas en materia de gestión ambiental. Se destacó el caso de la finca La Esmeralda, donde se implementó parcialmente un modelo basado en la norma ISO 14001, y el trabajo de Yépez, que enfatizó la participación

comunitaria y el enfoque estratégico. También se revisaron aportes relacionados con la toma de decisiones en empresas agropecuarias, en los que se evidenció la necesidad de adoptar una visión estratégica, ecológica y social para enfrentar los desafíos del entorno actual. Se reconoció la importancia de variables como la bioética, la ecoeficiencia y la formación ambiental en el fortalecimiento del sector productivo.

Conclusiones: la investigación concluyó que integrar la gestión ambiental en el ámbito agrario ofrecía múltiples beneficios, entre ellos la reducción del impacto ambiental, el fortalecimiento institucional y el acceso a mercados exigentes. Asimismo, se determinó que el éxito de esta integración dependía del compromiso colectivo, la educación ambiental y la planificación estratégica, elementos clave para alcanzar un desarrollo sustentable en el municipio Colón.

Palabras clave: Gestión Ambiental; Sostenibilidad; Empresas Agrarias; Toma de Decisiones; Planificación Estratégica.

INTRODUCTION

The EMS (environmental management system) comprises the organizational structure and the responsibilities, practices, procedures, and resources necessary to implement environmental management.⁽¹⁾ According to the latter author, environmental management has been developed since the mid-20th century based on global thinking and the proliferation of policies to preserve the environment at the international, regional, state, and local levels. This has led to the creation of various treaties, management programs, and an increase in human and material resources.

At the same time, Espitia⁽²⁾ points out that the field of action of environmental management is framed within the management of natural factors and the activities that affect them, acting on the behavior of the individuals involved to achieve a better environmental quality and quality of life. Among the lines of action of environmental management are the prevention of environmental degradation, the correction of activities that generate or may generate degradation, and the recovery and restoration of degraded ecological spaces and factors.

This topic, which links a rational form of natural resource management, is outlined throughout the work as the conceptualization, overview, and background of environmental management and decision-making in agricultural companies in the municipality of Colón.

The research aims to make agricultural companies aware of the need to implement environmental management actions to minimize the impact of their activities, production, and administrative processes. This will reduce the inappropriate use of natural resources and maximize the proper management of raw materials, which will improve the company's profitability and productivity.

Each agricultural producer must commit to preserving the environment and ensuring comprehensive social responsibility to prevent problems such as air, soil, and water pollution, ozone depletion, deforestation, and many others associated with poor business management in agricultural areas.

Ways to apply environmental management on any farm include properly managing resources, such as rationing water and electricity use, reducing pollution risks by following product recommendations, preserving aquifers, establishing reforestation programs in watersheds and pastures, and increasing the presence of pollinators and wildlife, among others.

A publication by Estévez⁽³⁾ on the Eointeligencia website notes that, given the growing interest in incorporating environmental issues into business strategy, we can define ecological strategy as a plan whose purpose is to mitigate the effects of a company's operations and products on the environment. Environmental effects include those related to the depletion of natural resources, the accumulation and emission of waste, and the side effects of using unhealthy materials. Strategies, motivations, and values are part of a company's culture and identity, giving rise to the various approaches companies adopt to environmental issues. However, the debate on corporate ecological strategy has traditionally been framed in terms of a confrontation between defensive and proactive strategies.

Given that communities in general express dissatisfaction with having agro-industrial complexes and livestock or agricultural fields in their surroundings, even though they contribute to the social development of the region, it is essential to show the ecological and cultural social benefits that could be generated by designing properly planned environmental management systems and programs within the organization, aimed at reducing the impact on the environment and the community.

This research reflects the importance of socio-environmental planning as a fundamental tool for designing an environmental management system that can be implemented and maintained so that the organization performs adequately in ecological terms and carries out the actions or activities necessary for continuous improvement to ensure sustainability in the surrounding areas.

Environmental planning will also facilitate the development of a more robust Environmental Management

System that aims to prevent, mitigate, control, correct, compensate, or eliminate negative impacts.

The methodology used for this research is based on experiences and working methods in the Colon region, reinforced by a bibliographic search on environmental management. The initial diagnosis, therefore, supports or provides evidence of the practices that farmers carry out to the detriment or benefit of the environment.

Concern for the environment and the impact that organizations have on it makes it an interesting topic for study in today's world, where myths arise that claim that responding socially and environmentally costs organizations money. However, business activity's footprint on the environment is becoming imminent, which is why investments in prevention, control, and environmental restoration must be justified.

