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Original article

Strategies for animal production in the semi-arid region of Minas Gerais

Estratégias para produção animal no semiárido mineiro

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Abstract

Objective: to analyze strategies for animal production during the dry season among producers of a cooperative in the north of Minas Gerais. **Materials and methods:** data collection took place between February and April 2024, using a semi-structured questionnaire sent by Google form, as well as in printed form. The population analyzed were dairy farmers, assisted by a cooperative in the region, with the aim of examining the type and purpose of animal production on each property, which government aid is available, and what type of food is intended for the animals. **Results:** among the 92 milk producers who participated in the research, the majority report their objectives as a source of income in the dairy activity, and have been in the business for more than ten years, despite mentioning the difficulties regarding the added values to their product, as well as support and investments. **Conclusion:** despite the difficulties highlighted by producers, they are looking for alternatives for animal production and the development of dairy farming.

Keywords: Semi-arid region of Minas Gerais. Animal production. Seasonality.

Resumo

Objetivo: analisar estratégias para produção animal no período da seca entre os produtores de uma cooperativa do norte de Minas Gerais. **Materiais e métodos:** a coleta de dados ocorreu entre os meses de fevereiro e abril de 2024, por meio de um questionário semiestruturado enviado via formulário Google, bem como de forma impressa. A população analisada foram pecuaristas leiteiros, atendidos por uma cooperativa da região, com objetivo de examinar qual tipo e finalidade da produção animal de cada propriedade, quais auxílios governamentais disponíveis, e que tipo de alimentação é destinada aos animais. **Resultados:** dentre os 92 produtores de leite que participaram da pesquisa, a maioria relata os objetivos como fonte de renda na atividade leiteira, e estão no ramo a mais de dez anos, apesar de referirem as dificuldades quanto aos valores agregados ao seu produto, bem como apoios e investimentos. **Conclusão:** mesmo com as dificuldades apontadas pelos produtores, buscam por alternativas para produção animal e desenvolvimento da bovinocultura leiteira.

Palavras-chave: Semiárido mineiro. Produção animal. Sazonalidade.

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Introduction

Animal production in Brazil plays a significant role both economically and socially. Brazil holds the second largest group in the world in cattle breeding; in 2022, the number of animals reached 234.4 million, for the fourth consecutive year, reaching record highs[1].

Livestock is considered an attribution of great relevance. The agricultural sector obtained a share in the Brazilian Gross Domestic Product (GDP) in the second half of 2022, which increased by 3.7% compared to the first quarter of 2023[2]. The activities of selling domestic products and services to other countries show a remarkable growth. In this context, the production of forest products, cotton, corn, soybean and beef, poultry and pork meat stand out[3].

The semi-arid region of Brazil naturally has a good aptitude for breeding diverse species. This is due to the climatic conditions and territorial expansion, highlighting its great potential in the animal production sector[4]. Animal products are currently an important supplier of food in Brazil and the world. According to data from the Ministry of Agriculture and Livestock (MAPA), in 2020, this sector fed the equivalent of 800 million people[5].

The Brazilian semiarid is characterized by irregularities in rainfall; during the year, this is notable[6], because it has seasons marked with dry periods, scattered rains and storms, it is found that it is the most vulnerable region of Brazil, whose average rainfall is below 600 mm[7].

Considering the seasonal challenges faced in Brazil, it is necessary to explore alternatives for efficient agricultural production systems, such as rotation between different forage plants, according to the season. In this segment, dairy cattle varies their production coefficient between regions of good fitness, and others in more severe climates where they are confined and, in other months, pastures[8].

Among the factors that influence agricultural production, water availability stands out[9]. Due to the changes, alternatives are observed to supply the demand for water, such as artesian wells, plate cisterns, pipe trucks, etc[10].

Despite the relevance of the agricultural sector, rural credit lines are intended to provide farmers with incentives for development through investments, increase in productivity and provide economic consolidation[11]. Thus, the use of agricultural machinery, milking machines and fans among others of general use are directed to the current production system in the farm[12].

For the increase in animal feed, exploring regionally available foods has been essential[13]. Production, sugarcane, peanuts, soybeans and palm oil are potentially useful as animal feeds[14]. In small rural properties, the use of sugar cane has been satisfactory, especially in months with dry time[15].

Seasonal changes represent a challenge in plant production, affecting its quality and quantity in which it can be stopped in the dry period. Thus, management strategies should be evaluated from the preparation of the area to the final stage that is the harvester[16-17]. To guarantee the forage performance even in dry periods, it is possible to choose the following species: palm (*Opuntia* spp.), *mandacaru* (*Cereus jamacaru* P. DC.), buffel grass (*Cenchrus ciliaris* L.), and *maniçoba* (*Manihot* ssp.), among others[18].

