Profile of bovine-milk-producing farms in Rondon do Pará, state of Pará, Brazil

Perfil das unidades de produção de leite bovino de Rondon do Pará, estado do Pará, Brasil

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Abstract

This study describes the bovine milk-producing farms of Rondon do Pará, state of Pará, with the aim of assisting institutional actions and public policies that support the development of the milk production chain. The data were collected from interviews, using questionnaires administered in 55 dairy farms, which together represent 43.3% of the herd of milking cows in the municipality. We collected information on producers, characteristics of the milk-producing farms, dairy exploitation, machines and equipment, facilities and improvements, herd health, milking practices, and herd management. The average age of the interviewees in Rondon do Pará was 57.41 years. The producers had low education levels, with a prevalence of incomplete elementary education. Manual milking was used in 98% of the farms. When it came to hygiene practices, less than 2% of the milkers washed their hands before milk collection, and only 10% cleaned the teats of the cows. Animals were fed almost exclusively on pasture in the rainy season, given that only 2% of the producers complemented the diet with forage. Dairy production involved low technological levels, as the mean productivity was 5.5 L cow $^{-1}$ day $^{-1}$. The adoption of technological innovations in herd management may enable the growth and development of the activity in the municipality, and may make producers aware of the principles of sustainability.
Key words: Family agriculture. Dairy farming. Production systems. Technology. Amazonia.

Resumo

O artigo caracteriza as unidades produtoras de leite bovino de Rondon do Pará, estado do Pará, visando auxiliar ações institucionais e políticas públicas de suporte ao desenvolvimento da cadeia produtiva do leite. Os dados foram coletados a partir de entrevistas, com utilização de questionários, realizadas em 55 propriedades leiteiras, que juntas representam 43,3% do plantel de vacas ordenhadas do município. Foram levantadas informações sobre os produtores; características da unidade de produção e da

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exploração leiteira; máquinas e equipamentos; instalações e benfeitorias; sanidade do rebanho; adoção de práticas de ordenha e manejo do rebanho. Em Rondon do Pará, constatou-se que a idade média dos entrevistados é de 57,41 anos. Os produtores possuem baixo nível de escolaridade, com predominância do ensino fundamental incompleto. Em 98% das unidades produtivas utiliza-se a ordenha manual e quanto à higienização, menos de 2% dos ordenadores lavavam as mãos antes da coleta do leite e apenas 10% higienizavam as tetas das vacas. A alimentação dos animais no período chuvoso é quase exclusivamente a pasto, pois em apenas 2% das unidades de produtivas ocorre complementação da dieta com volumoso. A produção leiteira é de baixo nível tecnológico, pois a produtividade média é de 5,5 L vaca^{-1}dia^{-1}. A adoção de inovações tecnológicas no manejo e gestão pode viabilizar o crescimento e desenvolvimento da atividade no município e alinhar o produtor aos princípios de sustentabilidade.

Palavras-chave: Agricultura familiar. Pecuária leiteira. Sistemas de produção. Tecnologia. Amazônia.

Introduction

Dairy production in the state of Pará is carried out in family farms. The data collected from the 2006 Census of Agriculture indicates that 8 out of 10 bovine-milk-producing farms were family-owned and their total area was lower than 200 hectares (IBGE, 2008). Family farming also accounted for the greatest percentage of milking-cow herds (70.38%) and production (70.29%). Dairy production was concentrated in the mesoregion of southeastern Pará, which accounted for 71.34% of the total production in 2015. Rondon do Pará, a municipality located in this region, is the target of this study. The municipality holds 2.4% of the state dairy production and ranks second in production, with 22.9% in the Paragominas microregion (IBGE, 2015).

Dairy cattle raising is practiced in the state of Pará by producers developing their activities with technological standards that are not efficient in terms of production and sustainability. The milk comes from systems that exploit unspecialized cows, kept in poorly managed pastures, resulting in low animal productivity (LOURENÇO JÚNIOR; SANTOS, 2015; SANTANA; AMIN, 2002).

