



Design thinking and egg processing units: a different proposal for a checklist for facilities and equipment maintenance self-control program

Tatiana SCHIAVONE¹, Gustavo Luis de Paiva Anciencs RAMOS^{1,2*} , Iracema Maria de Carvalho da HORA¹,
Mônica Queiroz de FREITAS², Eduardo Henrique Miranda WALTER³

Abstract

Eggs quickly lose their quality if they are not in adequate conditions during handling, and adequate control of the entire production chain is essential, considering that the introduction of contaminants can occur at any stage of production. The Self-Control Programs (PACs) aims to guarantee the hygienic-sanitary quality of products and the steps of the program include the description, implementation, monitoring, and verification, being considered fundamental in the quality management in companies that produce food of animal origin in Brazil. The checklist for maintenance of facilities and equipment proposed in this study was developed by a multidisciplinary team covering egg processing units with a production of up to 3,600 units/day. The design thinking methodology was used in this context to facilitate the search for better ideas through discussions that could develop creative thoughts in an empathic and user-centered way. The proposed list collaborated as a quality measurement instrument with simple language and applicable to the small producer. It reinforced the need to meet the prerequisites for the proper functioning of the PAC, serving as a stimulus for the search for knowledge of the quality culture, through the constant observation of the paradigm required by regulatory agencies.

Keywords: quality management; good manufacturing practices; Self-Control Program; Brazilian legislation.

Practical Application: The list developed presents simple language applicable to small producers, reinforcing the need to meet the prerequisites for the self-control program for maintenance of facilities and equipment, and spreading the benefits of the design thinking methodology considering the users.

1 Introduction

Egg quality is associated with different aspects such as microbiological safety, the presence of physical and chemical hazards and allergenic components that can be conveyed at the time of consumption. Adequate control of the entire production chain is essential, considering that the introduction of these contaminants can occur at any stage of this chain. (Alvarenga et al., 2018). When effective and efficient hygienic and sanitary measures are adopted along the food production chain that can reduce risks to the consumer, provided that the products are used under the indicated conditions and for the purposes for which they are intended, they can be considered safe (Peretti & Araújo, 2010).

Food-producing organizations have shown rapid growth in recent decades, including small and less developed businesses. Consequently, the requirements related to aspects such as conditions of physical structure (location, structure, facilities, equipment, and utensils), human resources, pest control and control of the quality of the water to be used are increasing. This set of adjustments is one of the foundations for quality

management, thus forming competitive advantage in the market (Alvarenga et al., 2018).

With the advancement of legislation and aims to complement the routine activities of the inspection service, the so-called Self-Control Programs (PAC) were assigned to the industries that process food of animal origin in Brazil. PACs are defined as programs developed, procedures described, developed, implemented, monitored and verified by the establishment, with a view to ensuring the safety, identity, quality and integrity of its products, which include but are not limited to the prerequisite programs, Good Manufacturing Practices (GMPs), Sanitation Standard Operating Procedures (SSOPs), and Hazard Analysis and Critical Control Point (HACCP), or equivalent programs recognized by the Ministry of Agriculture, Livestock and Supply (Brasil, 2017a).

PACs constitute a challenge for small-scale agro-industries producing eggs and other products of animal origin. Historically, the control of the process and facilities of these establishments

Received 15 Sept, 2022

Accepted 08 Dec, 2022

¹Instituto Federal de Educação, Ciência e Tecnologia do Rio de Janeiro, Rio de Janeiro, RJ, Brasil

²Faculdade de Medicina Veterinária, Universidade Federal Fluminense – UFF, Niterói, RJ, Brasil

³Empresa Brasileira de Pesquisa Agropecuária – EMBRAPA, Rio de Janeiro, RJ, Brasil

*Corresponding author: gustavoanciencs@id.uff.br

have been carried out through the GMPs program. With the PACs, establishments have to record control measures and non-conformities (deviations), as well as corrective actions, related to establishment maintenance, cleaning and disinfection, pest control, and water management; personal hygiene and health status; control of operation and prevention of cross-contamination; HACCP; traceability and recall procedures.

It is understandable that the productive sector does not receive passively the obligation of implementing the PACs, particularly by small agro-industries, which, in addition to the GMPs program, need to make records related to HACCP and traceability programs. With the requirement of the PAC, the records are not limited to the critical control points of the HACCP program, demanding considerable effort from the productive agents, particularly in small industries with few employees.

