

## Good production practices on dairy farms

Thiago Augusto Costa Marins<sup>1</sup>, Tainá Pereira de Souza Rocha Santos<sup>2</sup>, Karyne Oliveira Coelho<sup>3</sup>.

### ABSTRACT

Maintaining milk quality is a challenge, especially in controlling the microbiological load, measured by the Standard Plate Count (CPP). It is crucial to adopt measures along the entire production chain, focusing on obtaining milk, since after processing, quality improvement becomes limited. Studies show that water quality and equipment hygiene are key points to reduce CPP and ensure safe milk consumption. Good Agricultural Practices (GAP) cover economic, social and environmental aspects, promoting general improvements in the production system. Despite the resistance of some producers, national and international regulations offer important guidelines to ensure the quality of milk. To increase competitiveness, Embrapa launched a biosafety certification seal in 2022, ensuring compliance with GAP and animal welfare.

**Keywords:** Milk quality, Production chain, Animal welfare.

### INTRODUCTION

Maintaining milk quality in the current production situation is still a challenge, thinking about some parameters, especially the microbiological load of milk, in Standard Plate Count (CPP). In view of this, it is necessary to adopt measures throughout the production chain, especially in the procurement sector, since raw material after it is sent for processing, there can be no improvement, only to maintain quality (Linhares 2021; Cruz 2019).

Thus, it is essential to adopt measures to solve this impasse, since the quality of milk is related to some factors, such as: nutritional, genetic, environmental, sanitary aspects and, above all, with the care that must be taken from obtaining to storage and, consequently, in transport (Neto, 2018).

It is mentioned that there are studies on the application of Good Agricultural Practices (GAP) relating to CPP, in some regions of Brazil, such as in Campos dos Goytacazes, Serra Gaúcha, Minas Gerais and Espírito Santo (De Pré 2018; Cross 2019; Ströher 2021; Linhares, 2021). The main key points observed in these studies were in relation to water quality, raw material transportation and equipment hygiene. In terms of water quality, identified as a factor that is related to milk quality in all regions, the importance of the equipment cleaning process is also highlighted, since the use of water of poor origin can cause an increase in PPC and also affect consumption by animals (Neto, 2018; Ströher, 2021).

---

<sup>1</sup> Master's student in Animal Science, Federal University of Goiás – Goiás

<sup>2</sup> Master's student in Animal Production and Forage, State University of Goiás/ West Campus – Goiás

<sup>3</sup> Professor/Doctor, State University of Goiás/ West Campus – Goiás



GAPs are a set of aspects that affect not only the production of a raw material, such as milk, but that covers the entire property. A field technician, before applying a treatment to a property, needs to understand that there are three basic pillars that must be explored: the economic, social and environmental pillars. And BPA's are directly associated with these pillars. It is not only to reduce pathogenic microorganisms in production and increase quality, but also to promote an improvement in the system as a whole, ensuring better gains for the producer, animal and employee welfare, work and food safety, and highly sustainable production, among other aspects encompassed in the Brazilian milk production system (Deretti, 2019).

The adequacy of the application of GAP comes up against the perception, on the part of producers, that good practices have little or possibly no impact on the final result of the production system and on the quality of the products, and, therefore, do not recognize them to the point of incorporating them properly (Young et al., 2010). From the perspective of regulation, the provisions of technical recommendations are adopted, specifically, the national (RIISPOA, IN 76, IN 77 in 2018) and international (*Codex Alimentarius*, FAO/IDF and OIE documents) Normative Instructions and Regulations. It is also mentioned that to help the competitiveness of producers, Embrapa launched a biosafety certification seal in 2022, in which it guarantees that that property produces with BPA and mainly guarantees the well-being of the animals (Steagall, 2022).

