PERFORMANCE AND PRODUCTIVITY MANAGEMENT IN THE FOOD INDUSTRY: A CASE STUDY APPLIED TO A SMALL-SCALE AGROINDUSTRY

GESTÃO DE DESEMPENHO E PRODUTIVIDADE NA INDÚSTRIA DE ALIMENTOS: UM ESTUDO DE CASO APLICADO À UMA AGROINDÚSTRIA DE PEQUENO PORTE

GESTIÓN DEL DESEMPEÑO Y LA PRODUCTIVIDAD EN LA INDUSTRIA DE ALIMENTOS: UN ESTUDIO DE CASO APLICADO A UNA AGROINDUSTRIA DE PEQUEÑA ESCALA

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ABSTRACT

Performance and productivity management in the food industry constitutes a strategic factor to ensure competitiveness, quality, and sustainability, especially in micro and small agro-industries. This chapter presents an integrated analysis between theoretical foundations and practical application, addressing tools such as Statistical Process Control (SPC), performance indicators, the seven quality tools, Knowledge Management, and Business Intelligence. The case study conducted in a small dairy plant located in Minas Gerais aimed to plan the expansion of a goat fine cheese production line, evaluating production capacity, mass balance, labor, and structural compliance. The results demonstrated the feasibility of the expansion through increased raw material supply, production rescheduling, targeted investments in infrastructure, and the hiring of an additional employee. The analysis showed that the structured use of indicators and management tools makes it possible to identify bottlenecks, reduce waste, and support strategic decisions based on data. It is concluded that the integration of theory and practice strengthens organizational competitiveness, even in contexts of limited resources, and highlights the role of data-driven management as a differentiating factor in the food industry scenario.

Keywords: Industrial Productivity. Performance Indicators. Continuous Improvement. Food Industry.

RESUMO

A gestão de desempenho e produtividade na indústria de alimentos constitui um fator estratégico para garantir competitividade, qualidade e sustentabilidade, especialmente em

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micro e pequenas agroindústrias. Este capítulo apresenta uma análise integrada entre fundamentos teóricos e aplicação prática, abordando ferramentas como Controle Estatístico de Processo (CEP), indicadores de desempenho, sete ferramentas da qualidade, Gestão do Conhecimento e Business Intelligence. O estudo de caso realizado em um laticínio de pequeno porte, localizado em Minas Gerais, teve como objetivo planejar a expansão da linha de queijos finos de cabra, avaliando capacidade produtiva, balanço de massa, mão de obra e conformidade estrutural. Os resultados evidenciaram a viabilidade da expansão mediante ampliação da captação de matéria-prima, reprogramação produtiva, investimentos pontuais em infraestrutura e contratação de um colaborador adicional. A análise demonstrou que a utilização estruturada de indicadores e ferramentas de gestão possibilita identificar gargalos, reduzir desperdícios e subsidiar decisões estratégicas baseadas em dados. Conclui-se que a integração entre teoria e prática fortalece a competitividade organizacional, mesmo em contextos de recursos limitados, e evidencia o papel da gestão orientada por dados como diferencial no cenário da indústria de alimentos.

Palavras-chave: Produtividade Industrial. Indicadores de Desempenho. Melhoria Contínua. Indústria de Alimentos.

RESUMEN

La gestión del desempeño y la productividad en la industria de alimentos constituye un factor estratégico para garantizar la competitividad, la calidad y la sostenibilidad, especialmente en micro y pequeñas agroindustrias. Este capítulo presenta un análisis integrado entre fundamentos teóricos y aplicación práctica, abordando herramientas como el Control Estadístico de Procesos (CEP), indicadores de desempeño, las siete herramientas de la calidad, Gestión del Conocimiento y Business Intelligence. El estudio de caso realizado en una pequeña planta láctea ubicada en Minas Gerais tuvo como objetivo planificar la expansión de la línea de quesos finos de cabra, evaluando la capacidad productiva, el balance de masa, la mano de obra y la conformidad estructural. Los resultados evidenciaron la viabilidad de la expansión mediante la ampliación de la captación de materia prima, la reprogramación productiva, inversiones puntuales en infraestructura y la contratación de un colaborador adicional. El análisis demostró que el uso estructurado de indicadores y herramientas de gestión permite identificar cuellos de botella, reducir desperdicios y apoyar decisiones estratégicas basadas en datos. Se concluye que la integración entre teoría y práctica fortalece la competitividad organizacional, incluso en contextos de recursos limitados, y evidencia el papel de la gestión orientada por datos como un diferencial en el escenario de la industria de alimentos.

