

Campus Colorado do Oeste
Coordenação do Curso em Bacharelado em Medicina Veterinária

EDUARDA CARINTA COIMBRA FARIA

**ESTUDO DIAGNÓSTICO DAS ROTINAS E BOAS
PRÁTICAS DE ORDENHA EM PROPRIEDADES DE
AGRICULTURA FAMILIAR NA REGIÃO DO CONE SUL
DE RONDÔNIA.**

COLORADO DO OESTE

2026

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Artigo entregue como Trabalho de Conclusão de Curso ao Instituto Federal de Educação, Ciência e Tecnologia de Rondônia (IFRO), *Campus* Colorado do Oeste, como requisito parcial para obtenção do grau de bacharel, junto ao Curso Medicina veterinária, sob a orientação do professor Matheus Henrique Nogueira.

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**Prof. MSc. Matheus Henrique Nogueira
(Orientador)**

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RESUMO

A segurança alimentar e a viabilidade econômica da agricultura familiar estão diretamente vinculadas à qualidade do leite produzido, a qual é frequentemente comprometida por falhas na higiene de ordenha e pela alta prevalência de mastite bovina. Este estudo teve como objetivo diagnosticar as práticas de manejo, a infraestrutura das instalações e o monitoramento da saúde do rebanho em 40 pequenas e médias propriedades leiteiras, selecionadas aleatoriamente em seis municípios da região do Cone Sul de Rondônia, Brasil. A coleta de dados foi realizada por meio de visitas técnicas e aplicação de checklists estruturados, fundamentados nas Instruções Normativas federais nº 76 e nº 77. Os resultados demonstraram o predomínio da ordenha manual (65%) e do estímulo natural com o bezerro ao pé (82,5%), enquanto o uso de ocitocina para a ejeção do leite foi observado em apenas 17,5% dos casos. Foram identificadas lacunas sanitárias críticas para a qualidade do produto: 85% dos produtores não adotam procedimentos de desinfecção pré ou pós-imersão (*pré* e *pós-dipping*), 75% não realizam o teste da caneca de fundo preto para detecção de mastite clínica e 60% reutilizam o leite de forma inadequada. No que tange à infraestrutura, embora 90% das áreas de ordenha sejam cobertas, 60% carecem de piso impermeável, o que resulta no acúmulo prejudicial de matéria orgânica no ambiente de ordenha.

Palavras-chave: Qualidade do leite cru; higiene na ordenha; mastite bovina; agricultura familiar; segurança alimentar

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Milking management diagnosis identifies key hygiene and infrastructure risks in regional dairy production

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Abstract. Dairy farming is a cornerstone of rural development and food security in family agriculture; however, its economic viability depends heavily on milk quality, which is often compromised by inadequate milking hygiene and the high prevalence of bovine mastitis. This study aimed to evaluate milking management practices, including hygiene protocols, facility infrastructure, and herd health monitoring, on family-farming properties in the Southern Cone region of Rondônia, Brazil. Forty small- and medium-sized dairy farms were randomly selected for evaluation across six municipalities. Data were collected through technical visits using structured checklists based on Brazilian federal regulations, covering pre-milking procedures, facility infrastructure, milking practices, and post-milking management. Manual milking (65%) and natural calf-at-foot stimulation (82.5%) were the predominant practices in the region, whereas only 17.5% of farms used oxytocin to stimulate milk let-down. Significant sanitary deficiencies were identified: 85% of producers did not perform pre- or post-dipping disinfection, and 75% did not carry out strip cup tests for mastitis detection. Although 90% of milking areas were covered, 60% lacked impermeable flooring, resulting in the accumulation of organic matter. Furthermore, 60% of producers improperly reused milk from sick cows for animal feed instead of discarding it. While 92.5% correctly identified treated animals, 55% remained unaware of milk-borne zoonoses. These findings reveal a critical gap between traditional farming practices and the technical standards required, posing risks to food safety and the competitiveness of the regional dairy sector. Improving milk quality in this production system requires targeted technical assistance and low-cost structural adjustments to align family-based dairy farming with industrial safety standards.

Keywords: Bovine mastitis, family farming, food safety, milking hygiene, raw milk quality.

