Environmental Aspects of Production Management of Services in The Amazon

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Abstract

Environmental degradation is one of the most discussed topics today, but organizations also consider it a source of competitive advantage. This study is qualitative and uses the Case Study Method. Data were collected in a pest control company located in Porto Velho, Rondônia, Brazil. As its main topic, it takes aspects of environmental management in a pest control company´s production process in the city of Porto Velho. Its specific goals are to (1) identify which tools and sustainable production methods are used by the company in its production process; (2) highlight the competitive advantages arising from the incorporation of aspects of environmental management in production processes; and (3) indicate the innovation process that best contributes to the improvement of the company´s environmental management. Assessing the environmental aspects of the company´s production management revealed satisfactory results. The

company is engaged in sustainable development and is gradually pursuing improvements to its methods of maintaining and conserving the environment. The subsidies mentioned allow the degree of sustainability demanded by contemporary society, which benefits from the environmental services offered. This study is a university´s research contribution to managers and stakeholders who want to learn more about the applicability of concepts of an environmental management system in pest control companies

Keywords: Amazon. Environmental Management. Sustainable Production. Innovation. Reverse Logistics. Competitive Advantage.

1. INTRODUCTION

Sustainability has become a significant requirement of organizations, which demands practices that are increasingly committed to preserving the environment. Sustainability involves technology, which can provide help environmental management to develop, enabling production processes to improve, become more efficient and can simultaneously preserve the environment through the search for ecologically wholesome products and services.

Based on this premise, Silva (2019) suggests the creation of processes to facilitate the return of packaging to the production chain and the reduction of consumption during manufacture, reusing inputs already used. However, even though most entrepreneurs must limit their costs, it brings better results for the organization, as well as the environment, to consider the elements that create cleaner production and reverse logistics. Among these results, more profitability and an improved organizational image stand out, since consumers have gradually come to valued actions aimed at the preservation and conservation of the environment.

Granting the importance of developing green products and services in the production chain, here we seek to answer the following question: how can environmental management contribute to practices related to the production process? To answer the question, this study has as main goal to evaluate which are the features of environmental management in a pest control company´s production processes in the city of Porto Velho; the specific goals of the study are to (1) identify which tools and sustainable production methods are used by the company in its production; (2) highlight the competitive advantages arising from the incorporation of elements of environmental management in its production process; (3) and indicate the innovation process that best contributes to the improvement of the company´s environmental management.

In the present paper, with its topics and subtopics, this introduction is followed by a theoretical and conceptual review; next come the methodology adopted for the preparation of this document, the results, according to the objectives outlined, the conclusion and the references that support the research.

2. THEORETICAL-CONCEPTUAL REVIEW

The evolution of today's society occurred through three major events. The first was the emergence of agriculture, the invention of the plough marking the initial technology of the era. The second is represented by the industrial revolution, with the invention of the steam engine, followed by the combustion engine, the division of labor, Henry Ford's assembly line and the ideas of Frederick Taylor, which mark the period

of mass manufacturing. The third era is distinguished by the beginning of digital and hi-technology development, the post-industrial society and current knowledge. This journey of development and scientific progress has made major impacts on the environment.

In addition, Pereira (2019) identifies that, in the last forty years, the world has undergone the kind of technological transformation that no other generation has been able to witness. Scientific and industrial knowledge has led the world to great transformations, directly intervening in the use of natural resources, in the production of consumer goods and in the increase of disposables to the detriment of environmental health. At the height of industrial development, there was an accelerated disposal, resulting in garbage accumulation, which resulted in environmental degradation, the proliferation of disease and rapid climate change.

2.1 Concepts of an environmental management system

The environmental management system (EMS; SGA in Portuguese) is a structure which emphasises the sustainability of as industrial production process, according to Silva (2019). It is, therefore, a set of guidelines adopted to implement an environmental policy that, in addition to improving the environment, adds quality to the company's products, services and processes.

If such a system is to be implemented, whether in industry or commerce, the organizational activities that may impact on the environment must be mapped to establish its control and propose in the institution's environmental policy methods of minimizing or overseeing this impact. Therefore, when a company adopts an effective environmental management system, raw materials that still have some use are reused and introduced in recycling programs that reduce the amount of inappropriate waste for disposal. These processes are seen by Schirmann (2019) as ways to avoid waste which can also reduce water and energy consumption.

2.2 Concepts of tools and methods of sustainable production

The attitude taken by a manager in analyzing the impact of his production process on the environment encapsulates a systemic view of the performance of his/her organization in society. It is in this context that one can highlight the choice of the tools and methods that best conserve and maintain natural conditions to assess which environmental aspects are acknowledged in the production of goods and services. For this, Sales, Gouveia, Ruzene and Silva (2017) recommend that each organization should adopt the method that best meets its needs and that establishes links with the operational objectives and goals that determine its characteristics of its production.