When agricultural producers realize that simply by taking conscious precautions in their daily activities and maintaining a common sense approach to their environment, they can instantly achieve energy and economic savings while increasing the natural wealth of their land, turning it into efficient and environmentally friendly forms of production.

DEVELOPMENT

Background to the research

Biodiversity conservation is everyone's responsibility. The plasticity of our biological diversity is helping us partially resolve the agri-food problems we have been experiencing for almost two decades. The sustainable use of our genetic resources must be key to responding to the major social and environmental problems we face as a society. Below are references to various research projects that address this issue in the best possible way.

In this regard, the authors Burbano *et al.*⁽⁴⁾, in their research entitled Design of an environmental management system for the La Esmeralda farm in the Alto San Juan district, municipality of Yotoco, Colombia, whose objective was to design an Environmental Management System (EMS) for coffee production at the La Esmeralda farm, in the Alto San Juan district, municipality of Yotoco, Valle del Cauca, Colombia, based on the NTC ISO 14001 standard. They used a methodology for carrying out this work with the ISO 14001 (2004) environmental management model, based on the method known as PHVA (Plan-Do-Check-Act). "According to the above, the requirements established for the implementation of an environmental management system proposed by the ISO are: to generate an environmental policy, carry out a planning stage, followed by implementation and operation, and then carry out the verification and review stage by management".

In this study, only the planning segment was developed; the other components were left for further development.

Site visits, conversations with workers, and photographs allowed us to identify these issues, which are sometimes not evident to the people who work there, as they live with them daily and are part of their everyday lives. This makes it necessary for external agents to intervene to highlight the conflicts and involve the business community in identifying the problem and solution strategies. Therefore, workers at the site must become engaged in the issues affecting their environment and establish solution strategies with them.

The company's strengths and weaknesses in terms of existing practices and procedures were identified, as this tool will provide an excellent starting point for the implementation process. Finally, La Esmeralda Farm is an organization that has not yet identified the possibility of accidents and emergencies related to the production system, which is why there are no emergency plans in place. In addition, there is no control or monitoring of key regularities in operations and activities that could have a significant impact on the environment.

In his work entitled Environmental Management Strategies to Strengthen the Quality of Life of Venezuelan Citizens, researcher Yépez⁽⁵⁾ aimed to generate environmental management strategies to improve the quality of life of citizens living in the La Mora sector of Palavecino Municipality, Lara State, Venezuela. The research has a qualitative approach, embedded in the post-positivist paradigm, since it is understood that knowledge arises from the interaction between individuals, from the dialectic between the subject who knows and the known.

To carry out the diagnosis, it was necessary to maintain the joint activity of this study in a dynamic and consistent manner. This required familiarizing oneself with these problems and ensuring that the social protagonists perceived the researcher as just another member of the community.

In this case, these required skills allowed us to obtain as much information as possible from the community. The results showed that, during this study, the action plan developed by the protagonists was carried out with enthusiasm, and there were initiatives in different proportions, which led to other actors discreetly and voluntarily joining the group work, investigating each problem to find solutions. It was evident that applying the various techniques developed the cognitive, affective, and behavioral levels operationally to the point that the community council, which had previously been extremely distant, became present and active and regained the leadership that, according to the residents, it had lost. This attitude is positive, as it created harmony, trust, and balance among all the actors in this study.

As this research perceives, the current global trend in environmental matters is for the ecological dimension to form an intrinsic part of companies' corporate strategy. In other words, the most appropriate approach today is to have a business strategy that includes environmental aspects as a critical part of the firm's success,

in addition to all the traditional components. The community must understand that our actions and natural elements are intertwined to the point that our actions impact the development of comprehensive sustainability or accelerate extinctions.

Continuing with the administrative idea, González et al.⁽⁶⁾ worked on strategic management: a tool for decision-making in organizations, whose objective is to analyze strategic management in organizations as a tool for decision-making and responding to the demands of the competitive environment. They applied qualitative methodology with a documentary approach to do this, laying the foundations for more far-reaching research. Specialized documents were reviewed to produce an initial theoretical dissertation^(7,8,9,10,11) The results indicated that the specialized literature in the area is diverse and provides essential elements for the construction of strategic thinking, the latter characterized by the development of critical processes in the mind of the strategist that contribute to improving the capabilities of organizations, to formulate and deploy strategies more effectively.^(12,13,14,15,16)