O diagnóstico da gestão da ordenha identifica os principais riscos de higiene e infraestrutura na produção leiteira regional

Resumo. A pecuária leiteira é um pilar do desenvolvimento rural e da segurança alimentar na agricultura familiar; entretanto, sua viabilidade econômica depende fortemente da qualidade do leite, frequentemente comprometida pela higiene inadequada na ordenha e pela alta prevalência de mastite bovina. Este estudo teve como objetivo avaliar as práticas de manejo da ordenha, incluindo protocolos de higiene, infraestrutura das instalações e monitoramento da saúde do rebanho, em propriedades de agricultura familiar na região do Cone Sul de Rondônia, Brasil. Quarenta pequenas e médias propriedades leiteiras foram selecionadas aleatoriamente para avaliação em seis municípios. Os dados foram coletados por meio de visitas técnicas, utilizando *checklists* estruturados com base na legislação federal brasileira, abrangendo procedimentos pré-ordenha, infraestrutura das instalações,

práticas de ordenha e manejo pós-ordenha. A ordenha manual (65%) e o estímulo natural com o bezerro ao pé (82,5%) foram as práticas predominantes na região, enquanto apenas 17,5% das propriedades utilizavam ocitocina para estimular a ejeção do leite. Foram identificados importantes deficiências sanitárias: 85% dos produtores não realizavam desinfecção pré ou pós-dipping, e 75% não executavam o teste da caneca de fundo preto para detecção de mastite. Embora 90% das áreas de ordenha fossem cobertas, 60% não possuíam piso impermeável, favorecendo o acúmulo de matéria orgânica. Além disso, 60% dos produtores reutilizavam inadequadamente o leite de vacas doentes para alimentação animal, em vez de descartá-lo. Embora 92,5% identificassem corretamente os animais tratados, 55% desconheciam as zoonoses transmitidas pelo leite. Esses achados revelam uma lacuna crítica entre as práticas tradicionais de produção e os padrões técnicos exigidos, representando riscos para a segurança alimentar e para a competitividade do setor leiteiro regional. A melhoria da qualidade do leite nesse sistema produtivo requer assistência técnica direcionada e ajustes estruturais de baixo custo, a fim de alinhar a produção familiar aos requisitos de segurança da indústria.

Palavras-chave: Mastite bovina, fazenda familiar, segurança alimentar, higiene de ordenha, qualidade do leite cru.

Introduction

Milk production plays a fundamental role in the agricultural economy and food security, particularly within family farming systems, where it contributes to income generation, rural development, and the sustainability of production systems ([Fiorillo & Amico, 2024](#); [Pires et al., 2018](#); [Santos, 2022](#)). However, the competitiveness and economic viability of this production chain depend on milk quality, which is frequently threatened by failures in sanitary management and milking hygiene ([Gagnon et al., 2025](#); [Ramírez-Rivera et al., 2019](#); [Soares et al., 2019](#)). Among the main obstacles, bovine mastitis stands out as the disease with the greatest global economic impact on dairy herds ([Fonseca et al., 2021](#); [Peres Neto & Zappa, 2011](#); [Silva & Nogueira, 2010](#); [Stanek et al., 2024](#)).

Subclinical mastitis is particularly insidious because, although it presents no visible signs in the udder or milk, it causes a marked increase in Somatic Cell Count (SCC) and a silent reduction in milk production and industrial yield ([Almeida et al., 2021](#); [Costa, 2017](#); [Oliveira, 2020](#); [Zalewska et al., 2025](#)). Recent studies conducted in neighboring Brazilian states have demonstrated that the presence of pathogens such as *Staphylococcus aureus* and microorganisms from the NASM group (Non-aureus *Staphylococci* and *Mammaliicoccus*) can reduce the daily economic return per cow by up to US\$ 0.65 ([Awale et al., 2012](#); [Hogeveen et al., 2011](#); [Reneau & Packard, 1991](#); [Silva et al., 2024](#)). This financial loss is influenced not only by the pathogen involved, but also by factors such as parity, stage of lactation, and the number of infected mammary quarters.

Beyond production losses, inadequate hygiene practices favor the microbiological contamination of raw milk and the dissemination of pathogenic microorganisms ([Fávero et al., 2015](#); [Murphy et al., 2016](#)). In this context, producers' perception of herd health is a key determinant of disease control. However, the demand for professional technical assistance remains limited. In some production systems, although the perceived incidence of clinical mastitis is approximately 3.7 cases per 100 females per year, only about 11% of producers seek veterinary assistance ([Castro et al., 2025](#)), highlighting a gap between disease occurrence and adequate technical management. This deficiency in technical management, combined with the persistence of bacterial biofilms on milking equipment ([Goetz et al., 2025](#)), represents a significant risk to public health and dairy product quality ([Doyle et al., 2017](#)).