According to the regulations, it is mentioned that IN 76/2018 (some items amended by IN 58/2019 and IN 55/2020), the Technical Regulations that establish the identity and microbiological and physicochemical characteristics that refrigerated raw milk must present are approved. It is observed in IN 77/2018 (amended by IN 59/2019), the criteria and procedures for the production, packaging, conservation, transportation, selection and reception of raw milk in establishments registered with the official inspection service (BRASIL, 2018). According to IN 77 (BRASIL, 2018), the establishment must maintain as part of its self-control program, the milk supplier qualification plan (PQFL), which must include technical and managerial assistance, as well as the training of all its suppliers, with a focus on property management and implementation of GAP.

## **OBJECTIVE**

Thus, the objective of this study was to evaluate the GAP applied to dairy farms in the region of Vale do São Patricio in Goiás.

## **METHODOLOGY**

The exploratory field research was carried out in September 2023, covering three milk producers in the municipality of Itapuranga-Goiás, located in the region of Vale do São Patricio. The properties were



selected from the final stage carried out in a Technical Assistance company that serves the region. For data collection, a technical visit was carried out by a student of Veterinary Medicine, accompanied by the mandatory internship supervisor, to evaluate the processes, hygienic-sanitary and structural conditions, through observations and information provided by those responsible, for the proper completion of a checklist. The application of the checklist and interviews were carried out in a single moment, lasting an average of 30 minutes.

A roadmap of indicators of the practices adopted for the six key areas of good practices listed in the Milk Supplier Qualification Plan (PQFL) provided for in IN No. 77/2018 (Brazil, 2018 and 2019) was addressed: among other items related to the characterization of the properties, which: average production, breed of cattle, type of labor, type of management, type of milking, expansion tank and if there is technical assistance, in addition, CCS and CPP data. The evaluation of the GAP's was also carried out through visual inspection in all properties.

For evaluation, the checklist script presented 3 (three) answer options, identified as to the degree of compliance, as "YES" (S), in compliance with all the requirements of the evaluated item, "NO" (N), when it does not meet one or more requirements of the evaluation item, and "NOT APPLICABLE" (NA), when the evaluation item does not apply/is not present in the inspected property.

The items, whose answer would be "Not applicable", were not evaluated. The collected data were tabulated in a spreadsheet with the help of the Microsoft Office Excel software, to calculate the frequencies. The results of the SCC and CCP were evaluated using ANOVA, with subsequent application of the test for comparison between means,  $p > 0.05$ . For the analysis of variance, logarithmic transformation (logarithm in base 10) of the results of SCC ( $\log_{10} \text{CCS}$ ) and CPP ( $\log_{10} \text{CPP}$ ) was performed.

## **DEVELOPMENT**

From the data obtained through the application of the checklist, it became possible to characterize the milk production units that participated in the present study and that are part of the region of Vale do São Patricio, thus, the general characteristics of the properties can be observed in Table 1.

Table 1 - Characterization of the Properties dairy companies with Good Agricultural Practices installed in the region of Vale do São Patricio in August/September.

Category	Property 1	Property 2	Property 3
Number of Animals	19	85	23
Race	Dutch	Dutch	Jersey/Dutch
Daily average liters	480L	2,000L	490L
Family Labor	Yes	No	Yes
Size in Bushels	5.5 alq.	8 alq.	3 alq.
Technical Assistance	Yes	Yes	Yes
Handling	Semi-intensive	Intensive	Semi-intensive
Expansion Tank	Yes	Yes	Yes
Type of Milking	Mechanized	Mechanized	Mechanized
Number of people	2	6	2
Education level	Middle school	Middle school	Technical education

The properties are located in different regions of the municipality of Itapuranga, but have similar management between them. In most of the properties, the Holstein breed predominates, a breed that is present in almost all milk producing units. The predominant production system is based on pasture with concentrated supplementation and conserved forage. Nutritional, reproductive and sanitary management is similar among the semi-intensive ones, and in relation to milking hygiene, all three perform *pre-* and *post-dipping*.