The establishment assumes the responsibility of having supporting documents, through auditable records, of the control of the process and the ability to trace its production, including a specific PAC for maintenance of facilities and equipment. In this context, the participation and support of all employees must take place during the elaboration and implementation of the PAC in the food industry so that everyone can be qualified and the documentation written and updated, being all aware and following the process (Oliveira et al., 2021).

Allied to the need to implement PACs in industries, the possibility arises of transforming the preparation of these documents from ideas and solutions focused on solving local problems. The use of the tool called design thinking brings benefits as it can be applied in training and the treatment of non-conformities and quality standards (Leonhardt, 2019). Design thinking emerges in this context to facilitate a multidisciplinary group to find the best ideas through discussions that develop user-centered creative thinking, being characterized as a model of innovation (Macedo et al., 2015).

This study aimed to propose a maintenance checklist for egg processing units with a production volume of up to 3,600 units/day, serving as a model for application in different egg processing agro-industries. The checklist has been developed based on the importance of implementation of a self-control program for maintenance facilities and equipment, with the help of the design thinking strategy for the elaboration of creative thinking, thus enabling the improvement of the companies' food safety management system, in addition to serving as an example for other companies that have the desire to expand their activities.

2 Material and methods

The research was initially carried out remotely, to carry out a workshop that motivated the preparation of the draft and final checklist. For the application of the final list, three small egg processing companies were chosen, located in the Brazilian cities of Nova Friburgo (RJ), Conselheiro Lafaiete (MG), and Juazeiro (BA).

2.1 Phases of research and design thinking

The methodology was based on the use of design thinking, involved in all stages of the research, from the application of different tools for each phase, as shown in Table 1 (Paredes & Alves, 2018). Design thinking was inserted in order to assist in data collection and elaboration of the checklist proposal.

In the initial phase, the tool called the conceptual map, which is responsible for visually organizing the data at different levels (Vianna et al., 2018), allowed the definition of the theme and issues related to egg production. Desk research, on the other hand, was based on the search for information on the central theme of the research in several sources. Brainstorming in the intermediate phase served as a basis for building ideas during the workshop and drawing up lists to encourage creativity without losing focus. In the final phase, the prototype on paper was in fact the list presented to the producers so that an evaluation could be carried out, thus providing feedback of great relevance for the conclusion of the study, given that the proposal of the design thinking methodology consisted of discussing and enable innovative solutions with empathy as one of the pillars.

2.2 Drafting and final checklist

The checklist proposal was elaborated from a bibliographic survey of food legislation and technical standards related to egg production, which was discussed in a joint work, where all the studied items related to maintenance of facility and equipment were presented and classified as fundamental, recommended or not applicable. The list was designed as a quality measurement instrument being of simple language and applicable by the entrepreneur, responsible for the egg processing unit, reinforcing the need to comply with the prerequisites for the elaboration and implementation of the PAC in the future.

The draft list proposal was discussed and evaluated by a team of professionals in the area composed of three veterinarians, a nutritionist and a food engineer. After discussing the draft of the list to evaluate the necessary items and the best form of presentation, a final list was prepared in a simplified model, so that the person responsible for filling it out could have agility in observing the areas in compliance or not and recording the corrective actions.

Table 1. Design thinking methodology in research.

	Research stages	Design thinking stages	Tools
Early stage	Definition of the theme, objectives, bibliographic survey	Immersion	Concept Map / Desk Search
Intermediate stage	Participation in the Workshop, preparation of lists	Ideation / Prototyping	Brainstorming
Final stage	Submission of the list for self-assessment of producers	Prototyping / Validation	Prototype on paper / feedback