2.2.1 Concepts of cleaner production

Cleaner production means manufacturing products – including the use of water, energy and raw materials – with the least possible generation of pollutants and waste,. To make this process feasible, technical, economic and environmental feasibility studies are carried out in order to evaluate, select and, finally, implement the best methods and solutions for the production management, acting at the strategic points where failures occur. In addition, there is also the implementation of P + L continuity measures to support

the activities developed or to insert new alternatives and projects for sustainable production, with the objective of maintaining the organization's cycle of continuous improvement. In this regard, Schirmann (2019) points out that cleaner production is a tool that works to reduce the impact of the production process; it gives manufacturers a chance to improve the processes of production, and contributes to the reduction of direct and indirect costs and the consumption of inputs in the performance of the company's main and secondary services.

2.2.2 Concepts of product life cycle and reverse logistics

The concept of product life cycle is closely linked to all stages of the production process, encompassing studies about how they relate to each other, to the environment and what are the social, environmental and economic impacts that are generated in the entire production chain. Thus, it is a complex system that takes into account the production of raw material, its processing and all distribution and disposal logistics. The so-called reverse logistics is introduced in disposal. Reverse logistics is an area of Logistics, whose purpose is described by Lira (2018) based on promoting the return of rejected products or at the end of their useful life to their place of origin, seeking to solve the problem of solid waste disposal in the environment and contributing to reduce pollution and waste.

2.3 Concepts of competitive advantage in sustainable production

The implementation of the environmental management system was seen in the past as a costly process, applicable only to large companies. However, small businesses are gradually discovering and demonstrating that being socially and environmentally responsible has become a significant competitive advantage for them too. Dal Forno (2017), for example, finds that sustainable management, while representing a challenge for companies, opens the door to new business and growth opportunities, providing benefits to society, the environment and the organization from the savings generated and the preservation of the resources used.

The most enduring practices related to environmental health are the adequate collection and disposal of waste; the efficient use of water and energy, raw materials and supplies; and the choice of certified product suppliers. As a result, the quality of products, services and processes rises significantly. Other results are verified by Lira (2018), showing that the company also gains in consumer preference, because this behaviour strengthens the brand's reputation in the face of competition. These elements imply that the environmental management system is a fundamental tool in the strategic planning of organizations that work for success and survival in the market.

2.3.1 Concepts of innovation and technology for sustainable production

According to Pinsky and Kruglianskas (2017), innovation is an action or act adopted by industries to contribute to organizational survival through new technologies and processes that generate new products and services or improve existing ones. Given an increasingly globalized market, with unstable economies and fierce competition, advances in technology in favour of the environment have been changing the current production processes. The largest companies in the world value sustainability as a lever for the organizations' strategy, and no longer treat it as an element outside the process.

Two types of innovations focused on sustainability are discussed by Sales et al. (2017): innovation as an incremental change, in which only the improvement of existing processes occurs; and radical innovation. The latter is the most challenging of the sustainable innovation models, causing total and integral systemic transformation and reinventing defective business models conceived from no economic perspective.

2.3.2 Environmental concepts in an pest control company

The disorder of urban growth and the lack of basic sanitation is accountable for a significant increase in vectors and pests that transmit diseases, such as rats, cockroaches, flies, and mosquitoes, among others. In this regard, Silva (2015) extends the capacity of pest control companies to combat the most diverse types of urban pest by devising control techniques and methods that use chemical agents safely without jeopardizing the health of the population and the environment. When handling chemicals with a high toxic content, professionals must be aware of their performance and the consequences arising from negligence, not to say malpractice, in the development of pest controls. For this reason, companies should train the agents who perform such services to reduce their unnecessary use of highly toxic pesticides. Their techniques should identify strategic points for applying specific products for each pest, in order not to contaminate the soil or rivers and other sources of water.

Another important point in the development of pest control services addressed by Silva (2015) is the disposal of pesticide packaging and containers. Packaging requires the application of reverse logistics, since it cannot be reused but if disposed of carelessly represents a risk to the environment and the health of the population. This being the case, pest control companies must use a flowchart to guide their activities in a safe and ecologically sound way, aiming at greater use of products with the least possible environmental impact.

3. METHODOLOGY

This is a study of environmental management, investigating the production processes of a pest control company in the Amazon region. To address its aims, the study began with a bibliographic review, tackling concepts related to the introduction of environmental management in production processes as its theoretical basis. The central approach consisted of field research in a pest control company to collect data for analysis. This task was overseen by researchers, and reflects the qualitative character of the investigation. It has explanatory bias, based on observing, recording and interpreting the facts presented, together with the variables involved in the phenomenon.