Strategic thinking does not focus solely on developing plans; it goes further, allowing decision-makers in organizations to change their mental models. The ultimate contribution of strategic management is a fundamental tool in any organization. In this study, we examined the essential elements of this tool from a theoretical perspective, considering classic views of authors specializing in the field. Strategic analysis generates a perspective on the organization's present and future, clarifying the opportunities offered by the environment and the company's competencies. It is essential to create and follow logical strategic development processes. However, the expertise and intuition of managers are crucial, since following a methodological process does not guarantee organizational success. All organizations have a strategy that guides them in a specific direction. Therefore, they require a formal strategy derived from analyzing the environment, assessing strengths and weaknesses, and identifying opportunities where the organization has a competitive advantage. Thus, companies must adopt methods or techniques that align with the new times and allow them to survive, grow, and consolidate themselves in these increasingly turbulent and complex environments.^(17,18,19,20)

Psychological processes lead to a specific perception of the environment in which each person operates. Therefore, if little action is taken to manage the environment in the field, it would be even more challenging to bring about change in closed exercises with little contact with the natural world. In administrative processes, it is not easy to radically change how people act and think. However, learning how our actions are closely linked to an element of the climate and how its dynamics bring about changes in people could spark the magic that triggers change. This would make it easier to start planning actions that do not interrupt this biological dynamic and to begin the expected path forward.^(21,22,23)

For his part, Artana⁽⁷⁾, in his research on decision-making in agricultural holdings: current situation and prospects, aimed to describe the current decision-making situation of many farm establishments in Argentina. His measurement method was gross margin, considering that it is a good starting point for understanding and establishing how these companies analyze and approach decision-making to be able to carry out, in a future study, an approach that is more in line with the theory of costs and decision-making that we know and that is more appropriate for such purposes.

He then raises the issue that even when implementing measurement tools based exclusively on economic and financial indicators, these are insufficient and must be adjusted to the perspectives and realities of today's globalized world. On the contrary, to implement it, the support of managers working as a team with all their staff is needed. If they are not involved, the strategy will be challenging to implement.^(24,25)

The author concludes that he has tried to present one of the primary measurement tools used in the sector: gross margin. Due to its shortcomings, it is not the most appropriate tool, and it is not the closest to current techniques most suitable for decision-making. I believe this analysis's usefulness lies in seeing how we can gradually move from the "Stone Age" where we are now to the current "era of communication and integration." An approach aimed at success would involve considering investing in and properly managing intellectual assets rather than relying on measuring past events.

Theoretical Basis

General information about the municipality of Colón

According to data taken from the Colón municipality atlas⁽⁸⁾, it is currently one of the 21 municipalities of the state of Zulia. It is made up of five parishes. Its capital is San Carlos del Zulia, which has an area of 3,368 km².

According to data from the 14th National Population and Housing Census conducted in 2011, the country has 28 946 101 inhabitants, and the state of Zulia has 3 707 404 inhabitants, of whom 128,729 belong to Colón.

The official website of the municipality of Colón, dated September 2019, states that it has a population of 107 821 inhabitants with a population density of about 32 inhabitants per km².

Economy and development

Although the municipality of Colón was forged through the strength of agricultural activity in Venezuela,

farming predominated for more than four centuries under feudal production relations, with little investment in productive capacity, rudimentary tools and methods, and low productivity. We have always been a single-product producer and exporter. Initially, cocoa, coffee, and livestock accounted for 80% of economic activity. It contributed approximately 70 % of national production, with the southern part of the lake representing the epicenter of the country's economy in the 20th century.

The agricultural sector developed not as a primary objective, but as a condition for the existence of mining (precious metals) in the early days and, in the last century, for the continuation of oil exploitation. This exploitation began in the south of the lake with oil concessions in 1916 by the Colón Development Company, which discovered large and rich oil fields in the Colón District that faced serious transportation problems due to the jungle nature of the region.⁽⁸⁾

This explains why, in general terms, the agricultural sector has been characterized by the predominance of monoculture production, the presence of large estates, and the exploitation of slave labor. These factors, combined with food imports from transnational oil companies, have led to a low level of development and evolution in this fundamental sector of the economy.

When we refer to the south of the lake, we are referring to what was once the Colón District. According to the political and territorial criteria of the time, it was divided into the municipalities of Colón, Catatumbo, Francisco Javier Pulgar, and Jesús María Sempurín. Today, these municipalities should be united and integrated into the region's development hub.

The agricultural sector in Venezuela has undergone a series of transformations due to the various crises it has experienced, including the implementation of agrarian policies and the lack of education, motivation, and guidance for farming activities. In this regard, and driven by this cause, one of the problems facing the agricultural sector in Venezuela is undoubtedly the lack of organization, planning, and administrative control in all its operations and activities. That is why they are carried out very rudimentarily, empirically, and unplanned in most activities, with a few exceptions.