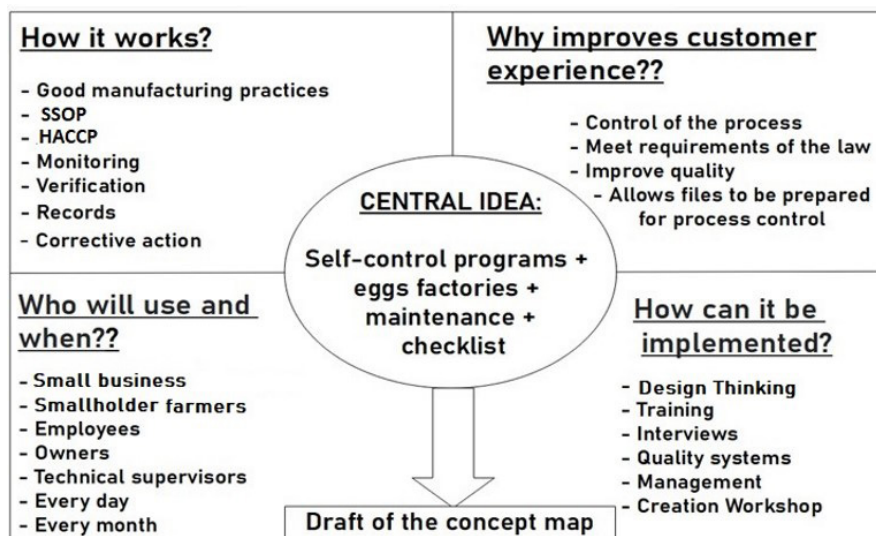


Figure 1. Concept map defined in the immersion phase.

For an item to be considered critical or absent, it should meet the following criteria: lack of control in the requirement could result in failure of previous and subsequent procedures.

2.3 List evaluation by egg producers

The producers initially answered a questionnaire, so that the place of production could be identified and characterized. Soon after the application of the questionnaire, the egg producers received the final checklist, remotely. The company manager or technical manager was designated to start the self-assessment of the items present, considering which would be classified as used (applicable) and important and which would not be applicable on-site, in addition to the doubts that could arise while reading the document.

3 Results and discussion

Figure 1 represents the conceptual map used in the initial phase of the research (immersion) and was useful for communicating data to the team, in addition to constituting the basis for creating and provoking ideas on the central theme (Vianna et al., 2018). The graphical representation, with the main sentence in the center of the concept map, served as a basis for the following developments from the data that were collected and reached the objective by illustrating the links between them.

3.1 Drafting and final checklist

A draft of the list was generated with 25 monitoring items arranged in blocks and divided into selected sectors that accompanied excerpts from Normative Instruction - IN n° 5 (Brasil, 2017b), with priority being given to the maintenance PAC items for facilities and equipment, revised through the understanding of the requirements regulations raised in the bibliographic research (desk research). After discussing the draft list to evaluate the necessary items and the brainstorming that was generated throughout the process, the team decided that the best way

to present the final list would be to define a simplified model, with 15 numbered items, without containing texts (sections of legislation) and arranged in the form of items without marking option, in order to facilitate that the producer could observe through self-assessment and thus record the corrective actions planned and executed and the person responsible for the action. The checklist items are displayed in Table 2.

In order to encourage the small producer to seek these conditions of processing, the use of tools such as the application of the checklist can help both in the diagnosis of non-conformities and in the verification of their PAC, among other functions. During the application of a list observing the items, it is possible to verify compliance with the topics required by the legislation and determine the degree of adequacy of the establishment, which has been very useful in practice for producers in general (Benedito Júnior et al., 2019).

3.2 Application of the questionnaire and checklist by producers

After collecting data tabulated in the identification and characterization questionnaire answered by the producers, it was possible to observe a significant difference in relation to the size of the built area, number of employees and the total number of eggs produced per day, as shown in Figure 2. All producers have their own processing and are from family farming.

According to Brazilian legislation (Brasil, 2017a), the processing facility must have a size compatible with the production volume and be separated from the other facilities by entire walls. It was observed that one of the companies has a much smaller production area than the others, with a single employee responsible for production. As for the number of employees, it was evident that the same company has only one employee to perform all functions, but the number of eggs produced is smaller, while the others have a similar production, but the number of employees has a significant difference. In some studies, this is

Table 2. Producers' feedback after self-assessment.