3.1 Method

The method is the key in conducting research. For this research the Case Study Method was used, defined in Merriam and Tisdell (2016) and in Yin (2005) as an empirical investigative practice by detailed description and analysis of a contemporary phenomenon delimited to a specific body of theory and concepts. Confirming the views of the authors, the documents obtained from the bibliographical collections of works on environmental management supported the evaluation of the environmental elements identified in the pest control company, which constitutes the unit of analysis of this research. Thus, the methodology

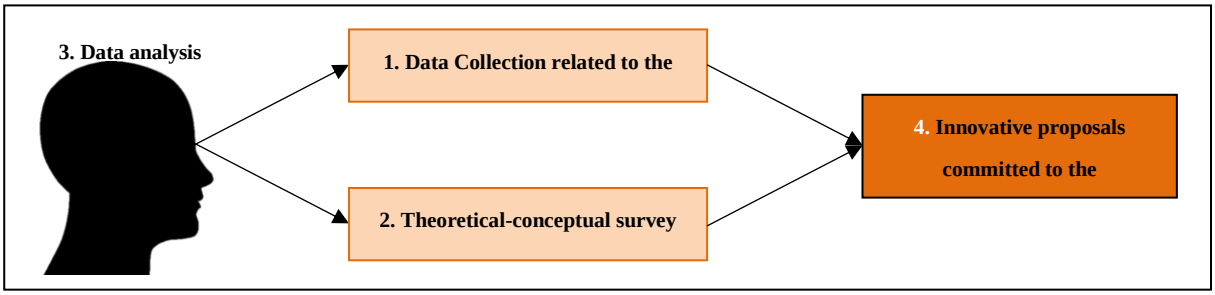
presented here converges towards Creswell's (2010) advice to incorporate supplementary data independently of the investigative task before, during or after data collection, starting from the utilitarian data.

3.2 Procedures

The instruments used to carry out the research in the city of Porto Velho / RO, consisted of a semi-structured interview and inspection of places on the pest control company's premises in order to identify the resources available for carrying out the pest control works. Among these resources, the equipment and chemicals used were considered, as were the procedures and techniques for limiting environmental damage from the company's work. Through this process, a flowchart was developed to describe the pest control process, making it possible to compare the company's procedures with the sustainable management practices highlighted in the theoretical-conceptual body.

The flowchart sought to cover the initial inspection of the site, passing to the identification of pests, the method of performing its services, the chemical control that involved the manipulation of active principles (in this case the pesticides) and the return of the product packaging used by the industry. This process allowed the research to meet its established objective, because it was able to thanks to the identify and propose innovations and improvements that would preserve and conserve the environment. The detailed description of the methodological procedures adopted is shown in Figure 1, followed by Chart 2.

Figure 1 – Execution stages of the Case Study



Source: the authors.

Chart 2. Description of the execution stages of the Case Study

Elements	Description
1. Data Collection related to the object of study	1.1 Description of the practices carried out in the pest control company, based on interviews and on-site inspections, in order to describe the operating process in a flow chart.
2. Theoretical-conceptual survey about the EMS	2.1 Survey of data about the environmental management system, highlighting elements of credible data arising from the preparation of the report.
3. Data analysis	3.1 Evaluation and interpretation of the information collected in the unit of analysis and subsequent triangulation of data, comparing it with the information from the environmental management system.

4. Innovative proposals committed to the environment	4.1 Presentation of proposals for innovation and improvement of pest control practices, based on the principles of environmental preservation and conservation

Source: the authors.