In the state of Rondônia, the high prevalence of mastitis and the scarcity of studies on milk quality in specific regions, such as the South Cone, underscore the need for local diagnoses to support more effective control measures. Therefore, evaluating management practices on farms where production is primarily based on family subsistence is essential, since the lack of technical data may compromise microbiological quality and food safety ([Silva et al., 2024](#)). Given this scenario, the present study aimed to diagnose milking management practices on family farming properties in the South Cone region of Rondônia. The research evaluated aspects related to hygiene, infrastructure, sanitary management, and

producers' knowledge, with the objective of providing information to improve milk quality and strengthen regional food security.

Material and methods

The study was conducted in the South Cone region of the state of Rondônia, encompassing the municipalities of Colorado do Oeste, Cabixi, Cerejeiras, Pimenteiras do Oeste, Corumbiara, and Vilhena. Forty small and medium-sized dairy farms, randomly selected, were evaluated between January and July 2025.

Data collection was performed through technical visits to the farms, during which a structured checklist for diagnosing milking practices was applied, adapted from ([Silva et al., 2024](#)). The instrument was based on the guidelines established by Normative Instruction (IN) No. 76 of November 26, 2018 (Ministry of Agriculture, Livestock and Food Supply ([MAPA, 2018a](#)), and IN No. 77 of November 26, 2018 (Ministry of Agriculture, Livestock and Food Supply ([MAPA, 2018b](#)). The checklist was divided into four sections: (i) procedures adopted by the milker before the beginning of milking, (ii) facility infrastructure, (iii) practices performed during milking, and (iv) post-milking management.

Information was obtained directly from rural producers, recorded in standardized forms, and subsequently tabulated in Microsoft Excel® spreadsheets. Data were analyzed descriptively using absolute and relative frequencies and were presented in tables and graphs to facilitate interpretation of the results. Personal information from the producers was kept confidential, ensuring anonymity and data privacy throughout the study.

Results and discussion

The results obtained demonstrate that the milking management practices adopted on the evaluated farms are heterogeneous, with advances in some aspects and significant deficiencies in others, directly affecting milk quality and food safety.

Infrastructure and operational characteristics

Table 1 presents the infrastructure and operational characteristics of the visited farms. Our study revealed that 90% of the properties had covered milking areas. Adequate facilities help prevent accidents and reduce stress in cattle ([Arruda et al., 2024](#)). Furthermore, providing shelter through covered facilities is essential to protect the herd from direct solar radiation and adverse weather conditions, such as rain and wind, resulting in significant benefits for physiological responses and thermal comfort in dairy cows ([Schütz et al., 2010](#)).

Although most farms had covered milking areas, only 40% possessed impermeable flooring. This factor is crucial for bovine welfare and performance, as the quality and type of flooring directly affect gait characteristics; slippery or inadequate surfaces reduce stride length and significantly increase the risk of falls and locomotor injuries ([Murphy et al., 2018](#); [Telezhenko et al., 2017](#)). Moreover, the presence of impermeable and easy-to-clean surfaces in the milking area is one of the structural pillars for controlling environmental bacterial load, since deficiencies in floor design and cleaning are positively associated with increased bacterial contamination of teats ([Magnusson et al., 2008](#); [Murphy et al., 2018](#)).

Table 1. Infrastructure and operational characteristics of dairy farms in Southern Rondônia (n = 40)

Characteristic	Category	Frequency (%)
Milking Facility	Covered area	90
	Impermeable flooring	40
Milking System	Manual	65
	Mechanical	35
Let-down Stimulus	Calf-at-foot	82.5
	Oxytocin	17.5
Biosecurity	Basic hygiene materials	30
	Presence of other animals	80

The absence of this type of flooring compromises environmental hygiene due to the accumulation of organic matter, mud, and waste, since permeable surfaces hinder the proper drainage of water used during cleaning. This prolongs environmental humidity and creates favorable conditions for the survival and proliferation of pathogenic microorganisms ([Murphy et al., 2018](#)). These environmental conditions increase the microbial load at the milking site and elevate the risk of udder and milk contamination during milking ([Deddefo et al., 2023](#)). According to [Ruegg \(2017\)](#), frequent exposure to humid environments with high organic loads is the main risk factor for environmental mastitis, as these pathogens are opportunistic invaders that inhabit the environment and require direct contact with the udder to cause infection. Thus, the absence of impermeable flooring represents not only a structural limitation but also a sanitary risk factor that compromises milk microbiological quality and animal health.