Areas such as the municipality of Rondon do Pará, which lack information on bovine milk production systems regarding feeding, reproductive, and sanitary management practices, also lack research supporting the development of the activity. Moreover, it favors the implementation of government policies and promotional programs,

especially those related to technical and managerial assistance (LEITE et al., 2004; MONTEIRO et al., 2007; SANTOS; AZEVEDO, 2009; MARTINS et al., 2015).

Thus, this study describes the bovine-milk-producing farms of the municipality of Rondon do Pará, the state of Pará, with the aim of supporting institutional actions, public policies and the adoption of technological innovations in the bovine milk production chain.

Material and Methods

This study was conducted in the municipality of Rondon do Pará (04º46'45" S / 48° 04'00" W), the state of Pará, Brazil, climate type Am, with a mean temperature of 26.35 °C, maximum of 32.01° C, minimum of 22.71 °C, and mean relative humidity of 78%. The data were collected from interviews using questionnaires in 55 dairy farms between 2012 and 2014. These farms, together, represent 43.3% of the milking cows of the municipality (IBGE, 2015).

The snowball technique was used for sample selection. In this technique, each respondent indicated other farms relevant to the research. According to Alexiades (1996) and Bernard (1988), this approach is limited by the relationship networks within the group. Therefore, the farms were selected using information from different sources chosen with the help of technicians from the local office of the Technical Assistance and Rural Extension Company of Pará (Emater), the

Municipal Department of Agriculture of Rondon do Pará, and the Association of Producers "Amigos do Leite" (Amileite).

The questionnaire was administered by researchers from Embrapa Eastern Amazon and a graduate student from the Graduate Program in Animal Science of the Federal University of Pará (UFPA). The interviews followed a structured script for all interviewees, to ensure a uniform collection of information. Therefore, variations in response were only due to individual differences and not due to the manner in which questions were asked by the researchers.

The questions were grouped into the following categories: producer identification, production farm and dairy production description, machines and equipment, facilities and improvements, herd health, milking practices, and herd management. The data were processed in the IBM SPSS 20 software.

Results and Discussion

Farm characteristics

The municipal dairy farms were in the size ranges of up to 100 ha (29.1%), from 101 to 500 ha (60%), and over 500 ha (10.9%). Farms had small areas for the cultivation of temporary and permanent crops that contribute to household food security (Table 1). Different results were observed by Dantas (2016a) in dairy farms in northeastern and southeastern regions of the state of Pará, where most of the farms have a total area of 50 to 100 ha.

Table 1. Mean size of milk-producing farms and soil occupation, according to the total area ranges of the dairy farms of the municipality of Rondon do Pará.

Total Area Ranges	N	%	Mean	Reservation (ha)	Modified (ha)	Pasture (ha)	Crop (ha)
<50 ha	7	12,7	45,1 ± 3,8	8,1	31,5	24,7	1,2
51 <100 ha	9	16,3	89,2 ±14,2	5,5	83,6	81,2	1,7
101<200 ha	14	25,4	137,8 ±25,3	19,6	101,1	72,1	0,6
201<500 ha	19	34,5	339,0 ±100,6	53,0	282	221,3	1,7
>501 ha	6	10,9	854,8 ±225,7	213,1	617,8	577,1	0,8
Total	55	100	265,8 ±253,9	48,53	208,2	174,2	6

Only 65.5% of producers had a legal reserve area, which implies the need for public policies that support them in adopting measures such as the rural environmental registry (CAR), and reducing deforestation. This would increase the percentage of environmentally adequate production farms and strengthen local dairy activity by adding value to the product, providing favorable conditions to access credit, financial support, and rural technical assistance (COSTA; FLEURY, 2015).

The relief of 81.8% of the farms analyzed were slightly undulated, which shows the progress of other activities on flatlands where cattle raising was practiced. There were large grain planting areas, mainly soybeans, with an increase in planting from 150 ha to 12,000 ha, from 2008 to 2014; an increase in corn planting from 3,150 ha to 4,000 ha, from 2008 to 2014; and 11,000 ha of reforestation during the same period (IBGE, 2015).

Milk and calf production was the most frequent in dairy farms (85.5%), followed by milk, calf and fattening (9.1%), and exclusively milk (5.5%), which is why it is difficult for a local dairy farm to specialize in any one domain, although 67.3% of the producers received funding for their activities. Dantas et al. (2016a) found similar data in a study conducted in the same mesoregion.