As for the infrastructure for producing and obtaining milk, the producers used wooden or concrete stables with concrete floors and milking parlors with pits as milking places, and the others still use stalls with dirt floors. The main milking system found is mechanical milking with a milk transfer. The storage and cooling of the milk is carried out in expansion tanks.

In relation to the items evaluated regarding the qualification of the producers, Table 2 shows the results obtained.

Table 2 - Level of compliance of the areas of evaluation of good practices for the production of dairy farms

Item	Property 1	Property 2	Property 3
	(%)		
Property management	80	60	75
Input management	67	100	66
Sanitary management	60	50	50
Food management and food storage	72	85	78
Water quality	67	50	83
Personal hygiene and workers' health	100	100	100
Integrated pest control	100	100	100
Worker empowerment	50	0	50
Milking and post-milking management	93	60	86
Milk refrigeration and storage	100	87	87
Waste management and treatment of waste and effluents	75	25	25
Rational use and storage of chemicals, toxic agents and veterinary drugs	58	57	57
Preventive maintenance and calibration of equipment	100	100	50

Adoption of rational management and animal welfare practices	67	67	67
--	----	----	----

Table 3 – Mean of the last three months of Somatic Cell Count and Standard Plate Count of the three properties

Parameters	Property 1	Property 2	Property 3
CCS/Céls/mL x 1000	193a	1,000b	210a
CPP/UFC/mL x 1000	24th	1.386b	2nd

Different capital letters in the columns indicate statistical difference (P<0.05).

Table 2 shows the adoption of insufficient practices in the crucial areas of animal health and milking hygiene, which have direct and immediate impacts on milk quality, the other areas also lack the implementation of GAP. These areas represent a significant opportunity to increase the efficiency of the production system as a whole, in addition to impacting food quality and safety. GAP in the areas of nutrition, animal welfare, and socioeconomic management have a high potential impact on the financial result of the production system and can be the starting point for changes in producers' perception of the importance of GAP (Deretti, 2019).

Analyzing the data provided, it is highlighted that the management of the property, which includes the implementation and monitoring of the GAPs, varies between 60% and 80% in the three properties. This suggests that there is room for improvement in the implementation of GAP's in these farms, which could result in quality milk production. Input management, which refers to the quality of feed used in milk production, shows significant variation between farms, with one farm achieving 100% compliance. According to Brito et al. (2021), the quality of the inputs can have a direct impact on the quality of the milk produced. In relation to stock, specifically in the context of veterinary products and other agricultural inputs, inadequate management can negatively affect the quality of the food produced. Improper storage can result in contamination or loss of effectiveness of the products. The GAPs establish that quality management must be maintained at all stages of production (Almeida, 2015).

Cruz (2019), highlights the importance of *pre- and post-dipping* in the reduction of SCC and CPP, and in the general hygiene of milk production. Property 1 and 3 have better results in this regard compared to property 2. Thus, this poor hygiene can directly reflect on the final milk quality data, as evidenced in Table 3, in which the SCC and CPP data of farm 2 are well above what is expected by the Brazilian legislation.

Sanitary management, which is crucial to prevent disease and ensure herd health, shows relatively low compliance across all farms. This is concerning as herd health is a key factor in the production of high-quality milk. Pereira (2022) relates animal health to quality production, inserted in GAPs. Water quality, which is essential for herd health and milk quality, varies significantly between farms. This suggests that water quality may be an area of focus for improving milk quality at these properties.



As for the hiring of employees, it is essential that they receive the proper training, especially in intensive management properties. This not only ensures production quality, but also provides a safer and more efficient working environment. There is a need for investment in training and development of skills in this aspect. On the other hand, property 3 presents an interesting dynamic by having family labor with technical training in finance. This may explain the effectiveness in the management of certain aspects of the property, reflecting a more strategic and analytical approach to the management of the agricultural business. Deretti (2019) shows how this can be beneficial to the property by professionalizing employees to apply BPA's for quality production.