Moreoveer, some non-conventional food plants (NCFP) are used to obtain foods that add nutritional value in a sustainable way, aiming to contribute to the feeding with the use of native species and to promote nutritional gain. They can be found in several regions of Brazil, such as: *bredo-d'água* (*Alternanthera philoxeroides*), garden dahlia (*Dahlia pinnata*). In addition, they serve in the formulation of diets with control of the concentration of fibrous materials[20-21-22].

Thus, the study shows that strategies for animal production are linked to climate issues of the Brazilian semiarid, therefore, seeking ways to improve the production system. Therefore, the objective of this study was to analyze strategies for animal production in the drought period among producers of a cooperative in northern Minas Gerais.

Material and Methods

This is a field research, descriptive, with quantitative analysis and cross-sectional. The study was carried out in the rural area of the city of Icaraí de Minas, located at 575 meters altitude, with the subsequent coordinates, latitude: 16º 11'46" South, longitude: 44º 53'59" West. The population analyzed were dairy farmers, assisted by a cooperative in the region, with the aim of examining what type and purpose of animal production on each property, which government aid available, and what kind of feed is intended for animals. From a population of 360 ranchers, the calculated sample was 187 participants, obtained by a confidence interval of 95%.

Producers that had been cooperating with the institution for at least a year and were located in the rural area of the city were included in the study. There were no participants in the survey who had some cognitive deficit to answer the questions proposed, and who did not have any relatives at the time of application of the questionnaire to help them in the answers.

Data collection took place between February and April 2024, through a semi-structured questionnaire, developed by the authors, adapted from the works of Pereira (2019)[23], Rodrigues et al. (2020)[24] and Santos et al. (2022)[25]. The questionnaire was sent by Google form, as well as in print, if the producer had no access to the internet or did not get acquainted with technological tools, the

application of the instrument was done face-to-face on the farms.

The research instrument contained questions about sociodemographic data and information regarding farm management and economic bases.

For data analysis, descriptive statistics and the chi-square test were used to verify the degree of association between variables using the SPSS (Statistical Package for the Social Sciences) version 22.0.

Ethical care

The study was approved by the Human Research Ethics Committee under the opinion n. 6.633.833.

Results

The study included 92 cooperative dairy farmers, with minimum age of 18 years and maximum of 68 years, with mean age of 43.1 years ± 10.7. Table 1 presents the characterization of the study in which farmers aged between 18 and 41 years (n = 41, 45.6%) and 42 to 61 years (n = 49, 54.4%) participated (Table 1).

Of the participants, 17 (19.4%) had higher education and most 40 (46.0%) had high school education, complete or incomplete. Furthermore, a large proportion of the volunteers are male (n=86; 93.5%), on the other hand only 6 (6.5%) were female.

Regarding the sociodemographic aspects, 67 (72.8%) of the participants had a partner and, in most cases, 3 to 5 people lived at home (n=50; 54.3%), and only 9 (9.8%) participants mentioned that more than five people lived in the same place (Table 1).

Furthermore, most of the participants identified themselves as belonging to the brown race (n=51, 55.4%), followed by the yellow one (n=3, 3.33%). In addition, the predominant family income was 1 minimum wage (n=28; 30.4%), and only 9 (9.8%) claimed to have 3-4 minimum wages (Table 1).

Table 1. Sample characterization

Variáveis	n	%
Age		
18 - 41 years	41	45.6
42 - 68 years	49	54.4
Education		
Higher education (complete or incomplete)	17	19.5

High school (complete or incomplete)	40	46.0
Elementary school (complete or incomplete)	30	34.5
Sex		
Female	6	6.5
Male	86	93.5
Marital status		
With partner	67	72.8
Without partner	25	27.2
Residents in the house		
1 or 2 people	12	13.0
2 or 3 people	21	22.8
3 - 5 people	50	54.3
over 5 people	9	9.8
Race		
Yellow	3	3.3
White	29	31.5
Cannot answer	1	1.1
Black	8	8.7
Brown	51	55.4
Family income		
1 minimum wage	28	30.4
over 4 minimum wages	12	13.0
1 - 2 minimum wages	19	20.7
2 - 3 minimum wages	24	26.1
3 - 4 minimum wages	9	9.8

When analyzing the association between age of the producer and techniques adopted for milk production, it can be observed that the time in dairy activity, as expected, was higher among the age group from 42 to 68 years (n=26, 53.1%). Interestingly, among the participants aged 5 to 10 years in this activity, most (n=25, 61%) were between 18 and 41 years old (Table 2).