Dairy production usually took place in intermittent stocking (43.6%) and alternating systems (41.8%), and less frequently in continuous systems (14.5%). It is worth noting that this measure was performed without adequate technical assistance, since technicians accompanied only 32.73% of the producers. Of these, only one-third received technical visits on a monthly basis, 16.66% on an annual basis, and 11.11% sporadically. These results differed from those observed by Dantas et al. (2016b) and Gonçalves and Teixeira Neto (2002) in their study describing dairy cattle in the southeastern mesoregion of the state of Pará, where most producers performed the activity in extensive systems.

Brachiaria brizantha is the grass that is most commonly used by producers (83.6%), a notion generating concern since none of them uses fertilizers in the maintenance of their pastures, thus representing a risk that can favor the appearance of invasive plants and consequent soil degradation. It is imperative that pastures are managed in a rational manner, regardless of the grazing system, to allow the striking of a balancing between high production and nutritive forage value, which results in uniform grazing and high dairy production (GONÇALVES et al., 2005).

All farms had water sources, with a prevalence of rivers (56.4%), streams (47.3%), dams (65.5%), springs (32.7%), and wells (36.4%). Most producers (83.6%) maintained vegetation to protect their water sources. The main water supply sites for the animals were pasture (65.5%) and rivers (12.7%). They also reported cattle shed and spring, and that responsible water management was essential to increase dairy production and the future of the activity (SULTANA et al., 2016).

Producer characteristics

The farms analyzed were located between 3 km and 40 km from the municipality of Rondon do Pará. It was observed that 56.4% of producers live on the farm and most came from the southeastern and midwestern regions of Brazil (50.90%), which have a long tradition in managing dairy farms. Of the total, 36.36% producers came from the northeast region and only 7.3% came from the state of Pará.

The average age of the interviewees was 57.4, which shows that the activity seems to be unattractive to young people, mainly because it is considered tiresome and exhausting, with no labor rights, and because it generates low income. To a certain extent, the profile of the producer is similar to the profile that is identified in other studies conducted in Brazil, where the mean age range of milk producers was found to be above 45, most of them being in the 50-year age range (COSTA, 2006; FRANÇA, 2006; MONTOYA; FINAMORE, 2010; ZOCCAL; GOMES, 2005).

The education level of the producers was low, and most of them (56.36%) did not complete elementary education, while 9.09% were illiterate. This notion can interfere with the effectiveness of public policy and the adoption of technologies that are important in making production systems more efficient and competitive (ZOCCAL et al., 2011).

A total of 38 (69.1%) producers were exclusively engaged in dairy farming, while the others had other sources of income, such as trade and service. This shows the importance of dairy production in family income, as Costa (2006) observed in Gurupi, state of Tocantins.

The analysis of the experience time in dairy production in the region revealed that producers had, on average, 19.87 years of activity, a positive factor, especially if they came from regions with a tradition of dairy farming. However, this factor may have a negative influence on the adoption of new technologies and management practices, since they tend to resist modifying long-term behavior, such as land regularization, rural environmental registry (CAR), preservation of the Permanent Preservation Area (PPA) and Legal Reserve (LR), regeneration of river banks, and other aspects (LOURENÇO JÚNIOR; SANTOS, 2015).

Labor

The participation of men in activities that involved dairy production in the farms was greater (70.91%) when compared to the participation of women (38.18%), with the exception of cheese production. Different results were found by Montoya and Finamore (2010) in a study with 190 milk producers in the southern region of Brazil, where in 78.8% of the farms, women were responsible for milking, herd management, and control of expenses. The members of the family actively participated in the management of the production, which facilitated the operationalization of the system (LANGE et al., 2016).

Employees were mostly hired for temporary jobs (45.45%). However, a considerable number of farms had at least one permanent employee (56.36%), who worked directly in dairy farming along with the owner. It is worth noting that a common complaint among the owners was that it was difficult to find specialized labor for the dairy activity. They usually reported disinterest on part of workers, since they did not adapt to the routine of a milk-producing farm.