Palabras clave: Productividad Industrial. Indicadores de Desempeño. Mejora Continua. Industria de Alimentos.

1 INTRODUCTION

The food industry occupies a strategic role in the world economy, being responsible for generating jobs and meeting a growing demand for quality, innovative and sustainable products. In recent decades, this sector has faced profound transformations, driven by globalization, technological advancement, intensified competitiveness, and growing concern with sustainability and efficiency in the use of resources (MESSIAS; ROMÃO; ROLAND, 2020).

Brazil is recognized for the strength of agribusiness and the potential for adding value in agro-industrial chains, which makes the search for productive excellence a decisive competitive differential. In particular, the micro, small, and medium-sized food and beverage industries have been challenged to optimize processes, reduce waste, and align their production with market requirements, which include both sensory and nutritional quality attributes and regulatory compliance and sustainable practices (ALVES, 2018; ALMEIDA et al., 2024).

In this context, performance and productivity management are a fundamental approach to transform information into strategic decisions, aligning indicators of operational efficiency, quality, and sustainability with decision-making. Modern quality management tools, statistical process control (SPC), *Business Intelligence* (BI) and continuous improvement methodologies have been incorporated into the industrial reality, allowing greater predictability, reduction of variability and value addition (SURBAKTI, 2015; FRANCISCHINI; FRANCISCHINI, 2018).

Beyond theory, it is essential to demonstrate how these concepts can be applied in practice, especially in sensitive sectors such as dairy, which demand strict process control and efficient resource management. To this end, this chapter presents an integrated analysis between theory and practice, exploring the conceptual bases of performance and productivity management, as well as the application in a case study on the expansion of the line of fine goat cheeses in a small dairy in Minas Gerais.

The objective is to present an assertive and grounded overview on the subject, showing how the integration between industrial management, quality and performance indicators can strengthen competitiveness and sustainability in the food industry.

2 PERFORMANCE AND PRODUCTIVITY MANAGEMENT IN THE FOOD INDUSTRY

Contemporary industrial management is marked by the need to reconcile three major dimensions: production efficiency, product quality and process sustainability. These

dimensions should not be seen as isolated objectives, but rather as interdependent pillars that support the sustainable growth of organizations.

According to Messias, Romão and Roland (2020), the survival of industries in the current scenario depends on their ability to innovate continuously, overcome the competition and respond quickly to market changes. This means that productivity, traditionally measured only in terms of costs and volumes produced, needs to be expanded to include aspects such as agility, reliability, waste reduction and value creation for customers and society.

For Alves (2018), the sustainable development of the industry requires systemic management, capable of integrating planning, control and innovation. This perspective becomes even more relevant in the food sector, where factors such as seasonality of raw materials, sanitary quality requirements, and variations in demand require constant monitoring and data-driven decision-making.

In this scenario, two complementary approaches stand out:

- Knowledge Management (KM): focuses on the acquisition, creation, sharing, and application of knowledge within organizations. In the food sector, KM is essential to ensure that safety practices, technological innovation, and quality standards are absorbed and replicated by the entire team (DALMARCO et al., 2017).
- *Business Intelligence* (BI): involves the systematic use of data and analytics to support strategic and operational decisions. With BI, it is possible to transform large volumes of operational data, such as process times, yields, loss rates and non-conformities, into useful performance indicators for management (SURBAKTI, 2015).

The integration between KM and BI enhances organizational development, creating learning environments and continuous innovation. Shehzad and Khan (2013) point out that, when combined, these approaches allow for more expressive results than when used alone, since they unite the human dimension (tacit and explicit knowledge) with the technological dimension (data analysis and prediction).

Considering this context, performance and productivity indicators become key tools, as they allow translating organizational objectives into tangible metrics. Falconi (2010) points out that well-defined indicators make it possible not only to monitor results, but also to direct efforts, identify bottlenecks and prioritize improvements in processes.