Checklist Item	Agreement on the presence of the item in the list (%)	Compliance observed on site during self-assessment (%)	Producers' remarks
1) Delimitation of the external area: without breaks and damages	66	66	Questioned item regarding delimitation, real need to have it in place and suggestion to use other methods.
2) Paving the vehicle circulation area: no dust and puddles	100	33	Related item as a difficult compliance point
3) Paving the area for people circulation, reception and dispatch: without dirt and holes	100	100	Item considered easy to understand.
4) Absence of disused materials and external contamination sources	100	66	Item easy to understand, but there were differences regarding the concept of contamination.
5) Maintenance of the sanitary barrier and availability of hygiene products	100	66	An item that is easy to understand, but observed to be difficult to comply with due to the need to reinforce the concept of good practices.
6) Floor, walls, ceiling, doors, windows, millimeter screens, countertops and sinks: no cracks, crevices, infiltrations and other damage	100	100	Item of easy understanding and considered of greater importance due to the visual aspect.
7) Drains and pipes: no leaks, backflow or retention of wastewater	100	100	Item considered easy to understand.
8) Ventilation: prevents undesirable odors, condensation and thermal discomfort	66	33	Related item as a difficult point of compliance, doubts about the ventilation method arose in the evaluation process.
9) Lighting: allows the processing of eggs and the visualization of environmental dirt	100	100	Item considered easy to understand.
10) Equipment maintenance: ovoscope, scale and egg washing machine	0	0	The presence of the egg washer was highlighted as unnecessary in the list. The other equipment was considered important.
11) Processing containers and waste collection containers: no cracks and other damage	66	66	The word "containers" was not correlated with boxes, there was no understanding of the word in the list.
12) Hygiene products and utensils: identified and stored in an appropriate place	100	66	Item easy to understand, but it was listed as difficult to comply with due to limited space.
13) Maintenance of the water and chlorinator tank	33	0	The concept of water reservoir was not understood correctly, making the evaluation difficult.
14) Maintenance of toilet(s) and changing room	33	33	There was no understanding in the separation of the term toilet and changing room. It was observed that this item is difficult to comply with.
15) Maintenance of laundry facilities and equipment	0	0	The presence of the laundry was highlighted as unnecessary in the list.

considered a common hypothesis, especially for small producers, considering that with two employees, one will be responsible for the operational part while the other will perform the quality part (Fernandes, 2019). When the establishment has one or two employees, the work group also proposed that the person carrying out the operating procedures is responsible for monitoring.

It is important in these cases to consider the presence of the company owner acting in the control of the process as a possible verifier, performing the role of a second or third person. The verifier is a person that evaluates not only the operation but also monitoring records and when non-conformities are identified in a certain step of the process, establishes what corrective actions must be taken (Fernandes, 2019).

As for the implementation of the PAC, considered mandatory by Brazilian legislation, two companies had already carried out the implementation, while in the other one the PAC was in the final phase of implementation. PAC help in the prevention and correction of non-conformities that may occasionally contaminate the final product, being essential for the control of the entire process (Pereira et al., 2014), and guarantee the sanitary quality

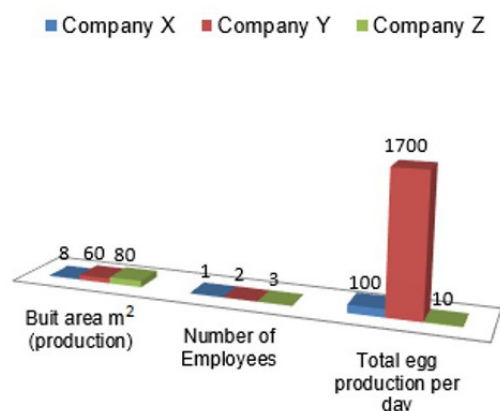


Figure 2. Characterization of egg producers in relation to the establishment. Each bar represents one of the producers.

and the compliance of the final product with current technical standards. To this end, it is necessary for the management of an establishment to agree, provide support and include all

employees in this journey and be able to qualify through training and recycling so that the PAC is always reviewed and updated (Artilha-Mesquita et al., 2021).

Despite the number of small companies located in Brazil, regarding the implementation of quality systems, the number of companies that adopt this practice is still very small. Costa & Bonnas (2016) emphasize that the lack of information about the advantages of implementing these systems predominates, in addition to the difficulty of viable technological resources and the behavioral and structural change in the direction necessary for the implementation. Companies need to create a continuous process in search of improvements based on the observation of their difficulties based on real data (Pereira et al., 2014).

