Zootechnical profile of the dairy farms in southern Minas Gerais State, Brazil

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Abstract. Minas Gerais State (MG) and especially its southern portion, plays an important role in milk production nationwide. This study characterized the livestock profile in 40 dairy herds in southern MG. Information obtained through interviews was used to construct a database and describe the variability present in the group, highlighting what is typical in this sample in order to reach conclusions. The farms evaluated have a median total area of 110 ha (interquartile range/DI = 223 ha), 82 total cows (DI = 98 animals) with 62 in milk (DI = 80 animals), mean daily milk production of 20 ± 7.4 L/cow and median production of the herd of 1350 L (DI = 1725 L). In most of the farms (60%) replacement animals are reared in semi-intensive systems; twice daily milked is most common (87.5%) using milking machinery with a pipeline (72.5%), and artificial insemination (AI) is practiced (65%). Regarding animal health, a significant proportion of the producers have not adopted a health management protocol including such practices as burying placentas (7.5%) and aborted fetuses (52.6%). These results indicate that there is great heterogeneity in milk production procedures used in southern MG and that most of the milk is supplied by small farms, based on family labor and use of technologies such as AI and mechanical milking.

Keywords: Dairy production, Husbandry indicators, Livestock management, Resources employed

Perfil zootécnico das fazendas de gado leiteiro no sul de Minas Gerais, Brasil

Resumo. Minas Gerais (MG) tem papel de destaque na produção de leite em âmbito nacional, sobretudo o sul do estado. Objetivou-se com este estudo caracterizar o perfil zootécnico em 40 rebanhos bovinos no sul de MG. A partir das informações obtidas por meio de entrevistas construiu-se um banco de dados e obteve-se a descrição de como variam os indivíduos no grupo, ressaltando o que é típico na amostra estudada para extrair conclusões. As propriedades avaliadas apresentam área total mediana de 110 ha (distância interquartílica/DI = 223 ha), 82 vacas totais (DI = 98 cabeças) e 62 em lactação (DI = 80 cabeças), produção diária média de 20 ± 7,4 L/vaca e produção mediana de 1350 L (DI= 1725 L) de leite/propriedade. Na maioria das propriedades (60%), os bovinos são criados em sistema semi-intensivo, há duas ordenhas por dia (87,5%), em sistema mecânico canalizado (72,5%), e utiliza-se a inseminação artificial (65%). Em relação às características sanitárias, uma considerável proporção dos produtores não adota o manejo sanitário considerado mais adequado, como enterrar placentas (7,5%) e fetos abortados (52,6%). Os resultados deste estudo indicam que há uma grande heterogeneidade no processo de produção de leite no sul de MG, sustentado principalmente por pequenas propriedades, baseado na mão de obra familiar com uso de tecnologias como inseminação artificial e ordenha mecânica.

Palavras chave: Indicadores zootécnicos, Manejo zootécnico, Produção leiteira, Recursos empregados

Introduction

Brazil is a world leader in cattle farming, and has the largest commercial herd, estimated at 213 x 10^6 head in 2011 (IBGE, 2011).

Minas Gerais State (MG) plays an important role in dairying nationwide, with approximately 5.7 x 10^9 L of milk produced in 2006, which represents 27.8% of Brazil's total production. Within the state dairy production is concentrated in the southern region (IBGE, 2006).

In MG perceptions of the local dairy producers on farm management is based more on practical experience than on the acquisition of knowledge, which makes difficult increasing the quantity and improving the quality of the milk produced (Rocha *et al.*, 2011). Achieving high standards of herd health is one of the biggest challenges faced by local dairy producers.

The use of indexes to evaluate the efficiency in dairy farming is a long standing practice. Some of these indexes, such as age at first parturition, calving rate, disposal rate, and mortality rate are important indicators of animal productive performance and affect the profitability of the operation (Lopes *et al.*, 2009). Studies to determine these rates are needed to guide research on new productive alternatives and also to focus programs of assistance and support to family farmers. Thus, considering the prominent position of MG in cattle production and a shortage of specific studies on the dairy cattle profile in the state, the present work seeks to characterize the dairy cattle health profile, providing information to help improve dairy farming in the southern region of MG.

Material and Methods

A cross-sectional observational study was conducted to assess the animal health profile of 40 dairy farms located in the south of MG (45°W meridian and parallel 21°S), and distributed among 14 municipalities (Boa Esperança, Campo Belo, Carrancas, Guapé, Ijaci, Ilicínea, Ingaí, Itumirim, Lavras, Nepomuceno, Oliveira, Perdões, Ribeirão Vermelho and São Francisco de Paula), in the three regions of the Campo das Vertentes, west and south/southwest of MG (Figure 1). In 2006 these regions accounted for 25% (7,95 x 10^5 head) of the cows milked in MG, corresponding to 6,3% of the total for Brazil. The three regions produced 23% (1,606 x 10^9 L) of the total milk for the state, representing 8% of the country total.