For the average milk production per day (liters), with an average age of 42 and 68 years, 17(34.7%) participants have a yield greater than 200 liters/day. Concerning the milking system, between 18 and 41 years (n=37.3%) present use of mechanical system with bucket at the foot, and with age between 42 and 68 years, significant part (n=22; 44.9%) of the participants, use mechanical system with closed circuit (Table 2).

Regarding the size of the property per hectare, most individuals with 42 to 68 (n=22, 44.9%) have extensions from 50 to 100 ha. In relation to the number of cows, in the age group from 18 to 41 years, 28 (68.3%) participants have less than 20 animals on the property. Moreover, in relation to production goals, most individuals between 42 and 68 years (n=47, 95.9%) have as their main goal family income source (Table 2).

Table 2. Association between producer age and strategies adopted for milk production.

Variables	Age (years)		p*
	18 a 41	42 a 68	
Years working with milk production			0.000
11 – 15 years	6 (14.6)	26 (53.1)	
5 – 10 years	25 (61)	6 (12.2)	
Over 20 years	3 (7.3)	13 (26.5)	
Below 5 years	7 (17.1)	4 (8.2)	
Type of production system			0.93
Full cycle	9 (22)	12 (24.5)	
Breeding	24 (58.5)	27 (55.1)	
Re-breeding	5 (12.2)	7 (14.3)	
Re-breeding and fattening	3 (7.3)	3 (6.1)	
Size of the property (ha)			0.001
Over 200	1 (2.4)	3 (6.1)	
Up to 50	28 (68.3)	13 (26.5)	
101 – 200	5 (12.2)	11 (22.4)	
50 – 100	7 (17.1)	22 (44.9)	
Number of cows			0.001
21 – 35	10 (24.4)	13 (26.5)	
36 – 50	0	15 (30.6)	
51 – 70	2 (4.9)	3 (6.1)	
71 – 100	1 (2.4)	1 (2.0)	
Menos de 20	28 (68.3)	17 (34.7)	
Average production of milk per day (liters)			0.000
Up to 50 liters/day	16 (39)	5 (10)	
101 - 200 liters/day	6 (14.6)	14 (28.6)	
51 - 100 liters/day	17 (41.5)	13 (26.5)	
Over 200 liters/day	2 (4.9)	17 (34.7)	
Goal of the production			0.001
Regional culture	1 (2.4)	2 (4.1)	
Income source	29 (70.7)	47 (95.9)	
Family tradition	11 (26.8)	0	
Milking system			0.000
Manual: with bucket at the foot	25 (61)	16 (32.7)	
Manual: with or without the presence of the young	7 (17.1)	1 (2.0)	
Mechanical: closed circuit	6 (14.6)	22 (44.9)	
Mechanical: with bucket at the foot	3 (7.3)	10 (20.4)	
Number of employees			0.033
1 – 5	20 (48.8)	38 (77.6)	
5 – 10	1 (2.4)	1 (2)	
Over 10	1 (2.4)	0	
No employees	19 (46.3)	10 (20.4)	
Purpose of the production			0.098
Dairy delivery	31 (75.6)	44 (89.8)	
Other derivatives	6 (14.6)	1 (2)	
Cheese production	3 (7.3)	4 (8.2)	
Cottage cheese production	1 (2.4)	0	

In relation to the amount of grass species, a lower percentage (n = 3.3%) is observed in the use of signal grass, but a large part (n = 51, 55.4%) affirms the use of *mombaça* grass. The feed

adopted by the producer in animal nutrition, only 3 (3.3%) use soybean meal and palm oil cake, which are by-products; but a larger number of participants uses corn (n = 39, 42.4%). Using plants as a food source, 3 (3.3%) participants reported the use of sugarcane as forage, while 62 (67.4%) used sorghum silage (Table 3).

On the other hand, most of the participants in this study (n=89; 96.7%) did not use other forages, such as those traditionally used in some places that suffer from limiting climates, such as the forage palm (Table 3).

On the use of government aid, only 2 (2.2%) participants hold the subsidy of Pronamp (National Program to Support Medium Rural Producer), and most of them (n = 53; 57.6%) benefit from the Pronaf program (National Program for Strengthening Family Agriculture). When asked about the difficulties faced in the activity developed, 4 (4.3%) participants said that it was the absence of technical assistance; but a large percentage (n = 36, 39.1%) says that it is related to the low price paid for milk and difficulty of access to rural credit (Table 3).

Table 3. Main productive dairy strategies applied on the property.