Regarding the milking system, 65% of the properties used manual milking, whereas 35% adopted mechanical milking. These results demonstrate that manual milking still predominates in family farming systems in the region, reflecting low-technology production systems in which milk production is primarily directed toward subsistence or local markets, potentially compromising the quality of the final product ([Alves et al., 2013](#); [Lange et al., 2017](#); [Silva et al., 2021](#)). Similarly, 82.5% of producers reported allowing calves to suckle before milking as a stimulus for milk let-down. This traditional practice is characteristic of systems with low technical investment and manual milking routines. In contrast, only 17.5% of the farms used exogenous oxytocin administration to stimulate milk flow. The limited use of pharmacological stimulation highlights a production model focused on family subsistence and low-cost management, since injectable hormones generally involve higher operational costs and require more specialized management of the herd's physiological responses. These findings corroborate reports from other Brazilian regions, such as the states of Piauí ([Castro et al., 2025](#)), Rio Grande do Sul ([Kleinübing et al., 2021](#)), and São Paulo ([Jamas et al., 2018](#)), where the predominance of manual milking and calf-at-foot management reflects infrastructural limitations and the persistence of traditional practices in family farming systems ([Jamas et al., 2018](#); [Kleinübing et al., 2021](#); [Saran Netto et al., 2009](#)).

Regarding the availability of basic hygiene materials, only 30% of the properties had potable water, soap, and a lidded trash can available at the milking site, whereas 70% lacked these essential items. This scenario demonstrates that deficiencies in basic hygiene practices remain prevalent and compromise milk quality. In addition, 80% of the properties housed other animal species in the corral alongside dairy cattle, which hinders environmental hygiene and consequently increases the risk of cross-contamination, compromising both milk quality and herd health ([Abebe et al., 2023](#)). These findings highlight the need for effective management strategies and environmental adjustments to mitigate production losses. Strict control of the milking environment is essential to prevent infections ([Ruegg, 2017](#); [Silva et al., 2024](#)).

Milking hygiene and disease control practices

The adoption of core milking hygiene and disease control practices varied considerably, and most practices were not adopted by the majority of producers (Figure 1). Regarding teat hygiene before milking, 57.5% of producers did not perform adequate teat cleaning, whereas 42.5% reported carrying out this procedure. Furthermore, only 15% of producers correctly performed both pre-dipping and post-dipping. The low adherence to these procedures is concerning, since the consistent use of pre- and post-milking disinfectants is fundamental to effective mastitis control programs and indispensable for optimizing mammary gland health and reducing the economic losses associated with the disease ([Silva et al., 2024](#)). Teat disinfection, particularly post-dipping, remains the single most effective practice for preventing new intramammary infections and reducing the microbial load in the milking environment ([Ruegg, 2017](#)).

The adoption of diagnostic tools for clinical mastitis monitoring was also found to be deficient. Only 25% of the evaluated producers performed the strip cup test during milking. This low adherence is critical, as it suggests that subclinical or early-stage clinical cases may not be properly identified, directly compromising the microbiological quality of milk and regional food safety. This negligence, combined with the low adoption of disinfection protocols, underscores the persistence of traditional practices that favor the dissemination of intramammary pathogens within the herd.

Regarding the management of animals with mastitis or other diseases, 75% of producers reported milking affected animals last. Concerning the disposal of milk from sick animals, only 40% reported disposing of it properly, whereas 60% continued to offer it to other animals. Negligence in milk disposal management and milking order is critical, since pathogens such as *Staphylococcus aureus* can persist in the mammary gland, causing progressive tissue damage and intensifying economic losses over time ([Silva et al. 2021](#)). Furthermore, the absence of protocols for correctly identifying the causative agent compromises treatment efficacy and herd biosecurity, increasing the risk of disseminating intramammary infections ([Castro et al., 2025](#)).