The farms were chosen randomly from lists acquired from pertinent local agencies such as the Institute of Agriculture of Minas Gerais--IMA (Instituto Mineiro de Agropecuária), cooperatives or municipal Departments of Agriculture and Livestock. The initial approach to producers was made by the person in charge at each locality, to explain the objectives and benefits, of the reseach and seek the producer's participation. The data were collected from June to December 2011.

Interviews were conducted using semi-structured forms that had been tested previously, and aimed to gather information on the producer's health management and milk production. The interviews were performed by a single interviewer
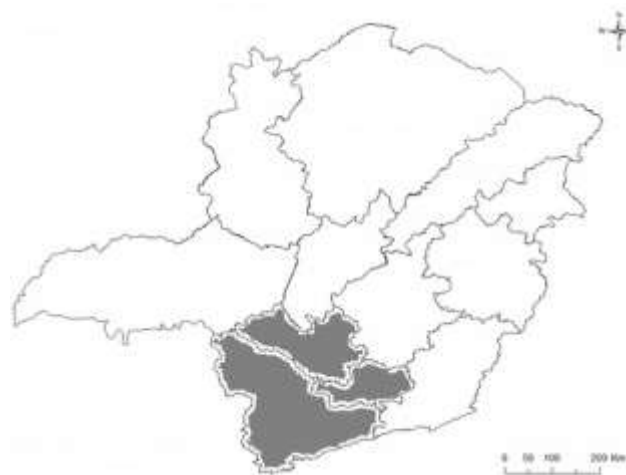

Figure 1. Location map of the three regions sampled (shaded area) in the state of Minas Gerais, Brazil, 2011.

who was a veterinarian and could make decisions on the farm. The questionnaire was pre-tested and adjustments made to the final version. Therefore, the sampling period lasted approximately six months.

Based on the information obtained from the interviews, a database was constructed. Thus, for each question asked, a description of the data was made by indicating how the individual producers vary in the group, highlighting what is typical (higher frequency) in the sample to draw conclusions and profiles. Thus, the descriptive

analysis was made of the main zootechnical and health variables included.

Initially, Kolmogorv-Sminorv normality tests were applied in metric variables of the study. Thus, for the variables that showed normality in distribution of the data, the mean ± standard deviation was used, while for the variables that lacked normality in distribution the median and interquartile range were used as measures of central tendency and dispersion (Pestana and Gageiro, 2008). All statistical analyzes were performed using SPSS 18.0.

Results and Discussion

The farms evaluated in this study have a median total area of 110 ha (DI = 223 ha), and the area dedicated exclusively to dairy production (corrals, milking parlor and pasture) is 20 ha (DI = 68 ha) (Table 1). The farms have a median of 82 dairy cows (dry + lactating) (DI = 98 ha), 62 in lactation (DI = 80 ha), producing a median of 1350 L milk/d (DI = 17.25, 0). Most dairy farms have this activity as their single source of income (55%), produce refrigerated raw milk (52.5%) and raise crossbred cattle (51.3%) (Table 2).

From the present results and those of other studies that evaluated the profile of the milk producers in MG, it is clear that different systems exist in the same region, especially in regard to the use of technologies, such as machine milking and artificial insemination, which impact the total production and level of per cow productivity.

Rocha *et al.* (2012), interviewed 193 dairy farmers from the towns of Lavras, Passos and Divinópolis, and observed lower productivity than that from the present study and operations characterized by use of the total area for cattle farming with enormous

variation in farms size 2-580 ha (71.4 ± 81.9 ha), mean total daily milk production per property from 6 to 2800 L (454.6 ± 627.0 L) and daily milk production per cow 2 to 29 L (10.2 ± 5.5 L). Similarly, Rocha *et al.* (2011), interviewed 100 producers in Divinópolis, MG and observed a profile of properties characterized mainly by small areas up to 50 ha, destined to milk production only milking crossbred cows that produced 8 L/d and 100 L/d per herd. Amaral *et al.* (2011b), analyzed the production systems in 163 properties in different regions of Brazil in 2005 and 2006 and found a predominance of crossbred cattle (80.4%), a majority (71.2%) of the herds with up to 100 head and a milk production median of 350 L/d (percentiles 170-790 L). Amaral *et al.* (2011a), interviewed 103 farmers attending various courses offered by Embrapa Dairy Cattle (Embrapa Gado de Leite), Juiz de Fora, MG, and other events in MG in 2007, and found that the farmers possessed 18-400 cows and produced on average 106 L of milk/d and crossbred animals were dominant (59.1%).