The activities that generated monetary income in order of importance were the sale of milk and calves (85.45% of the farms), and the cultivation of rice, beans, cassava, corn, fruits, and vegetables, which was carried out by a smaller portion of producers (27.27%) exclusively for family food security maintenance. Studies show that producers diversify production by combining dairy farming with agricultural and forestry activities, and by breeding small animals (poultry, swine, goats, and sheep) to cope with market forces. This set of activities makes it possible to complement dairy farming and leave the production farm less susceptible to market oscillations. However, it complicates the development of appropriate technologies to improve productive performance, implement management models, obtain a production scale, add value to products, and improve the way products are placed on the market (SANTANA; SANTANA, 2015; SKONIESKI et al., 2015).

Farm infrastructure

Most study farms had physical structure conditions that were considered deficient, without basic facilities, with poorly planned facilities or stables that often implied difficulties in maintaining hygiene. Consequently, a highly frequent accumulation of mud and feces of the animals in the milking places were recorded.

Only 12.7% of dairy farms had a milking parlor. Of these, only 28.57% had a cemented floor, and 71.43% had a covered area. It is worth noting that, during milking, inadequate production and hygiene conditions compromise the health of the mammary gland and milk quality, considering that soils, microorganisms, and chemicals at the milking site can be incorporated into the product. Oliveira et al. (2011) observed a lack of hygiene in facilities, during milking, and that mastitis control and prevention measures were not performed in a study conducted in Rondon do Pará.

A total of 96.4% of the farms in Rondon do Pará had a cattle shed, with prevailing areas (45.28%) between 100 m² and 500 m². Of the total, 42 (76.4%) farms had heifers, of which 7.2% were suspended, and 63.6% were at ground level, 87.3% had a trunk for management, 5.5% had a funnel, 52.7 % had a berth, 61.8% had drinking water in the pasture, and 14.5% were in the cattle shed. Salt troughs were found in 89.09% of the farms. Although milk-producing farms had basic infrastructure for managing the animals, it was essential to make advancements in this aspect to increase the productive performance of the system. This information was corroborated by the findings in Soares et al. (2013), who studied dairy farming in this municipality from 2009 to 2010.

Electric power was found in 92.73% of the farms, which facilitated the installation of cooling tanks,

primordial equipment to improve milk quality, and producer adequacy in accordance with Normative Instruction 62 of the Ministry of Agriculture, Livestock and Food Supply - MAPA (BRASIL, 2011). However, even with this basic structure, few producers (5.5%) owned this equipment, which resulted in a poor-quality product that was not adequate in keeping with expected standards.

Improvements were also reported, such as water tanks (85.5%), wells (56.4%), dams (60%), laystalls (1.8%), deposits (storehouse) (61.8%), and equipment, namely plows (7.3%), water pumps (74.5%), trucks (3.6%), carts (1.8%), cars (50.9%), wagons (9.1%), electric fences (21.8%), forage harvesters (3.6%), harrows (5.5%), motorcycles (44%), mill (10.9%), manual motorcycle mowers (21,8%), chain saws (73%), mechanical milking machines (5.5%), grain planters (1.8%), drag mowers (3.6%), hydraulic mowers (3,6%), sowing machines (6%), bulldozers (1.8%), treadmill tractors (9.1%), and forage crushers (21.8%), which directly and indirectly influenced the productivity of the herd.

Food management

Food management differed depending on the time of year. In the rainy season, from December to June, when there was a greater supply of fodder, the producers exclusively fed animals with pasture, and only 2% of them supplemented it with forage grass. No concentrated supplementation was reported at that time of the year. In the dry period, from July to November, the supply of fodder decreases drastically, requiring supplementation. The producers used feed concentrate, chopped sugarcane *in natura,* or these two supplements in combination, forage grass, and by-products of the agro-industry. Among the farms analyzed, 34% used these alternative feeding means, while the other 66% only fed animals with pasture, which had a negative effect on dairy productivity.

Animal nutrition accounted for 50% of production costs (ALVIM, 2001). The variation in the quantity and quality of forage and concentration in the diet, and the use of regional food and co-products, duly tested and evaluated for the consumption of these animals, may be sustainable alternatives to increase production, especially for small producers (MAGALHÃES et al., 2004; FERREIRA et al., 2009).