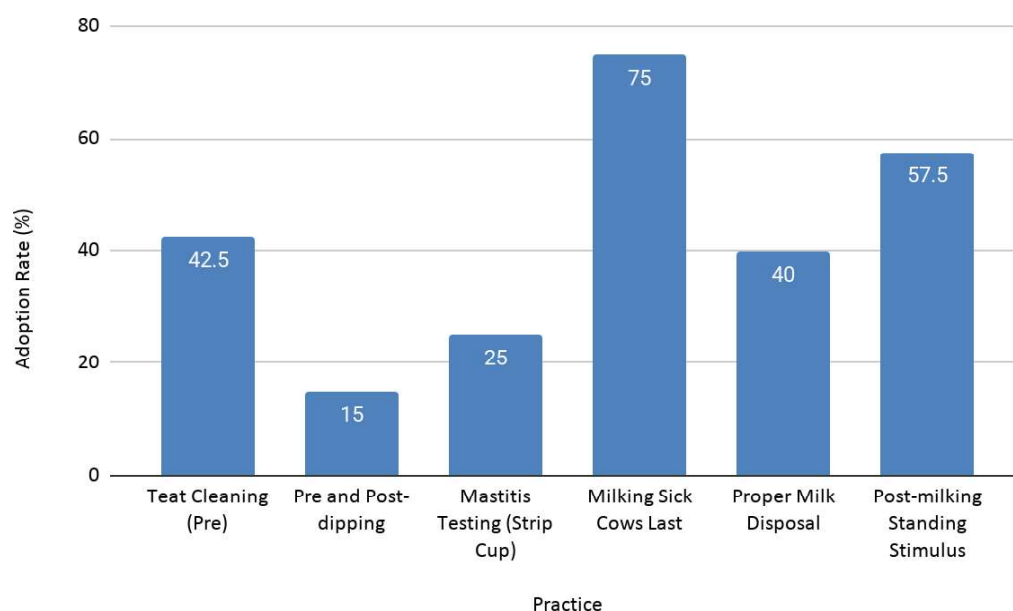


Figure 1. Core milking hygiene and disease control practices

During the post-milking period, 57.5% of producers encouraged animals to remain standing by offering feed. This practice is technically recommended to prevent intramammary infections, as it favors closure of the teat sphincter ([Tyler et al., 1997](#)). Keeping cows standing during this interval prevents direct contact between the teat end and contaminated environmental surfaces, thereby reducing exposure to opportunistic pathogens while the sphincter remains incompletely closed ([Ruegg, 2017](#)). Negligence in post-milking preventive management practices constitutes a risk factor that compromises mammary gland health and negatively affects the farm's economic performance ([Silva et al., 2021](#)).

Technical support, herd health management, and sanitary knowledge

Regarding zoonoses transmitted through the consumption of raw milk, only 45% of producers demonstrated awareness of these risks, whereas 55% lacked adequate knowledge (Figure 2). This finding highlights an important sanitary vulnerability, particularly in subsistence farming systems, where the absence of technical assistance compromises the quality and safety of the final product ([Silva et al., 2021](#)). This scenario reinforces the importance of rural extension programs and the involvement of animal health professionals to promote the responsible use of medications and the appropriate application of diagnostic tests ([Dillon et al., 2016](#)).

The search for veterinary assistance in suspected mastitis cases was reported by 65% of producers. Although this percentage is higher than that observed in other production contexts, where only approximately 11% of producers seek technical assistance to manage clinical cases ([Castro et al., 2025](#)), the persistence of a proportion of producers without professional support reinforces the need for greater veterinary involvement. Technical monitoring is fundamental for encouraging the adoption of appropriate diagnostic methods and the responsible use of veterinary medicines, both of which are essential for successful prevention strategies. In addition, the absence of technical data and continuous support hinders the development of targeted control strategies, which are indispensable for optimizing

mammary gland health and mitigating the economic impacts of mastitis within the herd ([Silva et al. 2021](#)).

The identification and marking of treated cows during lactation were reported by 92.5% of producers, representing a positive indicator of sanitary management. This practice enables proper control of the withdrawal period and prevents economic losses associated with the inappropriate disposal of milk. Compliance with the withdrawal period is essential to ensure consumer safety and prevent the presence of antibiotic residues in milk ([Climova et al., 2024](#)).

Regarding medication use, 80% of producers reported using properly labeled products within their expiration dates. Correct drug identification is essential to prevent administration errors and reduce the risk of drug residues in milk (Ministry of Agriculture, Livestock and Food Supply ([MAPA, 2018b](#))). Furthermore, 70% of producers reported storing medications for dry cows separately from those intended for lactating cows. Proper organization and judicious use of medications constitute fundamental pillars of sanitary management ([Ruegg, 2017](#)). Adherence to correct intramammary therapy procedures is crucial for minimizing production losses and preserving milk quality ([Silva et al., 2021](#)).