Regarding the racial type of cattle, Rocha *et al.* (2011), and Amaral *et al.* (2011a, b) obtained results

Table 1. Physical and management characteristics of 40 dairy farms in the south of Minas Gerais, Brazil, 2011.

Characteristic		Median/Distribution
Total area of the farm (ha)		110 (DI = 223)
Area for the production of milk (ha)		20 (DI = 68)
Number of workers	Permanent	3 (DI = 3)
	Temporary	0 (DI = 0)
Instruction level of labor (%)	Elementary	65
	High school	25
	Higher education	10

Quantitative variables- median (DI = interquartile range); qualitative variables - %.

similar to those of the present study, i.e., a predominance of crossbreds. In a survey in the northern region of MG, Azevedo *et al.* (2011) observed that the inventory was composed of the Gir (42%), Holsteins (35%) and Nelore (21%) breeds and that the distribution was independent of the type of operation. These studies, agree in that crossbred cattle, despite being related to a lower level of specialization, are the most commonly found in various regions of the state of MG, due to their greater adaptability to climatic factors and resistance to parasitic diseases.

Most of the farmers interviewed have been engaged in milk production for more than 20 years (51.3%), and the workers who deal directly with cattle have only minimal formal education at the 4th grade level of elementary school (65.0%). Pedrico *et al.* (2009), interviewed 41 producers in the city of Araguaína-Tocantins in MG and found that almost all of them were literate (96%), but with different levels of education, and the majority (60%) had not completed high school.

The present study verified a low level of formal education of the producers of MG, especially when compared with milk producers in other parts of Brazil. The educational level of the producers is an important issue, especially regarding the adoption of new management practices, in order to improve the health aspects in dairy production. In southern MG, Rocha *et al.* (2011) observed that most farmers use family labor and have farmed more than 10 years with milk production as the single source of income. These producers have only primary school education and the level of technology used on their farms is low. According to these authors, it is important to consider social factors, including cultural aspects, which may affect attitudes for example toward animal diseases.

Most of the farms (55%), had milk production as the only productive activity. Cattle are reared under semi-intensive systems and there are two milkings per day (87.5%) in a mechanical channeled system (72.5%) (Table 2). Amaral *et al.* (2011a) noted that of 93 farmers interviewed, 35 (37.6%) had milk production as their main source of income and 29 (31.2%) as the exclusive source, the management system was semi-intensive in 65 9% of the farms (60/91) and the milking was done manually in 89% (81/91).

According to Table 2, the average production per cow was 20 ± 7.4 L of milk, which summed to a median production of 1350 L/d (ID = 1725 L). Thus, the properties evaluated in the present study have higher productivity levels than the average observed in dairy farms of other micro-regions of MG (Amaral

et al., 2011a, Rocha *et al.*, 2012). This can be explained by the fact that in the studied region dairying has a great impact in the regional economy and thus induces major investment and consequently higher production levels. According to Zegarra *et al.* (2007), in addition to their importance to human nutrition the dairy cattle play an important social role, especially in generating employment and income. Dairy farming is constantly evolving in southern MG, because, being the main source of income for over 20 years and sole productive activity of many farms, it increasingly employs technification, such as the use of artificial insemination and channeled milking.

Regarding reproductive traits (Table 3), most of the farms use artificial insemination, with a median of 2.5 (DI = 1.3), doses of semen/conception, which results in an average annual calving rate of 66.0 ± 20.1%.

An efficient livestock operation is one in which several factors are integrated for improved performance of the system as a whole. In this sense, breeding for genetic improvement stands out for its direct influence on milk production (McManus *et al.*, 2008). According to Neiva *et al.* (1992), the efficiency in dairy herds can best be evaluated by characteristics, such as proportion of cows lactating, age at first calving and calving interval.

The time taken to return to cyclicity after parturition is important for determining the calving to conception interval and, consequently, the interval between successive calvings. The return to cyclicity depends on several factors such as genetic makeup, presence or absence of the calf at milking, productivity, health, age of the cow, nutrition pre and postpartum, body condition and its maintenance in early lactation (Sartori and Guardieiro, 2010). In the present study, the interval between births observed was 12.8 ± 2.0 mo, which is considered close to the commonly accepted ideal of 12 mo (Ferreira, 1991).