The use of commercial mineral mixture with common salt (80%) prevailed in the mineralization of the herd, in a ratio of "one to one," and 5.5% of the interviewees did not perform this practice. The absence of mineralization can lead to mineral deficiencies, which occurs in many parts of the world, affecting many production animals that consume diets that often do not meet their needs. These deficiencies may vary, ranging from severe with characteristic disturbances, to mild, with non-specific symptoms, such as slow development, fertility problems, low carcass yield, and low milk production (TOKARNIA et al., 2000).

Food management, if conducted with specialized technical monitoring, may result in increased and sustainable production and prevent the inappropriate use of supplements, foods with high fiber content, and unbalanced rations in sufficient quantities to meet animals' needs during the dry season. Thus, the supply of adequate levels of nutrients to cows would lead to a better use of genetic potential and increased production indexes (SANTANA; AMIN, 2002).

Sanitary management

To prevent diseases, all owners vaccinated their cattle against foot-and-mouth disease and brucellosis, 90.91% for anthrax and 58.18% for leptospirosis, diseases with a relevant impact on public health. The positive highlight is in large part due to the repercussion of the actions of the state agricultural defense policy, starting in 2002, with the creation of the Agricultural Defense Agency of the State of Pará (ADEPARÁ). It prioritizes the implementation of programs for the eradication

of foot-and-mouth disease and brucellosis, which drove the growth of cattle raising in the state of Pará (CATÃO; CEBALLOS, 2001; SANTOS et al., 2007).

All producers administered endoparasiticides, most of them (78.2%) twice a year, and 12.7% of them, more than twice. Ivermectin and doramectin were mentioned as therapeutic bases for parasites control. Vaccination practices and deworming of the herd were also common among producers. Of the total, 94.6% of the farms used ectoparasiticides. Cypermethrin was among the most commonly used products (50%).

It was observed that 81.8% of the producers treated the calves' navels, as the inflammation of the navel is one of the major diseases that affect calves, causing the death of young ones, and affected 10% of the animals aged up to eight months (RADOSTITS; BLOOD, 2002). This disease leads to large economic losses, as the focus shifts toward reducing weight gain, which implies generating costs with drugs and veterinary assistance, delaying growth, and promoting the depreciation of calf carcass.

The diseases with the highest prevalence in calves were diarrhea (66.45%), verminosis (61.82%), and parasitic sadness (43.64%), due to the incidence of cattle ticks (58.18%) and horn fly (7.27%). Herd management and hygiene factors can influence the occurrence of these diseases in calves. These conditions cause significant economic losses, mainly due to delayed growth and increased mortality (PATÊS et al., 2012).

Breed characterization of the herd and reproductive management

Several dairy breeds are used to exploit the activity, such as Girolando, Dutch, Gir, Guzerá, and Brown-Swiss. Other breeds include beef breeds, especially the reproductive ones, such as Nelore, Guzerá, Brahman, and Tabapuã. However,

the most common situation is of a herd consisting almost exclusively of mixed-breed units of dual aptitude, coming from uncontrolled crosses and no zootechnical selection criteria. This is a striking characteristic, since a significant number of farms adopt a beef calf production system, creating a great difficulty in defining a production pattern and recomposing a herd with animals of milk aptitude. The low price of commercialized milk explains this fact and consequently, there is a need to use male calves to complement family income.

The mating system used by most producers (56%) was uncontrolled natural mating, which can overload the male and impair the prolificacy of the herd, 27.3% did not have criteria for the first coverage and only 16.4% used weight or age as criteria. Artificial insemination was performed only by eight producers, while the remaining 85.5% did not use any biotechnology. The expansion of the use of artificial insemination or controlled mount, along with the use of certified bulls, are important tools for herd improvement. These techniques could be favored with the support of associations of producers and financially supported by regional dairy companies (LOURENÇO JÚNIOR; SANTOS, 2015).