Currently, in the business of egg processing, there are 408 micro-companies and 84 small companies, compared to 1,131 companies of other sizes operating in Brazil (Serviço Brasileiro de Apoio às Micro e Pequenas Empresas, 2022). From micro-entrepreneurs to large companies, the fact is that all of them must follow the same regulations regarding quality management in egg production. Companies need support through a trained professional who is able to quickly identify non-conformities and work preventively, presenting demands and solutions in front of their leadership so that they can anticipate compliance with laws and requirements of government agencies. It is worth noting that most of these companies do not have this qualified professional (Starikoff et al., 2020).

Table 2 presents the checklist items and the feedback obtained from the producers.

An average of 71% acceptance of the items was obtained, demonstrating that, in general, the producers had an understanding of the PAC items when reading the list, even without having full knowledge of the legislation. The items that were most difficult to understand were related to ventilation, processing containers, water reservoir, toilet and dressing room, demonstrating that a more technical or objective language can disadvantage the application of the list when it is filled in by the owner in question.

One item that was not understood or evaluated by the producers was the issue of equipment calibration. Brazilian legislation determines that control instruments must be in proper working conditions, gauged or calibrated (Brasil, 2017b). Item 10 of the checklist covers the maintenance of the egg candler, scale and egg washing machine equipment, but the maintenance concept, as highlighted in the list, was also related to the proper state of conservation and operation, including the issue of gauging and calibration of equipment. As it was not noticed or questioned, one way out would be to include it separately in the list for better evaluation by the producer.

Benedito Júnior et al. (2019), through a study carried out with the application of a checklist, showed that the item gauging and calibrating the equipment was not complied with in its entirety by all the industries verified regarding the PAC and are considered essential for the adequate control of production. In another study carried out by Munin (2017), on a dairy farm, it was found, after applying the PAC checklist, that the item measurement and calibration of instruments reached 100% non-compliance in the evaluated period.

The presence of the laundry by the producers was highlighted as unnecessary, as they did not have it specific for the processing unit. According to current legislation (Brasil, 2017b), the washing of uniforms must comply with the principles of good hygiene practices, whether in own or outsourced laundry facilities. It is important that this item on the list includes outsourcing as a viable alternative for washing uniforms.

The average compliance observed during the self-assessment was 55%, corroborating the difficulties reported by the evaluators in the execution of some items, either due to lack of resources, lack of information, or deficient training. The items most difficult to comply with the required regulations were paving the area, maintenance of the sanitary barrier, availability of products for cleaning, ventilation, maintenance of the restroom and changing room, water reservoir and maintenance of laundry facilities and equipment.

A relevant fact is that 100% of the producers questioned the use of the egg washing machine and did not agree with its use during the process, but only one producer reported the concern in monitoring the eggs from the nests to storage, relating that it would be a possible alternative to not having to wash the eggs. Brazilian legislation (Brasil, 2017b) determines that the washing and drying of eggs, when carried out, must be performed in a machine, specifically for this purpose. This would be an important point to be discussed by producers and inspection agencies, given that better guidance would be needed on equivalent processes, such as the dry processing of eggs.

Regarding the water reservoir, which was included in this list as part of the PAC, as an external area item, to evaluate the existing conditions and also the chlorinator conditions, it was not evaluated correctly and presented 100% non-compliance, perhaps because of difficulties in understanding the item. Two of the producers reported having a water tank and one reported using the water only for external cleaning. As in many agro-industries located in rural areas, water capture is carried out through springs or artesian wells, as an alternative to reduce costs, and this fact can compromise water quality (Starikoff et al., 2020). This item should be rewritten more clearly, as well as the issue of the chlorine doser or chlorinator that is used for water treatment purposes.

On the topic of toilet and changing room, it was evident the difficulty on the part of producers to comply with the provisions of law that allow the use of existing toilets on the property, as long as it is not more than 40 meters away (Brasil, 2017b). Only one producer reported using the existing toilet at his house, which would be close to the production area, but at a much greater distance than required by law. Other producers reported the difficulty in having both items, when in fact, due to the reduced number of employees, they end up having only one location.

Benedito Júnior et al. (2019) in a study to verify the level of compliance with self-control programs in dairy industries in the state of Minas Gerais (Brazil), showed that 73% of the evaluated industries lacked lockers for the exclusive storage of uniforms, and when sanitary barriers were evaluated, 20% did not have the physical installation. In addition, 60% of these industries did not have an adequate place to store detergents and sanitizers, similar

to what was reported by the producers in the self-assessment. In this same study, 100% of the evaluated establishments were absent regarding the protection of the lamps and did not have quantitative lighting control, in addition to the total absence of relative humidity control, with poor ventilation.