The calving interval is directly reflected in the costs of production (Lopes *et al.*, 2009). According to Leite *et al.*, (2011), the goal of 12 mo is difficult to achieve in commercial herds. This has been shown in other studies conducted in various regions of Brazil, in which longer intervals between successive calvings have been reported. McManus *et al.* (2008) studied Dutch cattle in the midwest region of Brazil and found an interval between calvings of 413.45 ± 94.58 d. Lemos *et al.* (1997) studied crossbred Holstein-Zebu of the System of Milk Production of the National Centre of Dairy Research--EMBRAPA-CNPGL--and obtained an interval between calvings of 403.22 ± 19.63 d, while

Table 2. Characteristics of the production systems observed on 40 dairy farms in three southern regions of Minas Gerais, Brazil, 2011

Variable		Distribution/Mean/ Median
Productive activity (%)	Only milk	55,0
	Mixed farming	45,0
Herd inventory	Lactating cows	62 (DI = 80)
	Dry cows	18.6 ± 12.1
	Heifers	39 (DI = 36)
	Heifer calves	33 (DI = 35)
	Bulls	2 (DI = 2)
Type of milk sold (%)	A	5.0
	B	42.5
	Refrigerated raw	52.5
Racial type (%)	Zebu	2.6
	European	46.2
	Crossbred	51.3
Rearing system (%)	Semi-intensive	60.0
	Intensive	37.5
	Extensive	2.5
Milk production (L)	Milk/day	1350.0 (DI = 1725.0)
	Milk/cow	20.0 ± 12.1
	Milk / ha	4414.6 (DI = 10107.7)
Milking type (%)	Mechanical channeled	72.5
	Mechanics at foot	27.5
Number of daily milkings (%)	Two	87.5
	Three	12.5

Quantitative variables-median (DI = interquartile range).

Mean ± standard deviation (normal distribution); qualitative variables - %

Zambianchi *et al.* (1999), evaluated Holstein cows reared in 15 herds in the state of São Paulo, and determined an interval between calvings of 422 ± 94 d. Leite *et al.* (2001) obtained from reproductive data of Holstein cows in the state of Rio Grande do Sul, calving interval of 14.6 ± 3.8 mo.

Lopes *et al.* (2009) evaluated the economic impact of the interval between calvings in herds composed of Holstein cows, and showed that this index affects directly the composition and evolution of the cattle and influences the profitability of dairy farming, with the interval of 12 mo being the most efficient.   The authors concluded that with the improvement of this livestock index, higher efficiency and profitability are obtained from the herd, with a greatest proportion of cows in milk and lower proportion of dry cows.

Another commonly used index is body weight as a selection criterion for females that are suitable for breeding, but according to McManus *et al.* (2008), its use can inhibit the effectiveness of selection for sexual precocity, if it represents largely the ability of the female to gain weight and to achieve the minimum weight range. In the present study it was found that in addition to body weight, the desired age at first calving is also considered by producers in the decision to start breeding animals. It is interesting to note the sexual precocity present in the herds studied, since most of the heifers were bred at 18 (ID = 9) mo of age and a bodyweight of 350 (ID = 10) kg.

It was observed that, in southern MG, females with dairy aptitude were approximately 27 (DI=9) mo of age at first calving, a value close to that advocated by Youngquist and Threfall (2006), for the Holstein breed, of 22-25 mo. Other studies have found values of even greater precocity than that observed in the present study, such as McManus *et al.* (2008), who reported an age at first calving of 910.1 ± 204.9 d, and Grossi and Freitas (2002), who evaluated crossbred cattle reared in the southwestern region of Brazil, and found age at first calving to be 32 ± 5 mo in three herds of Holstein-Zebu (1/2HZ, 5/8 H, 3/4 H, 7/8 H) crosses. It is important to take into consideration economic aspects when trying to lower the age or body weight at first calving, due to the increase in production costs, mainly for feeding.

Table 3.   Reproductive characteristics observed in 40 dairy herds in southern Minas Gerais, Brazil, in 2011

Variable	Distribution/ Mean/ Median
Method of establishing pregnancy (%)	
Natural breeding	32.5
Artificial insemination	65.0
Embryo Transfer	2.5
Culling rate of cows (%)	14.3 (DI=11.1)
Annual calving rate (%)	66.0±20,1
Calving interval (mo)	12.8±2.0
Number of doses of semen per conception	2.5 (DI=1.3)
Age (mo) at first mating/insemination	18 (DI=9)
Body weight (kg) at first mating/insemination	350 (DI=10)
Age at first calving (mo)	27 (DI=9)

Quantitative variables- median (DI = interquartile range).
Mean ± standard deviation (normal distribution); qualitative variables - %.

In the present study indicators of technology, such as the use of milking machines and artificial insemination, were associated with better reproductive rates and higher productivity in the herds.

Conclusions

Results of this study indicate that, in southern MG there is significant heterogeneity in the production process, but most of the milk is produced on small farms that use family labor, and modern technologies, such as artificial insemination and mechanical milking.

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