The implementation of GAPs plays a crucial role in the quest for the quality of the milk produced. In the context of general herd management, it is essential that properties adopt practices that promote animal welfare, avoiding situations of heat stress. In this sense, it is remarkable to observe that the three properties are progressively moving towards proper management, demonstrating a commitment to the health and comfort of the animals. Zanello (2021) points out how animal welfare applied correctly can positively change the economic model of Brazilian livestock.

The highest percentage of non-compliance was waste management, which is related to the treatment of waste generated in milking, even on whether there is an adequate disposal of milk unfit for consumption. It is important to highlight that the management of waste disposal is a significant aspect for the sustainability and hygiene of milk production. The three properties are adapting to this. The correct management of waste contributes not only to the preservation of the environment, but also to the integrity of the final product, avoiding unwanted contamination and promoting food safety. Property 2 had a biodigester, which explains a reasonable index in this regard. Therefore, only half of the waste was sent there. As Campos (2021) says, in dairy farming, when animals are accommodated in semi-confinement or confinement systems, it is crucial to develop the best strategy to deal with these residues, implying the need to determine the most appropriate treatment procedure.

According to the descriptive analysis (Table 3), the property that presented the greatest variation in relation to the microbiological quality data was property 3. However, it was observed that in the other two farms the data were very similar both in the quality of the milk itself and in the management. Property 1 and 3 are family-owned.

Correlating Table 2 with Table 3, it can be seen that in property 02, in addition to not having waste management, which is 25%, there was no adequate refrigeration, milk storage, post-milking management at 60%, training of workers at inadequate levels, water quality and sanitary management at 50%, which explains the high numbers in SCC and CPP. In this way, it may contribute to an increase in the presence of bacteria on the farm, as evidenced by the frequency of cases of foot disease and the number of cows that had only three-quarters of mammary due to mastitis recurrences. In property 3, the labor was



conducted by the owner himself, and the low CPP index can be explained by the emphasis on hygiene, which was learned in a course, following the same way observed in property 01.

Cortez (2008) points out that there are several dangers related to milk contamination, physical, chemical and biological dangers, and that it is essential to have a strict control of the entire production process, from obtaining to processing to ensure the final quality of the product. The same author reinforces that what maintains a hygienic milking is the handler, it is with him the responsibility for preventive and corrective actions. Therefore, it is essential for a field technician to pass on scientific knowledge in a clear and objective language so that there is learning in this part. All of this is directly related mainly to the non-conforming data of property 02.

Tronco (2010), reinforces the importance of adhering to sanitary standards for the commercialization of dairy products. In property 2, for example, the overall average was much higher than what is allowed by law, which is 500,000 cells/mL for SCC and CPP of 300,00 CFU/mL at the maximum limit (BRASIL, 2018). Therefore, in order to continue to market the products, an appropriate treatment for mastitis must be applied. And breaking down the CPP results, still on the same property, the first two months were below the limit, but what pulled the average up was the last month analyzed in which it was in 5,006,000 CFU/mL, mainly due to non-training of the team, which indicates the need for team training, which would also ensure a better work environment for employees.

In the theoretical line of BPAs, Cruz et. al. (2019), say about the importance of applying GAP's in all aspects of the property, covering social, environmental and economic aspects, to avoid pathologies related to poor management, since it can even become a public health issue. Thus, the waste must be well directed, which was seen only in property 1, good disposal of the waste would avoid microbiological dissemination, reducing the data of CPP and CSS.

## **FINAL CONSIDERATIONS**

The application of BPA's in milk production is essential to ensure product quality. Correct waste management, animal welfare and employee training play crucial roles in this process. Property 1 and 3 have family labor, and therefore can indicate reasonable rates of BPA's since they have a greater concern with maintaining good production and ensuring greater profits. Property 2, on the other hand, only hires employees without first undergoing training, and this indicates a drop in GAP's because they do not have the technical visualization of the process.