Thus, performance management in the food industry is not limited to production control, but involves the creation of an integrated management system, driven by data, knowledge, and innovation. This system is able to simultaneously respond to customer demands, regulatory requirements, and the needs of competitiveness and sustainability.

3 TOOLS FOR MONITORING AND CONTINUOUS IMPROVEMENT

Performance and productivity management in the food industry depends on mechanisms that enable measurement, analysis and structured intervention in processes. In this sense, quality management tools and continuous monitoring methodologies are essential to ensure operational efficiency, standardization, predictability, and evidence-based decision-making. Among the main tools used by the quality management system in companies, the Statistical Process Control, the quality support tools, such as flowcharts, 5W2H, check sheets, histograms and others (Stadler and Silene, 2013) stand out. The use of performance and productivity indicators has also been widely used, together with other tools, to enable the use of prediction in systems that have sensing, combined with Artificial Intelligence (Martins, 2025).

3.1 STATISTICAL PROCESS CONTROL (SPC)

Statistical Process Control (SPC) is one of the most consolidated and applied techniques in the industry for monitoring and improving quality. Its central logic is to identify and reduce variabilities, distinguishing those inherent to the process, common causes, resulting from failures or specific conditions, special causes (Gouveia and Silva, 2011).

According to Ribeiro and Caten (2012), the SPC allows operators to monitor the process in real time, identifying deviations and promoting corrections before the final product is compromised. This characteristic makes the method highly effective in the food industry, since through the standardization of the process, it identifies process failures, which can compromise food safety and generate high costs with rework and waste.

Among the main tools of the CEP are:

- Control charts: allow for graphically visualizing the behavior of critical variables, identifying trends and deviations from the established control limits (CORTIVO, 2005).
- Process capability indices (Cp and Cpk): measure the ability of the process to meet quality specifications, considering both natural variability and the alignment of the process average with specification limits (FRANKEN et al., 2014).

The application of CEP provides greater stability and predictability to production processes, contributing to increased reliability, reduced costs of non-quality and greater consumer satisfaction. According to Kanan et al. (2023), the effective implementation of PESCO in food industries, especially in developing countries, contributes significantly to reducing losses, increasing operational efficiency, and strengthening the culture of continuous improvement.

3.2 BASIC QUALITY TOOLS

The so-called "seven tools of quality" are practical resources for identifying problems, analyzing causes and supporting decision-making. Paladini (2019) highlights that the correct choice of methodology and the structuring of quality programs determine the effectiveness of the results. Among the most relevant tools for the food industry are:

- Flowchart: maps production stages, facilitating the understanding of processes and the identification of bottlenecks (COSTA et al., 2004).
- Brainstorming: promotes the generation of collective and diversified ideas for problem solving (DANIEL; MURBACK, 2014).
- Ishikawa Diagram (Cause and Effect): allows analyzing potential causes for a given problem, grouped into categories such as machine, method, labor, environment and materials (CAMARGO; ANUNCIATION, 2022).
- The 5 Whys: simple methodology for identifying the root cause of problems (WEISS, 2011).
- 5W2H: structured tool for the elaboration of action plans, defining what, who, when, where, how, why, and how much it costs (MELLO et al., 2017).
- Check Sheets: assist in standardized data collection, facilitating subsequent analyses (LOBO, 2019).
- Histogram: allows you to visualize the distribution of data and identify patterns of variability (MELLO et al., 2011).
- Tree of Problems and Objectives: to relate causes and consequences of critical situations, assisting in the development of intervention strategies (COHEN; MARTINEZ, 2004).

These tools, when applied in combination, create a robust system for analyzing and solving problems, in addition to fostering a culture of continuous improvement, which allows for structuring accurate diagnoses, prioritizing critical causes, and guiding corrective actions efficiently, strengthening quality management and data-based decision-making. In the food industry, this approach contributes to strict process control, waste reduction, and compliance with required safety and quality standards (INÁCIO; 2023).

3.3 PERFORMANCE AND PRODUCTIVITY INDICATORS

Indicators are the basis for measuring and monitoring organizational performance. Francischini and Francischini (2018) define indicators as measures that allow comparing the results obtained with the objectives or expectations established.