A study on the self-control program carried out in a fish and fish products processing unit, in the State of Pará, through documental analysis of inspections and fiscal audits, highlighted that the maintenance of facilities and equipment PAC was the one with the highest occurrence of non-compliance. There were recurring problems with the flow of wastewater, floor failures, worn utensils, equipment without maintenance and incompatibility between the registered and the on-site verification by government agencies, regarding the preventive maintenance schedule, as well as the absence of corrective actions (Miranda, 2018). In a study by Munin (2017), the author demonstrated, through the application of the checklist, that items such as ventilation and lighting that had high percentages of non-conformities in the evaluated. These non-conformities were improved significantly after the effective implementation of the PAC.

Although the standards related to GMPs program have existed for more than 20 years, the results still prove the difficulty that companies have to comply with legal requirements (Benedito Júnior et al., 2019). The absence of training courses accessible to small companies, employees with low education, lack of commitment and lack of financial resources are part of the difficulties that small producers face when trying to implement the PAC (Costa & Bonnas, 2016). It is necessary to create policies and tolls, like the checklist presented in this paper, specially designed and built small and less developed businesses.

4 Conclusion

The proposed checklist collaborated as a quality measurement instrument, being simple and applicable by the producer responsible for the egg processing unit. The document presented served as an incentive for the formalization of a diagnosis and registration in three egg-producing establishments, considering that it worked as a guide for the process of implementing the maintenance of the facility and equipment PAC.

The checklist made it possible to observe non-conformities and carry out an action plan to improve all processes related to the PAC object of the study. With the design thinking methodology used in the creative process of the documents, it was possible to insert the producer, who mostly represents the person in charge of the unit, with empathy and engagement. For the implementation of the PAC, it is essential that the process is humanized so that it is valued, with the encouragement of the food safety culture so that egg quality control has a true performance, based on changes in behavior that reach all hierarchical levels from the company.