Variable	n	%
Grass species		
andropogon grass	05	5.4
signal grass	51	55.4
Massai	03	3.3
Mombaça	27	29.3
Feed (by-product)		
soybean meal	03	3.3
cassava (scrapings, bran, silage)	20	21.7
Corn	39	42.4
palm oil cake	03	3.3
Does not use	12	13.0
Forage		
Corn silo	15	16.3
Sorghum silo	62	67.4
Elephant grass	06	6.5
Sugar cane	03	3.3
Government aid		
None	36	39.1
Pronaf	53	57.6
Pronamp	02	2.2
Difficulties faced		
Lack of technical assistance	04	4.3
Low price paid for milk	36	39.1
Difficulty in accessing rural credit	36	39.1
Lack of knowledge in managing dairy farming activities and qualified labor	07	7.6
The climate of the region and the lack of rain	07	7.6

Discussion

From the data analyzed in this study, it is possible to observe that most of the milk producers are in the age range of 42 to 68 years, indicating a lower participation of young people in dairy farming, with a small portion of female gender. This fact may be due to administrative management in the property, family relations, decisions taken and remuneration before production.

According to the structural changes in society, along with rural exodus, the countryside was more masculinized due to the exit of women, and may be associated with the low prestige of their participation in the activity. They also report that such factors may be associated with emotional and relational motivations[26].

Through the lower participation of young people in rural areas, the study carried out by the evaluation of family management and succession in dairy farming and notes for public policies, the authors affirm, in a universe of 82 young people from 35 municipalities of Rio Grande Sul, that some families have already shared the management of the properties with their children, although many still have difficulty in proposing changes and investments. These authors still point out that the examples found in which a shared management between parents and children prevails favor family succession, as well as the permanence of the youngest in the family activities[27].

In controversy, this study evaluated the changes in the Brazilian rural environment in the second decade of the 21st century. One of the results found by these authors was that the condition of having among their family members a retiree, a greater number of members and its head being black, brown or indigenous increases the chances of the rural family being non-agricultural, in relation to being a family agricultural[28].

On the other hand, to increase production efficiency beyond the market structure, it has no interference in the price of the product. But, adopting new technologies, management practices associated with invested capital and intensive production systems, increases the amount of milk produced, conceiving increased profits. This statement reiterates the need for small producers to adapt to new demands, to meet obstacles such as number of animals or size of property, as observed in this study[29].

With such results on the variability of species, it is evident the little versatility of producers as to production strategies, such as use of signal grass, plant that has wide adaptation as to the type of soils, such as acid and low fertility soils, and the climate with temperatures and low rainfall, as is the case of the Brazilian semiarid[30].

A complementary evaluation showed that in ruminant feeding the objective is to maximize production with reduced cost and meet the requirements of animals in a sustainable way. Still, the by-products such as corn are used to produce silage[31].

Thus, the period of low rainfall due to mismatch of forage availability has been one of the problems faced. However, nutritional characteristics in the period of drought make the grass alternative for a sharp decrease in average milk/day production[32].

When evaluating the effect of different sources of fiber associated with forage palm in diets for lactating goats on nutrient consumption and digestibility, ingesting behavior, milk production and composition, they found that the association of forage palm with silages, hay and sugarcane bagasse did not alter milk production without correction, corrected for 3.5% fat and corrected for energy (2.78; 2.53 and 2.55 kg/day, respectively), in addition to the milk composition ($p>0.05$). In addition, the diets did not cause changes in the ingestion behavior ($p>0.05$), and since there was no change between fiber sources, the choice of the form of nutrition used is subject to availability and price[33].

The difficulties encountered in this study were due to contacting the producers, because many withheld answering phone calls and during formal presentation of the research being conducted, because many felt withdrawn when answering the questions. It is of great importance to carry out future work to encourage producers in relation to dairy farming adopting new measures and strategies for animal production and consequently its development. Thus, allowing a direction on the study and explorations for future research to be carried out on the subject.

Conclusion

The strategies adopted by small farmers through experiences during management in dairy farming, as well as implementation of technologies and government measures, are very important for profitability and sustainability of production. Due to the peculiarities of the climate of the semi-arid region of Minas Gerais, the sources of food for animal production becomes a limiting aspect. In the face of such changes, producers seek alternatives to avoid decreased production rates on their property. Therefore, the adoption of techniques, the use of government plans, the adoption of measures in times before the dry period, as well as the use of alternative foods that meet the nutritional requirements of farm animals, must be effective attitudes for the benefit of the productive system, ensuring the maintenance of man in the field, with quality of life, and successfully in their activities.

Authors' contribution

The authors have approved the final version of this article and declare themselves responsible for all aspects of the manuscript, such as integrity, originality and accuracy.

Conflict ofinterest

The authors declare that there are no competing interests.

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