4. ENVIRONMENTAL ASPECTS OF THE MANAGEMENT OF SERVICES IN A PEST CONTROL COMPANY IN PORTO VELHO

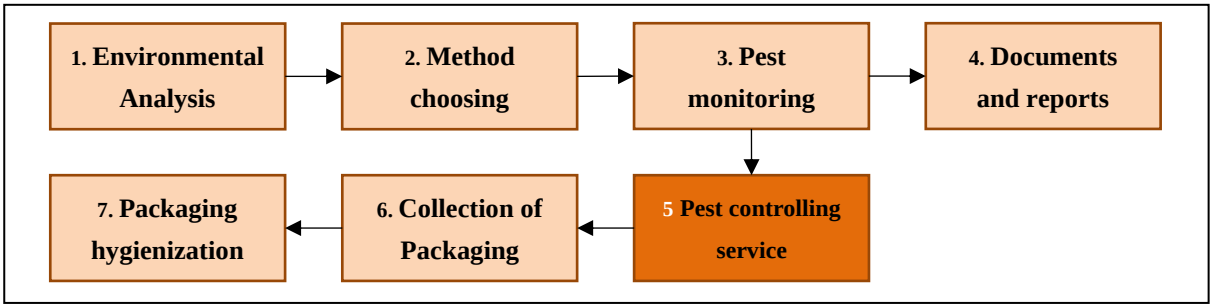
Company K is a multinational company that has operated in the field of pest controlling since 1938. Working in more than 66 countries, with 300 units spread around the world, the company is a world reference in pest controlling and one of the best-known companies in the city of Porto Velho / RO. The company offers services based on specific diagnosis for each segment, be it industrial, commercial, medical, in supermarkets, or in educational or residential institutions. It controls and monitors pests such as rodents, cockroaches, ants, termites, fleas, flies, mosquitoes, spiders, scorpions and moths. Its services use several methods; they include environmental preservation and the reduction of inputs in the production process.

4.1 Identification in the production process of tools and methods of sustainable production

According to the manager, the methods adopted by company K aim to provide maximum efficiency with the least impact on the environment, guaranteeing the safety of workers and customers. For this, the organization developed a programme called TEPS (Truly Elite Protection System), which has one of the most advanced systems for preventing, controlling and monitoring urban pests. The programme seeks to serve the corporate sector that engages in food processing, warehouses, food and beverages distribution centres, the pharmaceutical industry and supermarkets.

The pest controlling process begins by evaluating the facilities of the place to be pest controlled, where a programme of integrated pest management – MIP in Portuguese – is then implemented. After each visit, customers are given monthly information and a trend analysis , identifying and reporting on the insect behavior detected in the light traps and indicating the monthly percentage of rodents detected by devices; the aim here is infestation control and the non-indiscriminate use of pesticides. The pest control process carried out by the company under study is shown in Figure 2, followed by Table 3.

Figure 2 – Company K pest control process flowchart



Source: the authors.

Chart 3. Description of the pest control process flowchart

Elements	Description
1. Environmental Analysis	1.1 Technical visit to assess the site in order to select the best techniques, equipment and products to use.
2. Method choosing	2.1 Identification of the most effective method for pest control, including the choice of equipment and most appropriate products.
3. Pest monitoring	3.1 Analysis of potential risks, products used, reports of pest observations and other factors of technical action in the environment, seeking to minimize possible chemical and biological contamination.
4. Documents and reports	4.1 Provision to customers of monthly information and analysis of trends, listing the services performed; passing on information to facilities and corrective actions, if required.
5. Pest controlling service	5.1 Delivering the pest control service, applying the methods, products and equipment established in the planning that was based on the analysis and monitoring of the environment.
6. Collection of packaging	6.1 Collection of packages used during the pest control service in order to clean and store them in an agreed place before returning them to the industry.
7. Package cleaning	7.1 Cleaning of packages in a specific container, so that the water consumed in washing can be reused; the minimizes waste and contamination of the environment by chemicals.

Source: the authors.

As noted, company K cleans the packages used in the pest control process before returning them to the industry. This meets the cleaner production approach presented by Schirmann (2019), since the water used to wash the containers is reused to dilute other products. The sink adapted for the reuse of water consumed for this purpose is shown in Figure 3.

Figure 3 – Sink adapted for water reuse

Source: the authors.

Other sustainable practices are developed by the company in compliance with the criteria of reverse logistics and recycling, as discussed by Lira (2018). When the packages are collected and taken back to the industry, company K receives an environmentally friendly seal. The collection of pesticide packaging is shown in Figure 4.

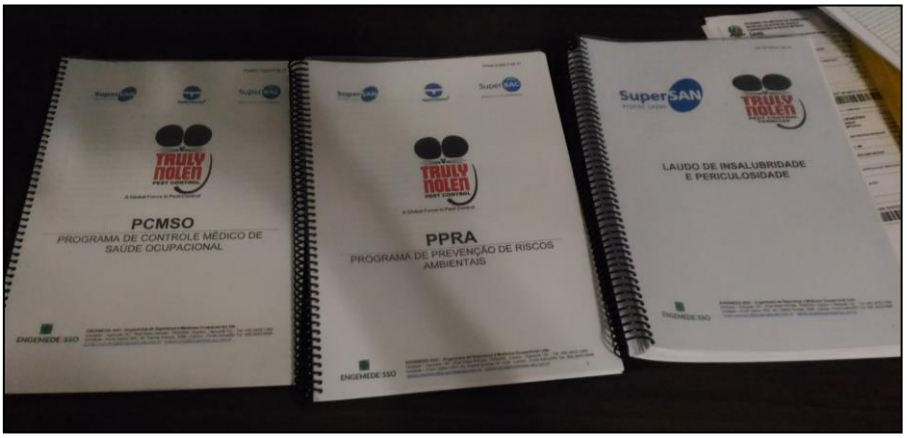
Figure 4 – Collection of pesticide packaging