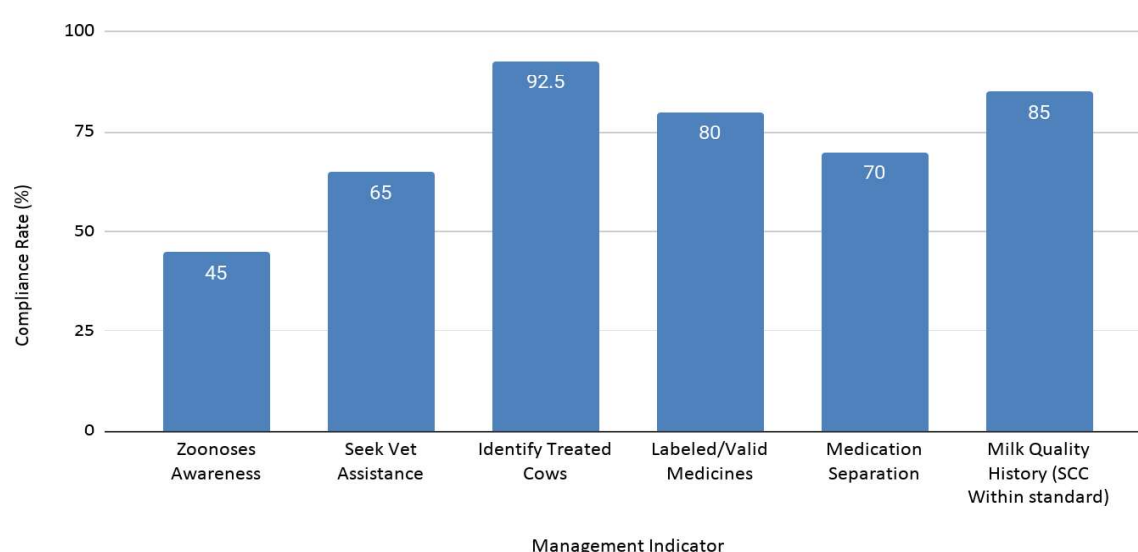


Figure 2. Veterinary medicine and herd health management

Regarding herd sanitary control, 85% of producers reported that somatic cell count (SCC) was within the required standard in recent months, while 15% reported values above the recommended range. This result aligns with the work of [Saran Netto et al. \(2009\)](#), who identified a higher incidence of SCC in manual milking than in mechanical milking, yet still within MAPA-established standards. However, the apparent compliance of SCC levels must be interpreted with caution. The previously noted lack of proactive diagnostic routines at the farm level suggests that current management may be failing to detect silent intramammary infections. Without continuous technical monitoring and systematic screening, the long-term health of the mammary gland and the overall industrial yield of milk produced in the region remain at risk.

Conclusion

The diagnosis of family-run dairy farms in the South Cone of Rondônia reveals significant contrasts between the adoption of good management practices and the persistence of structural and hygienic-sanitary deficiencies. Although there are consolidated positive points, such as the high rate of identification of treated animals (92.5%) and the presence of shelter in milking areas (90%), the research highlights gaps that compromise food security and the competitiveness of the regional production chain.

The main weaknesses lie in the low adoption of hygiene protocols, such as pre- and post-dipping (only 15%), and the precariousness of cleaning infrastructure, evidenced by the lack of impermeable floors and basic hygiene materials on most properties. Furthermore, the lack of awareness among more

than half of producers (55%) regarding zoonoses transmitted through raw milk, and the inadequate management of milk from sick animals, raises concerns about public health risks and herd health.

The predominance of manual milking and natural calf stimulus reflects the investment limitations characteristic of family farming in the region, but does not justify the absence of simple monitoring tests, such as the strip cup test. Improving milk quality in the South Cone of Rondônia does not depend exclusively on high-cost technological inputs but rather on strengthening rural extension actions and continuous technical assistance. Therefore, it is essential to develop training programs focused on good agricultural practices, with an emphasis on sanitary education and low-cost structural adjustments. Only through producer awareness and the correction of critical management points will it be possible to ensure a final product that meets current regulatory standards, ensuring the economic sustainability of families and the supply of safe food to the population.

Ethics Declarations

Participation in this study was voluntary and restricted to individuals aged 18 or older. All participants signed an informed consent form outlining the voluntary nature of the study and guaranteeing the right to withdraw at any time without penalty, as well as the right to anonymity. The research was conducted as part of a Scientific Initiation project approved by the Federal Institute of Rondônia (IFRO) under Call for Projects No. 6/2024/REIT/PROPESP/IFRO, involving the direct participation of undergraduate Veterinary Medicine students. No personally identifiable information was collected, and all data were analyzed and presented in aggregate, preventing any correlation between specific behaviors or infrastructure and individual respondents or properties.

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Data availability

Data will be made available on request.

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