## REFERENCES

- Almeida, R. L. (2015). Boas práticas agropecuárias. Brasília: Ministério da Agricultura, Pecuária e Abastecimento.
- Brasil. Ministério da Agricultura, Pecuária e Abastecimento. (2019). Normative Instruction No. 58, of November 2019. Amendment to Articles 44, 45, 49, and 52 of IN 77 of 2018. Official Gazette of the Union, Section 1, November 7, 2019, p. 18.
- Brasil. Ministério da Agricultura, Pecuária e Abastecimento. (2019). Normative Instruction No. 59, of November 2019. Amendment to Articles 07 and 08 of IN 76 of 2018. Official Gazette of the Union, Section 1, November 7, 2019, p. 18.
- Brasil. Ministério da Agricultura, Pecuária e Abastecimento. (2018). Normative Instruction No. 76, of November 2018. Approves the Technical Regulations that define the identity and quality characteristics of refrigerated raw milk, pasteurized milk, and pasteurized milk type A. Official Gazette of the Union, Section 1, November 30, 2018, p. 9.
- Brasil. Ministério da Agricultura, Pecuária e Abastecimento. (2018). Normative Instruction No. 77, of November 2018. Establishes the criteria and procedures for the production, packaging, conservation, transportation, selection, and reception of raw milk in establishments registered with the official inspection service. Official Gazette of the Union, Section 1, November 30, 2018, p. 10.
- Brito, M. A., Campos, A. T., & Embrapa. (2021). Agronegócio do leite: Qualidade. Embrapa.
- Campos, A. T. (2021). Agronegócio do leite: Manejo dos dejetos. Embrapa.
- Cortez, M. A. S. (2008). Qualidade do leite: Boas práticas agropecuárias. Niterói: EDUFF.
- Cruz, A. G., Zacarchenco, P. B., Oliveira, C. A. F., & Corassin, C. H. (2019). Microbiologia, higiene e controle de qualidade no processamento de leites e derivados (1st ed., Vol. 4). Rio de Janeiro: Elsevier.
- Cruz, V., & outros. (2019). Boas práticas agropecuárias (BPA) no controle e prevenção da mastite bovina: Estudo de caso. Enciclopédia Biosfera, 16(30).
- Dereti, R. M., & outros. (2019). Boas práticas agropecuárias na produção leiteira: Diagnóstico e ajuste de não conformidades. Arquivo Brasileiro de Medicina Veterinária e Zootecnia, 71, 2075–2084.
- Zanella, J. A. (2021, July 6). The role of animal welfare as an indicator of Brazilian agriculture sustainability. *Jornal da USP*. <https://jornal.usp.br/?p=433207>. Accessed on November 8, 2023.
- Neto, J. N. S. M., & outros. (2018). Best practices in dairy production: Main non-conformities in small properties in Campos dos Goytacazes, RJ. Proceedings of the Academic Week of the Agronomy Course at CCAE/UFES-SEAGRO.
- Pereira, A. (2021, November 8). Sanitary management: The importance for cattle welfare. Santa Catarina: Labovet.



- Ströher, J. A., & outros. (2021). Evaluation of good agricultural practices in dairy farms in the Serra Gaúcha-RS. *Research, Society and Development*, 10(7), e1710715696-e1710715696.
- Steagall, M. (2022). Dairy farms: New good practices seal launched. Summit Agro. <https://summitagro.estadao.com.br/saude-no-campo/fazendas-de-leite-novo-selo-de-boas-praticas-e-lancado/>. Accessed on November 8, 2023.
- Tronco, V. M. (2010). *Manual for milk quality inspection* (4th ed.). Santa Maria: Ed. UFSM.
- Young, I., & outros. (2010). Attitudes towards the Canadian quality milk program and use of good production practices among Canadian dairy producers. *Preventive Veterinary Medicine*, 94, 43–53.