Source: the authors

Since the handling of chemical products can be highly toxic, it is obviously important for professionals in environmental pest control work to be aware of the results of mis-handling these products. To avoid any such thing, company K provides its employees with raining and skills. The training helps to reduce environmental risks and extend the medical control of occupational health, as well as convincing trainees of the danger and risks to health that surround their work. The training is focused on respecting employees' health and safety, tied to the maintenance and preservation of the environment, with the

respective aims of preventing work accidents and environmental damage. Figure 5 shows the handouts that describe the training and qualifications offered.

Figure 5 – Handouts for employees´ professional training



Source: the authors.

It appears that in all pest control processes urban pest controlling techniques are developed to meet the criteria based on ecological control and natural pest mortality factors set by Integrated Pest Management - MIP. This method seeks to reduce the damage to public health and the environment caused by the use of chemical pesticides. To this end, the company uses devices and tools to combat natural pests, such as glue traps for insects; pheromone traps for warehouse pests; light traps for flying insects; and indoor and outdoor rodent monitoring devices.

4.2 Competitive advantages of incorporating aspects of environmental management into the production process

The advantages of the company under study of adopting environmental management in the production processes are diverse. Among them can be highlighted the savings in the inputs of water and electricity and the mainly chemical products used to control pests. By adopting techniques that reduce or eliminate the use of pesticides, company K saves more and at the same time ensures greater safety for its customers. Its processes aim to protect the environment and comply with national safety standards. Among the current regulatory measures, the technical norm for pest control companies from the National Health Surveillance Agency - ANVISA (2000) stands out.

According to the entrepreneurs of the evaluated company, customers feel more confident about hiring their pest control services due to the low consumption of pesticides used and the lower toxicity of their products. The biggest concern of customers is the waste that can be generated during this process and its effect on the environment, causing a risk of contamination to soil and the water in domestic wells. From this standpoint, the advantages of incorporating the aspects of environmental management observed by company K are not limited to the financial sector alone, but also affect the safety and health of its professionals and customers. This contributes to a favourable image of the institution, raising the brand name and generating institutional, social and environmental value. The results presented by the company corroborate the findings of Lira (2018) by reinforcing the view that a company which adopts the aim of

sustainable production has greater visibility among its competitors, since it is a competitive differential to consumers who are increasingly concerned with the welfare of the environment.

4.3 Innovation that contributes to the operational improvement of an organization´s environmental management

Although company K has had years of experience in the field of urban pest control and already has incorporated several measures in respect of the environment, it constantly seeks to implement new sustainable practices in its organizational structure. One of them is the development of a laboratory in Porto Velho / RO to study the specific behaviour of pests and their effect on the urban environment. This environmental innovation will require the hiring of a professional biochemist in order to study the stages of pests' reproduction, maturation and infestation, in addition to identifying better techniques for fighting them with the least possible impact on the environment.

As Pinsky and Kruglianskas (2017) point out, the adoption of technologies in the production process helps to improve services, benefiting the environment, generating savings for the company and contributing to the institution's reputation in the community. The laboratory is an initiative of the company to secure the best possible performance in the control of urban pests by developing innovative and more efficient methods of pest control, aimed at reducing or eliminating highly toxic chemical agents, ensuring greater safety to customers and mainly avoiding contamination of the ecosystem, especially in the city of Porto Velho / RO and its surroundings**.**

5. CONCLUSION

The present study sought to demonstrate the satisfactory production methods in use in the workplace of company K, thanks to its environmental management. The development of a specialized analysis system, seeking to cause the least possible damage to the environment from the entities that hire the service and from the analysis of insects and pests, demonstrates how greatly concerned the organization is with good production practices aimed at sustainability. Consumers are increasingly looking for organizations that are mindful of the environment; they want to stop buying products and services from companies that do not adhere to this emerging preoccupation. Therefore, the reuse of waste, the recycling of products, the monitoring of the evolution of environmental issues and the promotion of new environmentally less polluting technologies have made company K one of the largest in the field of pest control. Thus, the environmental management system, in addition to maintaining and preserving the environment, also guarantees for the organization a competitive differential advantage. This study may be of use to managers interested in providing services that impinge on the environment in general, especially in such fragile settings as the Amazon.

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