Livestock farming

In the canton of Zulía (Colón District), in 1838, there were only 50 head of cattle, and in 1895, 48 cows, 10 steers, 173 bulls, and 16 calves. Livestock farming replaced agriculture in the mid-20th century in the south of the lake, with the arrival of Nestlé in 1941, a Swiss company that promoted livestock farming as the main activity in the region's development. According to the 2010 census of the Bolivarian Mayor's Office of the municipality of Colón, there are 360,000 head of cattle out of the 2 335 274 in Zulía, representing 15,4 % of the state and 2,5 % nationally. This production process is characterized by limited technological development, and farms currently produce only 10% of their capacity, with an average of 1.5-2 animals per hectare (UA/Ha), when it should be 3-4 (UA/Ha). This demonstrates livestock production and land use inefficiency, so meat production needs to be increased from 48,810 to 194,619 tons per year.

This meat production has three cold storage plants: FRISULCA, FIBASA, and FRICASA, a municipal slaughterhouse in El Moralito, and a slaughterhouse in Caño Blanco.

Milk production and industries

On May 28, 1941, INDULAC began operations with 7 700 liters of milk per day from 29 producers. The whistle became a proverbial part of daily work in Santa Bárbara. In 1959, the number of producers increased to 500, supplying between 120 000 and 200 000 liters of milk daily in the Colón District. Other industries, such as Flor de Aragua, Colona, Sur del Lago, Mi Finca, and collection centers such as Los Andes and Carabobo, were established.

By 2010, records taken from the Colón municipality atlas show that it produced 277,180 liters of milk per day, with an average of 3.6 liters. Given the land's productivity conditions, the average should increase to 7 liters per day.

Theoretical guidelines based on environmental issues

Environmental education must become the necessary tool for achieving a general change in human beings, a comprehensive transformation, so that the environment is seen as the temple for all social and economic development and, without a doubt, for sustainable development. The Constitution of the Bolivarian Republic of Venezuela⁽⁹⁾ is the supreme, pyramidal, and fundamental law that legally guarantees ecologically, socially, and economically sustainable development. Article 127 states: "It is the right and duty of each generation to protect and maintain the environment for its benefit and that of the future world."

Likewise, the same law states that: "The State shall protect the environment, biological diversity, genetic resources, ecological processes, national parks and natural monuments, and other areas of special ecological importance." This legal basis for environmental education is a right that citizens have in their education and in acquiring knowledge from an early age.

Environmental Education

According to Yépez⁽⁵⁾ the spectrum of environmental education has been conceived as a strategy to promote new ways of generating emblematic behavioral changes in people, based on cultural, environmental, social, political, and economic values that are closely related to nature, while at the same time favoring and facilitating the acquisition of skills and abilities, capacities, training in environmental activities, promoting the active and effective intervention of individuals in their environment to improve the quality of life (p. 6).

Environmental Management

This is the set of procedures, methods, or steps to manage the environmental system comprehensively. By including sustainable development, we position it as a strategy for organizing human activities that affect and deteriorate the environment. This element is therefore necessary to achieve an adequate quality of life by reducing environmental problems.

According to Yépez⁽⁵⁾, management “is a systematic approach to caring for the environment, which includes a plan of strategic and tactical activities for the development, achievement, maintenance, review, and implementation of sound environmental policies and decisions” (p. 7).

According to Cáceres⁽¹⁰⁾, every “system that can be administered and managed has its characteristics, which determine basic principles to be taken into account in the activities and functions related to its administration and management” (p. 14). Below, we briefly outline those specifically related to the environment:

Basic Principles of Environmental Management

Sustainable development: The origin of sustainable development is associated with the growing concern in the international community in the last decades of the 20th century about the link between economic and social development and its more or less immediate effects on the natural environment. This was not a new conflict. What was new was the magnitude and extent of this conflict, which led to an assessment of its future consequences, including the survival of the human species.⁽¹¹⁾

Although environmental protection, conservation, and improvement emerged in a society driven by economic production, consumption, and growth paradigms, these intentions clash precisely with the prevailing system. In April 1987, the commission published and released its report, entitled “Our Common Future,” also known as the “Brundtland Report” (Brundtland, G.H., 1987), which introduced the concept of sustainable development, defined in these terms: “It is within the power of humankind to ensure that development is sustainable, that is, to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs”.

The big question that arises is which development model should be chosen: a process of economic development with high monetary value and growth in human capital (machinery, equipment, dams) or sustainable development with an emphasis on the growth of natural capital with little economic value (given the free nature of resources), without entering into the controversy about which development model is most environmentally friendly? Until another approach emerges, sustainable development is an indispensable premise for addressing environmental administration and management.