In the food industry, indicators can take on different applications:

- Quality indicators: number of non-conformities, customer complaints, rework rate.
- Productivity indicators: relationship between resources used (raw material, time, energy) and results obtained (quantity of product).
- Sustainability indicators: water consumption, energy, emissions and waste generation.
- Satisfaction indicators: evaluation of customers, employees and other stakeholders.

The effectiveness of the indicators depends on the clear definition of goals, frequency of monitoring and those responsible for data collection and analysis. Bahia (2021) emphasizes that indicators must be objective, communicable, value-oriented, and aligned with strategic planning.

By integrating indicators into a Performance Measurement System (SMD), it becomes possible to identify critical points, monitor trends, and support management decisions. In addition, the indicators work as "organizational compasses", guiding the direction of efforts and avoiding waste of resources, since it quantifies performance in relation to organizational objectives and allows the monitoring of the evolution of the company's results, and can be used as a reference for decision-making and improvement strategies (MERTZ, 2016).

3.4 INTEGRATION OF QUALITY TOOLS TO PERFORMANCE MANAGEMENT IN THE FOOD INDUSTRY

The biggest challenge is not only in knowing the tools, but in integrating them into an industrial management logic. The SPC provides statistical data; indicators translate objectives into metrics; and quality tools help in solving problems. When applied together, these practices strengthen performance management and create conditions for sustainable productivity (PALADINI, 2019).

In this context, the use of *Business Intelligence* (BI) systems has gained prominence for offering real-time monitoring, dynamic dashboards and integrated analysis of production data, making the monitoring process more assertive and assisting managerial decision-making (RODRIGUES; COSTA, 2019; BARROS, 2024). Task automation optimizes professionals' time and reduces the likelihood of errors. In addition, BI allows industries to continuously monitor their processes, quickly identify patterns of anomalies, and anticipate potential failures before they impact production (TURBAN et al., 2010; BARROS, 2024).

In the dairy sector, for example, the integration of these tools makes it possible to monitor variations in the yield of milk products, identify causes of losses (such as equipment failures or raw material problems), plan corrective actions with 5W2H, and monitor the impact of changes through indicators. This systemic approach enhances the company's production efficiency and competitiveness.

4 CASE STUDY IN A FINE CHEESE DAIRY: A PRACTICAL APPLICATION OF MANAGEMENT CONCEPTS

The application of the concepts of performance and productivity management can be better understood when analyzed in real situations. In this sense, the case study of Laticínio Piallet, located in Florestal, Minas Gerais, is presented, which stood out for the elaboration of an operational plan aimed at the expansion of the line of fine goat cheeses.

The goat dairy processing sector has been consolidated as a profitable activity for small producers in Brazil, especially due to the differentiated nutritional value of goat's milk and the growing interest of the consumer market for artisanal and high-quality products (IBGE, 2021; SILVA, 2023). In this context, industrial management assumes a strategic role to optimize resources, reduce waste and ensure competitiveness in this sector.

4.1 PURPOSE OF THE STUDY

The main objective of the work was to prepare the expansion plan for the line of fine goat cheeses, evaluating the structural conditions, raw material, production capacity, labor and facilities, in order to propose an action plan that would enable the increase in production.

In the expansion proposal, there was an increase of 50% in the production of fresh cheeses (Boursin, Minas Frescal and Tipo Feta) and 20% in the production of matured cheeses (Caprino Romano and Chevrotin), in line with the insertion of the new "Santa Cecilia" brand, expanding distribution and positioning in the market.

4.2 METHODOLOGY

The study was conducted as an applied case study, in which qualitative and quantitative data techniques were used, through:

- Survey of technical and operational data through visits to the dairy and interviews with those responsible for it;
- Mass balance for calculating yields and surveying the need for raw materials, according to Tadini et al. (2018);
- Mapping of production processes using flowcharts, enabling detailed analysis of production stages;
- Calculation of the operational capacity of the equipment (pasteurizers, tanks, presses and cold chambers), according to the methodology of Staudt et al. (2011);
- Study of times and movements with timing of operations, based on Corrêa and Corrêa (2012), to assess the need for labor;

- Analysis of compliance of facilities based on sanitary legislation (RDC No. 275/2002 of ANVISA and Ordinance No. 368/1997 of MAPA);
- Action plan structured by the 5W2H method, contemplating production strategies, supplies, physical structure and human resources.