References

- Alvarenga, V. O., Campagnollo, F. B., do Prado-Silva, L., Horita, C. N., Caturla, M. Y., Pereira, E. P., Crucello, A., & Sant'Ana, A. S. (2018). Impact of unit operations from farm to fork on microbial safety and quality of foods. *Advances in Food and Nutrition Research*, 85, 131-175. <http://dx.doi.org/10.1016/bs.afnr.2018.02.004>. PMID:29860973.
- Artilha-Mesquita, C. A. F., Stafussa, A. P., Paraiso, C. M., Rodrigues, L. M., Silva, L. A., Santos, S. S., Marins, A. R., & Madrona, G. S. (2021). Avaliação da Gestão da Qualidade e suas ferramentas: aplicabilidade em indústria de alimentos de origem animal. *Research. Social Development*, 10(1), e20210111248. <http://dx.doi.org/10.33448/rsd-v10i1.11248>.
- Benedito Júnior, H. D. S., Teodoro, V. A. M., Vicentini, N. M., Silva, M. R., Costa, R. G. B., Miguel, E. M., Sobral, D., & Paula, J. C. J. (2019). Verificação do nível de atendimento aos programas de autocontrole em indústrias de laticínios de Minas Gerais. *Revista do Instituto de Laticínios Cândido Tostes*, 74(2), 73-85. <http://dx.doi.org/10.14295/2238-6416.v74i2.714>.
- Brasil. (2017a). Regulamenta a Lei nº 1.283, de 18 de Dezembro de 1950, e a Lei nº 7.889, de 23 de Novembro de 1989, que dispõem sobre a inspeção industrial e sanitária de produtos de origem animal (Decreto nº 9.013, de 29 de março de 2017). *Diário Oficial [da] República Federativa do Brasil*. Retrieved from <https://legislacao.presidencia.gov.br/atos/?tipo=DEC&numero=9013&ano=2017&ato=4edkXWU9EeZpWT3a4#:~:text=Ementa%3A,DE%20PRODUTOS%20DE%20ORIGEM%20ANIMAL>
- Brasil. (2017b). Instrução Normativa nº 5, de 14 de fevereiro de 2017. *Diário Oficial [da] República Federativa do Brasil*. Retrieved from https://www.in.gov.br/materia/-/asset_publisher/Kujrw0TZC2Mb/content/id/20365563/do1-2017-02-15-instrucao-normativa-no-5-de-14-de-fevereiro-de-2017-20364902
- Costa, P. R., & Bonnas, D. S. (2016). Desafios na implementação de programas de autocontrole em frigoríficos de pequeno e médio porte costa. In 3º *Simpósio de Pós-Graduação do IFTM, Instituto Federal de Educação, Ciência e Tecnologia do Triângulo Mineiro, Uberlândia, MG*. Uberlândia: IFTM. Poster session presentation.
- Fernandes, F. F. (2019). *Implantação de Programas de AutoControle* (108 p.). Rio de Janeiro: S2G – Soluções em Sistemas de Gestão. Retrieved from <https://s2gestao.com.br/cac/wp-content/uploads/2019/11/PAC-Programa-de-Autocontrole-MAPA-1.pdf>
- Leonhardt, C. (2019). *Design além do produto: como a indústria de alimentos pode se beneficiar do design thinking*. Retrieved from <https://tactafood.school/blog/como-industria-alimentos-beneficiar-design-thinking>
- Macedo, M. A., Miguel, P. A. C., & Casarotto Filho, N. (2015). A caracterização do design thinking como um modelo de inovação. *Revista de Administração e Inovação*, 12(3), 157-182. <http://dx.doi.org/10.11606/rai.v12i3.101357>.
- Miranda, A. B. M. (2018). *Avaliação do Programa de Autocontrole (P.A.C.) em uma unidade de beneficiamento de pescado e produtos de pescado*. Universidade Federal Rural da Amazônia, Belém. Retrieved from <http://coremu.ufra.edu.br/images/Monografias/MONOGRAFIA-VERSO-FINAL.pdf>
- Munin, L. (2017). *Adequação e implantação de um programa de autocontrole nas atividades de ordenha em uma fazenda produtora de leite*. Retrieved from <https://teses.usp.br/teses/disponiveis/74/74134/tde-23022018-133719/pt-br.php>
- Oliveira, P. O., Silveira, R., Alves, E. S., Saqueti, B. H. F., Castro, M. C., Souza, P. M., Ponhozi, I. B., Costa, J. C. M., Schueler, J., Santos, O. O., Visentainer, J. V., & Duailibi, S. R. (2021). Implantação das boas práticas de fabricação na indústria Brasileira de alimentos. *Research, Society and Development*, 10(1), e35810111687. <http://dx.doi.org/10.33448/rsd-v10i1.11687>.
- Paredes, B., & Alves, G. (2018). *Manual Design Thinking: uma abordagem inovadora para a sua empresa*. Cysneiros e Consultores Associados. Retrieved from <https://conteudo.cysneiros.com.br/manual-design-thinking>
- Pereira, C. A. S., Formigoni, M. A., & Sereia, M. J. (2014). *Elaboração e implantação dos documentos de autocontrole na cooperativa de*

- comercialização e reforma agrária avante COANA*. Retrieved from <https://educapes.capes.gov.br/handle/capes/171082>
- Peretti, A. P. D. R., & Araújo, W. M. C. (2010). Abrangência do requisito segurança em certificados de qualidade da cadeia produtiva de alimentos no Brasil. *Gestão & Produção*, 17(1), 35-49. <http://dx.doi.org/10.1590/S0104-530X2010000100004>.
- Serviço Brasileiro de Apoio às Micro e Pequenas Empresas – SEBRAE. (2022). *Entenda o design thinking*. Retrieved from <https://www.sebrae.com.br/sites/PortalSebrae/artigos/entenda-o-design-thinking,369d9cb730905410VgnVCM1000003b74010aRCRD>
- Starikoff, K. R., Rankrape, F., & Bellon, A. K. (2020). *Agroindústria de alimentos: no caminho para um alimento seguro* (101 p.). Realeza, PR: UFFS. Ebook. Retrieved from https://rd.uffs.edu.br/bitstream/prefix/3905/4/PET_MEDVET.pdf
- Vianna, M., Vianna, Y., Adler, I. K., Lucena, B., & Russo, B. (2018). *Design thinking: inovação em negócios*. Rio de Janeiro: MJV Press.