Transdisciplinarity: This is the recognition of the interconnection of all aspects of reality, that is, in all circumstances and at all moments in history, development has involved complex negotiation processes, because development is generated by the interaction of forces expressed by different social actors. In sustainable development, decisions involve complex systems of negotiation and interrelation. Consequently, it is necessary to consider the principle of transdisciplinarity, which means that, while respecting the professional spaces of each discipline, there must be an attitude of openness in approaching the process of understanding sustainable development. Development, if you will, is the privileged place where different actors express their power.

Totality: The environment, as an open and dynamic system in which any action affects the whole and vice versa, must be coordinated in such a way that its management includes all living beings equally and also takes into account, on the one hand, the historical process involving economic, political, institutional, and sociocultural factors. Secondly, it requires legal protection that is neither isolated nor individual, but rather harmonizes and complies with the vital functions of quality of life and well-being in general.

Continuity: Environmental management should not be a one-off effort, nor should it be established solely to respond to emergencies or to carry out inspection and control tasks. These functions should be part of a broader management system, as the dynamic nature of the environment itself requires continuous and ongoing work.

Community participation

According to Yépez⁽⁵⁾, the United Nations Program (1993), in its Human Development Report, considers that participation means that “people are closely involved in the economic, social, cultural, and political processes that affect their lives” (p. 9). Participation is an extensive term in human development. It is related to personal growth and quality of life, since it starts with action in all environments and societal development.

It is a harsh reality that participation is particularly relevant in Venezuela, as it is included in the provisions of the constitution (1999) and defined in Article 58 as “the right of social sectors to be duly informed, to develop proposals, to identify priorities, and to recommend forms of participation that influence the constitution, viability, and perfectibility of planning.”

Agricultural activity

According to the Royal Spanish Academy (RAE, 2016), agricultural activity is everything related to farming and livestock, based on the concept that agrarian activities are primary production processes based on renewable natural resources: farming, livestock, forestry, and aquaculture. For García⁽¹²⁾, activities such as agriculture, livestock farming, fishing, and aquaculture are directly affected by the changes caused by the pressure being exerted on global ecosystems, particularly on the genetic resources essential for global food supply. These environmental impacts have serious consequences that mainly affect the base of the social pyramid, generating poverty, hunger, and malnutrition.

The question is whether productive activities can adapt to the five most serious and complex conditions we face: climate change, biodiversity loss, the energy crisis, water scarcity, and environmental pollution. Environmental management is the foundation of any sustainable strategy, regardless of the scenario.

Environmental issues generate health problems and cause particular social and economic situations. The agribusiness system must take these issues into account to prevent negative scenarios, particularly in the agri-food sector, considering our country's vulnerability to climate change due to its geographical location and activities associated with greenhouse gas emissions.

One example suffices to illustrate our point. According to figures from the Food and Agriculture Organization of the United Nations⁽¹³⁾, the value of insects that transport pollen for fruits and vegetables amounts to more than \$200 billion for the global food economy. Climate variations, mainly temperatures and rainfall, directly affect their life cycle and could lead to their total or partial extinction, with serious agricultural consequences.

Unfortunately, global policies have not produced the expected response to the current environmental concerns. Carbon credits, water footprints, and environmental certifications are just some of the efforts to contain the growing ecological impacts facing a world full of needs that are increasing their influence on the environment daily.

At the municipal level, it is an opportune moment to highlight the need for adequate environmental management, evidenced by correctly handling indicators that measure impacts on biodiversity, water, air, soil, and solid waste. If we do not take this situation into account, we risk our food security.

Decision-making process in agricultural companies

According to González ⁽⁵⁾, globalization forces us to recognize that the market is the entire planet. To optimize business activity, business plans must be designed to take into account resources wherever they are, customers from all continents, and suppliers from other latitudes. It is, therefore, essential to consider the market economy as the natural field in which companies operate.

Faced with these challenges, organizations have an obligation to be flexible enough to transform their entire business structure to respond to strategic changes and market challenges. In this sense, to achieve a competitive advantage, it is necessary to critically examine the environment to identify external opportunities and build internal capabilities. Organizations have gone from static to becoming part of a dynamic world with high demands that require a systemic and comprehensive vision.

All of the above can be adapted to the fact that environmental management offers advantages to the corporate image, which builds pride among current and potential customers and suppliers and ensures the marketing of certain products through green certifications. Over time, it demonstrates savings in resources (assets, legal, and financial) and improves the overall quality of your living environment, along with preventing and correcting environmental risks. Compliance with current regulations avoids penalties, contributes to the overall quality of the living environment, fosters positive synergies among staff (motivation), and actively participates in corporate social responsibility (CSR) programs.