This methodology provided a holistic view of the production process, allowing the identification of bottlenecks, opportunities for improvement and the development of expansion strategies.

4.3 RESULTS

4.3.1 Operational and Raw Material Planning

The mass balance showed that, to meet the new demand, it would be necessary to increase the volume of processed milk by 47.98%, from approximately 14,200 liters/month to 21,000 liters/month. This result highlighted the need to strengthen partnerships with suppliers and seek new channels for capturing raw materials.

The calculations showed that yields for the different types of cheese were consistent. This fact suggests stability in the production process even in the face of expansion. However, it was observed that the central limitation of the technical feasibility of the expansion was not in the yield, but in the availability of goat's milk.

4.3.2 Operational Capability

The operational capacity of the factory was evaluated through the analysis of the use of the equipment, which showed different scenarios:

- Boursin cheese: presented an average idleness of 40.25%, indicating the possibility of absorbing part of the expansion with adjustments in the production schedule.
- Feta Cheese: the average idleness was 43.55%, revealing the need to reschedule production, due to the high time of use of tanks and presses.
- Minas Frescal Cheese: the high idleness (50.23%) demonstrated immediate feasibility of expansion by 50%, without the need for new investments.
- Matured Cheeses (Caprino Romano and Chevrotin): presented bottlenecks in the pressing and maturation stages. The 20% expansion would require the acquisition of new shelves for the cold room and structural adjustments.

In general, it was observed that the expansion is feasible, but requires an optimization of the production schedule and small investments in infrastructure.

4.3.3 Evaluation of Labor

The study of times and movements revealed that, in order to maintain efficiency after the expansion, it would be necessary to hire a new employee. Thus, the number of employees on the production line had to increase from two to three, ensuring that processing times remained equivalent to today.

4.3.4 Physical Structure and Facilities

The inspection of the facilities highlighted the need for improvements in floors, walls, ventilation and external areas, in order to align the production environment with legal requirements and good manufacturing practices. These adjustments were included in the action plan, reinforcing the commitment to food quality and safety.

4.4 ACTION PLAN (5W2H)

Based on the results, an action plan was drawn up covering:

- Raw material: expand milk collection through new suppliers and commercial negotiations with current partners.
- Production: optimize the use of equipment with the reprogramming of the schedule and acquisition of presses and shelves for maturation.
- Labor: Hiring a new employee to maintain operational efficiency.
- Physical structure: make adjustments to floors, walls, cold rooms and external areas to ensure sanitary compliance.

Thus, the study proved the feasibility of the planned expansion, as long as it is accompanied by adjustments in supplies, production schedule, labor and infrastructure. The analysis provided technical support for strategic decisions, strengthening the dairy's position in the market and contributing to the competitiveness of the new brand.

5 CONNECTION BETWEEN THEORY AND PRACTICE

The literature highlights that industrial competitiveness depends on the ability to innovate and respond quickly to market demands (MESSIAS; ROMÃO; ROLAND, 2020; ALVES, 2018). This perspective was evident in the case analyzed, in which the expansion of production was planned not only based on growth expectations, but supported by concrete data on operational capacity, yields and labor.

From the point of view of quality management, the use of methodologies such as mass balance, flowcharts, 5W2H and analysis of times and movements contributed to identifying the bottlenecks of the factory and proposing specific solutions. This practice dialogues directly

with the Knowledge Management and *Business Intelligence* approach, by transforming dispersed information into useful knowledge for decision-making (ALMEIDA and CAMARGO, 2015; SURBAKTI, 2015).

Thus, the integration between theory and practice presented in this chapter shows how performance and productivity management can become a competitive advantage in the food industry. The case study of Laticínio Piallet illustrates, in an applied way, the relevance of management tools and performance indicators as instruments to guide strategic and operational decisions.