Milking management and milk quality

Milking management is one of the most important strategies to ensure milk quality. Only seven farms among those analyzed in Rondon do Pará had a milking parlor. From those only two had a cemented floor and five had a covered area. Inadequate conditions of production and hygiene during milking compromise milk quality, since soils, microorganisms, and chemicals may contaminate the product. Changes in infrastructure and adequacy of milking practices may help the milk producer adapt to the Brazilian legislation on milk quality (COSTA et al., 2013; PICOLI et al., 2014).

Most of the producers (98%) performed manual milking. When it came to basic hygiene procedures

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at the time of milking, only 1.8% of milkers washed their hands before milking and 10% cleaned the teats of the animals at that time. The lack of hygiene in the manual milking process, especially from teats and milkers' hands, favored the contamination of the product (FONSECA; SANTOS, 2001).

It was observed that 90.9% of the milk production of farms was sent to two dairy companies in the region, which collected dairy everyday from 47.2% of the farms. A total of 85.4% of the production was transported by truck, 1.8% was manually processed, and 9% sold it *in natura*. Dairy control is an essential tool for the management of a dairy production system (MONARDES, 2008). It was performed only by 12.7% of the producers interviewed.

Herd production and productivity

The farms had a mean herd size of 40 lactating cows, which represented approximately 43% of the total amount of cows in the herd, deviating from a recommended 83% (MARTINS et al., 2015). Dairy production was around 5.5 L cow $^{-1}$ day $^{-1}$ in the period of greater supply of pasture. However, in the

dry season, when the availability and nutritive value of forages were reduced, the mean production was approximately 3.5 L cow $^{-1}$ day $^{-1}$, which was 36% less than in the rainy season.

When it came to the mean annual dairy production, farms with areas up to 50 ha, and between 50 and 100 ha (Table 2) were more efficient, since they had a higher proportion of lactating females in relation to the total number of cows in the herd, with productivity similar to that of farms with areas greater than 100 ha. This result was also observed by Lopes Junior et al. (2012), who observed an association between specialization in dairy production and smaller production areas.

The farms with cow herds with more than 150 units were less specialized for dairy activity, since the proportion of lactating cows in relation to the total number of cows in the herd was small, contrary to what occurred in farms with less than 150 units (Table 3). This demonstrates that dairy activity in Rondon do Pará was performed by small and medium-sized rural producers, especially while considering farms with less than 35 cows, among which 74.6% were lactating.

Table 2. Distribution of lactating cow herds and animal productivity, according to the total area ranges of dairy farms in the municipality of Rondon do Pará.

Total Area Ranges	N	Lactating cow	Average L day $^{-1}$	Productivity - L cow $^{-1}$ day $^{-1}$	Total cows
<50 ha	7	18.14	86.67	4.5714	30.86
51 <100 ha	9	25.00	121.35	4,9611	48.89
101<200 ha	14	35.71	143.94	4.0625	84.50
201<500 ha	19	51.26	218.65	4.3866	124.05
>501 ha	6	69.50	341.24	4,8083	153.33
Total	55	40.78	180.29	4,4676	93.02

Table 3. Percentage of lactating cows and animal productivity, according to size ranges of cows from dairy farms in the municipality of Rondon do Pará.

Size ranges of cow herd	Lactating cow (%)	Mean L day $^{-1}$	Productivity - L cow $^{-1}$ day $^{-1}$
Less than 35	74.6	74.5	4.6
From 35 to 70	56.4	126.5	4.5
From 71 to 100	58.4	227.6	4.3
From 101 to 150	54.1	311.7	4.4
More than 150	23.1	236.0	4.4
Total	43.8	180.3	4.5

Conclusions

Milk producers in Rondon do Pará were heavily involved in the family farming segment, have a low education level, limited knowledge on quality standards of dairy production, and limited access to technology, technical assistance, and rural credit. Forage production was hampered by the limited adoption of pasture and fertilization management technologies, further reducing the mean productivity of dairy cattle from small farms in the dry season.

Thus, the productive systems, especially the zootechnical facilities, animal management practices, and technical assistance directed to good practices in milking need to be improved. Furthermore, it is important to seek efficiency in the nutritional system. The dairy systems in the municipality have a higher productive capacity when compared to the one found in this study. Therefore, producers must improve their technical and managerial knowledge through greater access to rural training actions to maximize zootechnical and financial indicators.

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