Usually, the organizational environment and surroundings were distant and even negatively opposed, stemming from the belief that conservation was incompatible with socio-financial growth, to the point of being considered an obstacle to progress. However, this is changing as the concept of sustainable development grows. This has led to global awareness of the importance of bioethics and eco-efficiency. With this new reality, many organizations have increased their hiring of professionals in the area of environmental management (EM), opening up a job market that was previously unknown. This has created a need for specific training in natural resource management, evaluation, and analysis in planning processes.

Business eco-efficiency

In 2012, the Peruvian Ministry of the Environment⁽¹⁴⁾ published a definition of eco-efficiency for companies with modern paradigms, whereby eco-efficiency is achieved through the supply of competitively priced goods

and services that meet human needs and provide quality of life, while progressively reducing ecological impacts and the intensity of resource use throughout their life cycle to a level at least in line with the Earth's estimated carrying capacity. In short, it is about creating more value with less impact.

Bioethics

Bioethics is a discipline that emerged in the mid-20th century in response to techno-scientific developments affecting life. Its purpose is to develop ethical thinking that responds to reasoned deliberation and provides ethical criteria for decisions that affect life.⁽¹⁵⁾

One of the first formulations of bioethics refers to the most global sense of humanity's survival on Earth, which is defined as a call to responsibility to preserve the environment, the atmosphere, and biodiversity.

General aspects of decision-making

For Gómez⁽¹¹⁾, achieving sustainable development involves jointly assessing the economic and environmental implications of the decisions that determine development. The financial aspect should not take precedence; all new investments must include an assessment of their short-term, medium-term, and long-term environmental impacts, which must be incorporated into the credit assessments of banks and financial institutions. Development strategies must integrate both aspects.

Similarly, an environmentalist approach cannot be the sole priority. All economic activity involves the use of natural resources, materials, and energy, which generates some type of waste that is returned to the natural environment, which may or may not be degraded and assimilated by it. However, it is argued that social needs cannot be met without economic resources, nor can the environmental liabilities or damage generated in the past be remedied.

However, Solano⁽¹⁶⁾ describes the decision-making process as a closed loop that begins with awareness of a problem, followed by recognition and definition of the problem. The existence of a problem or a disparity between a desired state and the actual condition must be identified; for example, if monthly expenses are calculated and it is found that more is being spent than budgeted, a decision is needed because there is a disparity between the desired level of spending and actual spending. Five factors can be beneficial when analyzing the importance of a decision:

1. Size of the commitment. This involves the quantitative factor, which is usually related to money, people, and time, and the time factor. In most cases, a decision involves large sums of money and the efforts of many people, and it may also have a long-term impact on the organization.
2. Flexibility of plans. Some plans can be easily reversed, while others are final. The more a decision involves following an irreversible course of action, the more critical the decision is.
3. Certainty of objectives and policies. Some companies may have a clear policy indicating how to deal with certain situations; in that case, decisions will be easy. Conversely, if an organization is highly changeable or, by its nature, the actions to be taken depend on factors known only to senior personnel, the decision takes on great importance.
4. Quantification of variables. A decision can be made more easily if the costs associated with that decision can be precisely defined.
5. Human impact. When a decision can harm some people, the decision is significant and must be made carefully.

Environmental management as an integrative methodology by Cáceres⁽¹⁰⁾

Decision-makers in the public and private sectors have realized that practices that do not consider the environment are not sustainable over time and that their institutional survival is closely linked to the development of environmental awareness. They are discovering that acting before environmental problems occur improves competitiveness, reduces costs, and that investments to achieve environmental competitiveness must be made in the medium and long term. "This is due, among other reasons, to the fact that there is currently not only greater awareness in society, but also a set of national and international standards whose mandatory or voluntary compliance brings obvious advantages and benefits for all".⁽¹⁰⁾

Among others, we can mention:

- Legislative and government action to generate, clarify, and reinforce environmental policies, laws, and regulations.
- Pressure from institutions such as banks, insurance companies, shareholders, workers, consumers, suppliers, the general public, and non-governmental organizations.
- International certifications are required to operate in some business areas.
- The image of companies and institutions in the face of stronger community pressure on the environment in areas such as care for the environment and impact on society.
- Competitiveness from the point of view of markets or preferences that can be accessed if specific

environmental patterns or standards are met.

- Financial aspects from the point of view of the vulnerability represented by the costs of solving problems, interrupting operations, or paying compensation for environmental reasons that were not considered or anticipated, or fines for non-compliance with legal regulations that in some countries have been included in the corresponding ecological laws.