5.1 INDICATORS TO SUPPORT DECISION MAKING

The performance indicators in the dairy analysis allowed the identification of equipment idleness, the additional need for milk and the production time per employee. According to Francischini and Francischini (2018), the indicators work as management guides, showing not only the current state of the operation, but also guiding corrections and improvements.

In this context, the average idleness indicator of 40.25% in the Boursin cheese production line revealed the possibility of expansion without major investments, while the indicators of use of presses and cold chambers for matured cheeses pointed to the need for new resources.

This quantitative analysis demonstrates how performance measurement systems (SMD) offer strategic support to management, enabling decision-making based on hard data and operational evidence. According to Cunha (2023), the effectiveness of SMD in industrial environments depends on the organization's ability to integrate data, technology, and a culture of continuous improvement, overcoming challenges such as inadequate selection of indicators, lack of alignment with corporate strategy, and limitations of real-time analysis.

In this way, the structured use of indicators allows transforming operational information into strategic inputs, guiding evidence-based decisions, strengthening organizational competitiveness, and promoting the efficiency and sustainability of production processes.

5.2 QUALITY MANAGEMENT AS A COMPETITIVE ADVANTAGE

In the case of Laticínio Piallet, although control charts were not applied in a formalized way, statistical reasoning was present in the calculation of yields and capacity indexes, which opens space for future implementations of a continuous statistical monitoring system, using the CEP.

5.3 CHALLENGES FOR SMALL AND MEDIUM INDUSTRIES

A relevant aspect is the finding that small and medium-sized food industries face particular challenges:

- Capital limitations for investments in new equipment;
- Dependence on local raw material suppliers;
- Need to adapt to regulatory requirements, often onerous;
- Shortage of skilled labor.

The case study showed that, even in the face of these restrictions, it is possible to apply modern industrial management practices, using low-cost tools (such as flowcharts, 5W2H and process timing) to obtain significant gains in efficiency and consequently competitiveness in the market.

5.4 FUTURE PROSPECTS

The experience of Laticínio Piallet points out paths that can be explored by other food industries:

6 FINAL CONSIDERATIONS

Performance and productivity management in the food industry is one of the fundamental pillars for competitiveness, sustainability and innovation. As discussed throughout this chapter, the sector lives under intense pressures from the consumer market, regulatory requirements and resource constraints, which requires companies to take a proactive stance of planning, monitoring and continuous improvement.

The theoretical foundation highlighted the importance of Systemic Industrial Management, which integrates knowledge, data and processes to transform information into assertive decisions. Tools such as Statistical Process Control (SPC), performance indicators, and the seven quality tools proved to be essential to reduce variability, guide action plans, and sustain consistent results.

The case study of Laticínio Piallet demonstrated, in practice, how theoretical concepts can be applied in a small agribusiness. Analysis of the expansion of the fine goat cheese line revealed:

- The need to increase milk collection by almost 50%, highlighting the importance of supply management;
- The feasibility of the expansion, given the existing idleness in certain equipment, as long as it is accompanied by rescheduling of production;

- The requirement for specific investments in presses and maturation shelves, in addition to hiring a new employee to maintain operational efficiency;
- The relevance of structural and sanitary adjustments, reinforcing the role of quality as a competitive differential.

This case reinforces that, even with limited resources, small and medium-sized industries can apply performance management methodologies effectively, obtaining significant gains in productivity and sustainability. The differential is in adopting management guided by indicators, supported by accessible quality tools and aligned with the organization's growth strategy.

In the future scenario, marked by digitalization, industry 4.0, and growing demands for sustainability, the ability to integrate data, people, and technology will be decisive for the survival and expansion of companies in the food sector. It is observed that this movement profoundly transforms the sector, making it essential to adopt smarter, more sustainable, and data-driven production practices.

Technological innovations and new market demands drive a structural change in the forms of management, in which efficiency, traceability and environmental responsibility are consolidated as pillars of competitiveness. In this context, understanding and applying performance and productivity management models is essential to ensure quality, efficiency, and sustainability in operations.

Therefore, this chapter contributes by offering an integrated look from theory to practice on performance and productivity management, demonstrating how scientific principles can be applied in a concrete way to support strategic decisions, strengthen competitiveness and ensure the production of safe and quality food.

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