Strategies

For this approach to environmental management to be applicable in the spatial and socioeconomic reality of any region, Cáceres⁽¹⁰⁾ proposes including some strategies, which are described below:

1. Land use planning. Within the framework of a coherent policy and in any development program, this involves the distribution and use of spaces according to their characteristics, potential, and limitations.
2. Environmental education and training. These are identified as basic strategies and defined as coordinated processes aimed at acquiring skills and abilities that provide the knowledge to generate actions in favor of the environment, that is, to compensate for a gap in the application of technical and analytical knowledge to solve specific problems.

It also indicates that these must be continuous and progressive processes to achieve the comprehensive training of the individual, who must be the primary objective of these processes. In this sense, the fundamental task of trainers must be to direct and organize learning experiences, i.e., knowledge is not only the accumulation of information, but also the ability to transfer experiences”.

Table 1. Operationalization of variables

Variables	Dimensions	Indicators	Item
Principles of environmental management	Sustainable development.	• Rational use of natural resources.	23-37-38-53-64-65
		• Balance between society, economy, and nature.	28-27
	Transdisciplinarity.	• Professionalism.	35-36-59
		• Interconnection of aspects of human reality.	41-42-43-44-45-49-50-54
	Totality.	• Human well-being.	40
		• Continuous cycles of natural energies.	24-25-26-27-29
	Continuity.	• Community participation.	5-6-7-12-60-61
		• Management of biological diversity.	15-17-18-19-20-30
	Corporate image.	• Synergy between the community and the company.	9-11-13-32-51-55-56
		• Improvements in local well-being.	10-32-58
Decision making	Green certifications.	• Compliance with environmental regulations.	33-62-63
		• Social and environmental commitment.	46-47-48
		• Application of bioethics in living environments.	14-31-34-52
		• Modeling eco-efficiency in the business space.	4-16-21-22-39.
	Financial and biological knowledge.		

CONCLUSIONS

This research highlights the crucial importance of integrating environmental management (EM) into the activities of agricultural companies in the municipality of Colón as a mechanism for achieving sustainability, competitiveness, and social responsibility. In an agricultural environment historically characterized by intensive and poorly planned use of natural resources, adopting an Environmental Management System (EMS) represents a transformative tool that mitigates negative environmental impacts and generates tangible economic and social benefits for producers and their communities.

The background information reviewed, together with the analysis of cases such as the La Esmeralda farm and the contributions of authors such as Yépez⁽⁵⁾ and Cáceres⁽¹⁰⁾, shows that environmental planning should be seen as a continuous, participatory, and adaptive process. The adoption of principles such as sustainable development, transdisciplinarity, totality, continuity, and community participation allows the actions of agricultural organizations to be guided toward more resilient models that are compatible with the environment. Likewise, it is reaffirmed that business decision-making must consider both economic and ecological and social variables, promoting a positive synergy between productive efficiency and environmental conservation.

Implementing proactive environmental strategies, such as rationalizing resource use, reforestation, protecting aquifers, and reducing pollutants, together with strengthening organizational culture and bioethics, allows agricultural producers to develop a new vision. This vision does not perceive environmental protection as a burden or an obstacle, but rather as an opportunity to improve quality of life, optimize processes, access

green certifications, and position oneself favorably in increasingly demanding markets.

Finally, the research shows that the shift toward effective environmental management in the agricultural sector requires political and technical will and a transformation in the mindset of the actors involved. Promoting environmental education, encouraging ongoing training for producers, and strengthening ties between the community, the government, and the private sector are necessary. Only then can truly sustainable development be guaranteed that benefits both the environment and present and future generations in the municipality of Colón and other regions with similar productive and ecological characteristics.

REFERENCES

1. Bermúdez C. Sistema de gestión ambiental ISO 14004 para una empresa de producción de leche en la sabana de Bogotá [trabajo de grado]. Bogotá: Universidad de La Salle; 2009.
2. Espitia N. Propuesta de gestión ambiental para la empresa SIPROCAS EU del sector ganadero del Hato Corozal-Casanare, Colombia. Bogotá: Pontificia Universidad Javeriana; 2009.
3. Estévez R. ¿Qué tipo de estrategia ambiental sigue tu empresa?. Murcia: Ecointeligencia; 2013. Disponible en: <https://www.ecointeligencia.com/2013/06/tipos-estrategia-ambiental-empresa/>
4. Burbano C, Ramírez A. Diseño de un sistema de gestión ambiental para la finca La Esmeralda en el corregimiento Alto San Juan, municipio de Yotoco, Colombia. Santiago de Cali: Universidad Autónoma de Occidente; 2008.
5. Yépez N. Estrategias de gestión ambiental para fortalecer la calidad de vida del ciudadano venezolano. *Rev Venez Cienc Tecnol*. 2017;30:1-17.
6. González J, Salazar F, Ortiz R, Verdugo D. Gerencia estratégica: herramienta para la toma de decisiones en las organizaciones. *Rev Científica Telos*. 2019;21(1):242-67.
7. Artana M. Toma de decisiones en explotaciones agropecuarias: situación actual y perspectivas. En: *Cruzando Fronteras: tendencias de Contabilidad Directiva para el Siglo XXI*. 2001. Disponible en: <https://www.intercostos.org/documentos/congreso-07/Trabajo181.pdf>
8. Fernández A. Atlas del municipio Colón. Venezuela: Alcaldía del municipio Colón. 2013. Disponible en: <https://alcaldiadecolon.gob.ve/>
9. Constitución de la República Bolivariana de Venezuela. Gaceta Oficial Extraordinaria N° 36.860. 30 de diciembre de 1999. Caracas: Asamblea Nacional Constituyente; 1999.
10. Cáceres G. La gerencia ambiental como metodología integradora del conocimiento para la administración y gestión del ambiente. *Fermentum*. 2008;18(51):148-73.
11. Gómez D. El desarrollo sostenible: conceptos básicos, alcance y criterios para su evaluación. 2016. Disponible en: <http://www.unesco.org/new/fileadmin/MULTIMEDIA/FIELD/Havana/pdf/Cap3.pdf>
12. García L. Las empresas agropecuarias y la administración financiera. *Rev Mex Agroneg*. 2017;40:583-94.
13. Organización de las Naciones Unidas para la Alimentación y la Agricultura (FAO). El estado de los recursos de tierras y aguas del mundo para la alimentación y la agricultura: la gestión de los sistemas en situación de riesgo. Roma y Madrid: Ediciones Mundi-Prensa; 2012.
14. Ministerio del Ambiente-Perú. Guía de ecoeficiencia para instituciones del sector público. 2012. Disponible en: file:///D:/Data/hgonzalez/Downloads/04-publicaciones-guia-de-ecoeficiencia-para-instituciones-publicas-2012_-_minam-educacion.pdf
15. Fundación Víctor Grifols i Lucas. ¿Qué es la Bioética?. Barcelona: Fundación Víctor Grifols i Lucas. 2015. Disponible en: <https://www.fundaciogrifols.org/es/web/fundacio/home>
16. Solano A. Toma de decisiones gerenciales. *Tecnol Marcha*. 2003;16(3):44-51.

17. Bateman T, Snell S. Administración, liderazgo y colaboración en el mundo competitivo. Mé-xico: McGraw-Hill Educación; 2009.
18. Chiner E. La validez. 2011. Disponible en: <https://rua.ua.es/dspace/bitstream/10045/19380/25/Tema%206-Validez.pdf>
19. Galán M. Metodología de la investigación. 2020. Disponible en: <http://manuelgalan.blogspot.com/p/guia-metodologica-para-investigacion>
20. Gallardo E. Metodología de la investigación: manual autoformativo interactivo. Huancayo: Universidad Continental; 2017.
21. Hidalgo L. Confiabilidad y validez en el contexto de la investigación y evaluación cualitati-vas. 2013. Disponible en: <http://www.ucv.ve/uploads/media/Hidalgo2005.pdf>
22. Márquez O. El proceso de la investigación en las ciencias sociales. Barinas: Ediciones de la Universidad Ezequiel Zamora; 2000.
23. Martínez V. Paradigmas de investigación. Manual multimedia para el desarrollo de trabajos de investigación. Una visión desde la epistemología dialéctico-crítica. 2013. Disponible en: https://pics.unison.mx/wp-content/uploads/2013/10/7_Paradigmas_de_investigacion_2013.pdf
24. Ramos C. Los paradigmas de la investigación científica. Avances en Psicología. 2015;23(1):9-17.
25. Romero L. El Sur del Lago de Maracaibo: momento de crisis, momento de oportunidades. In-vestigación. 1995;2:32-3.
26. Romero L, Romero R. Está germinando una nueva propuesta en agricultura. Agroecología en los Andes Venezolanos. Investigación. 2003;52:57.
27. Rosario M, Camacho C. Apuntes de metodología de la investigación. Santa Bárbara de Zulia, Venezuela: Universidad Nacional Experimental Sur del Lago “Jesús María Semprúm”, Direc-ción de Publicaciones; 2015.
28. Péfaur J, Angelino M. Biorecuperación de la región del Sur del Lago de Maracaibo. Talleres en Protozoología y Salud Comunitaria. 2013;16(1):49-54.
29. Arias F. El proyecto de investigación: introducción a la metodología científica. Caracas: Edi-torial Episteme; 2012.

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