

## CALF REARING PROFILE IN *AGRARIAN REFORM SETTLEMENTS* IN SANTANA OF LIVRAMENTO, RS, BRAZIL

### *PERFIL DA CRIAÇÃO DE BEZERRAS NOS ASSENTAMENTOS DA REFORMA AGRÁRIA DE SANTANA DO LIVRAMENTO, RS, BRAZIL*

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**ABSTRACT:** In agrarian reform settlements there are obstacles in the rearing of calves; however, the main aspects that cause this obstacle are not known. Thus, the aim of this study was to diagnose the main obstacles in the management of these dairy heifers to target extension actions. For this, semi-structured guided questionnaires were applied to 40 families from 20 settlements. The questionnaire contained questions about the characteristics of the family, property and general management, feeding and sanitation of calves. The data were tabulated in Excel, transformed into variables and studied by means of multivariate analysis of main components after the farms were grouped into clusters according to similarity. The variables that most affected the heifer rearing system in dairy farms in the agrarian reform settlements of Santana do Livramento, RS, Brazil, were related to diet and occurrence of diarrhoea in calves. The 40 farms studied were grouped into six clusters, which differed especially in relation to who was responsible for the management of the heifers inside the property, regarding the infrastructure for the calves, time in milk production and concern regarding the care in the breeding of the calves. Based on these differences between the clusters being correctly identified, the technicians who work in these farms can establish strategies to work with settled families, emphasising the points where the obstacles are known to trigger the survival of heifers that will replace the dairy herds.

**KEYWORDS:** Dairy cattle. Lactation. Nutrition.

### INTRODUCTION

The stage of calf rearing is very important in dairy farms, and requires planning, because, through these will be accomplished the replacement of discarded animals or the expansion of the stock (GASPARI; KHATOUNIAN, 2016). However, this level of importance is not yet clear in many dairy farms, especially those of a lower technological level or that have limited access to technical

al., 2011), that include aspects of infrastructure establishment, productive management of herds and organisation of property (GASPARI; KHATOUNIAN, 2016). Management can include colostration with passive transfer of motherly immunoglobulins (LEITE et al., 2017). Rational management and thermal comfort are decisive in the stability and reduction of mortality in calves, impacting directly on production when the calves arrive at the productive age (MARTINS et al.,

there is technical assistance for the informative progress of dairy farming; however, the language used or the consistency of approaches are not sufficient to trigger cultural change or actions that would make the educated care definitive. Similarly, the work of the technicians is often developed empirically, emphasising aspects that are not necessarily those that have the greatest impact on the process of calf rearing.

There exists a great diversity of precautions necessary in the rearing of calves (PETROCHI et

the transmission of this relevant information from the producer and workers of dairy production is a challenge for the technicians. The knowledge of the more relevant aspects which impact on the rearing of calves in the different systems of production should direct the extension actions and optimise the technical work. However, it is necessary to know which are the more relevant aspects from approaches about suitable tools.

One these tools is the study of production systems where the survey of management

characteristics allows, through multivariate analysis, the indication of those that have the greatest impacts on the different processes. Still, through systems studies, it is possible to know the properties that are similar, group them in Clusters (groups) and to look into these as bounding aspects and existing potentials. With this information, the extension technician can still adopt them to be used and the approach can be more strategic and more compatible with each type of property.

In this way, this study aimed to diagnose the characteristics of milk production systems in agrarian reform settlements in the town of Santana do Livramento relevant to techniques adopted in the rearing of calves.

## MATERIAL AND METHODS

The project was developed from January of 2017 to June of 2017, in family agrarian reform farms in the town of Santana of Livramento, Rio Grande do Sul, Brazil, that undertake milk production.

The data collection for calf production in milk production systems (SMP) was performed using a semi-structured guide questionnaire with 43 questions that had the objective of identifying at the very least 40% of properties in this study. This quiz contained questions about registration data, characterisation of the owner and of farmer property, milk production and of herd, milking management, sanitation management and addressed in detail the management of rearing calves.

For the integralisation of the project, two representative properties were randomly selected of each one of 20 settlements visited. The quiz was applied in visits performed to properties during the months of June, July and the beginning of August of 2017.

After the application of questionnaire, the data was tabulated and each answer was considered a variable. Subsequently, the method of variable selection was performed. Multiple correspondence analysis (MCA), methodology was utilised for the categorical data exploration, analogous to factorial analysis, utilised essentially for the graphical verification of the relationship between categories of variables. The variables that resulted in high contribution scores described in terms of variance explained and true to the original data ( $\alpha$  de Crombach  $> 0.75$ ) were retained. They were constituted by the criteria that the variables and each one they contained the levels of occurrence in the data groups.

The creation of these variables obeyed the concept of creation of "constructs", in other words, there was an effort to give statistic meaning to the concepts that were evaluate in the data collection group. After the selection and construction of variables, the answers of surveys were tabulated in order to generate a matrix in which the lines corresponded to the SMP and the columns corresponded to variables. Categories of each variable, when necessary, that completed the MCA, were transformed and coded. Finally, in this process, the resulting data variables were subjected to MCA, that determined the weight, in other words, the importance that each variable plays in the data group for the achievement of the study objectives. The variables that resulted in high contribution scores described in terms of variance explained were kept (KUBRUSLY, 2001).

From the relative weights that resulted from each variable complementary tools for hierarchical clusters analysis (CHA) were adopted, from the properties that were divided into groups allowing the study of separate groups, identifying the obstacles and potentialities in the study theme in each group. The grouping of properties and description could result in the optimisation of extension actions and technical assistance at the conclusion this study, with availability of results for extension organisations and technical assistance, which could be used for the optimisation of the performance of extension practices.

## RESULTS AND DISCUSSION

The characteristics of calf rearing in this study were compiled and interpreted through MCA in two main components (1 and 2). These explain, respectively, 39.080% and 31.474% of the variance of the data groups, totalling 70.554% of explained variance of the information of all collected variables (Table 1). The reliability of the results obtained through studies of production systems with use of MCA is determined by the total variance explained, which must be higher than 70%, as recommended by Fávero et al. (2009) and is consistent with 70.554% obtained in these study. The result reliability is determined by the variance explained value, because the larger the percentage of accumulated variations, the greater is the number of variables utilised to explain the results measured in the survey. Lange et al. (2016) when studying milk production systems in the West of Paraná, obtained an accumulated variance of 71.9%. Meanwhile, Bodenmüller Filho et al. (2010) when studying dairy

farms in North-Center of Parana-Brazil, had 70.52% of accumulated variance.

The Cronbach alpha parameter measures the confidence in tests utilised in research for the characterisation of systems, and its value should be between 0.70 and 0.90 (HORA et al., 2010). In this

present study, both values for Cronbach alpha, for the dimensions within the indicated range by Hora et al. (2010) appear valid (Table 1). These result confirms reliability of the questionnaire used and shows the high correlation between the elaborated questions for the research and the obtained answers.

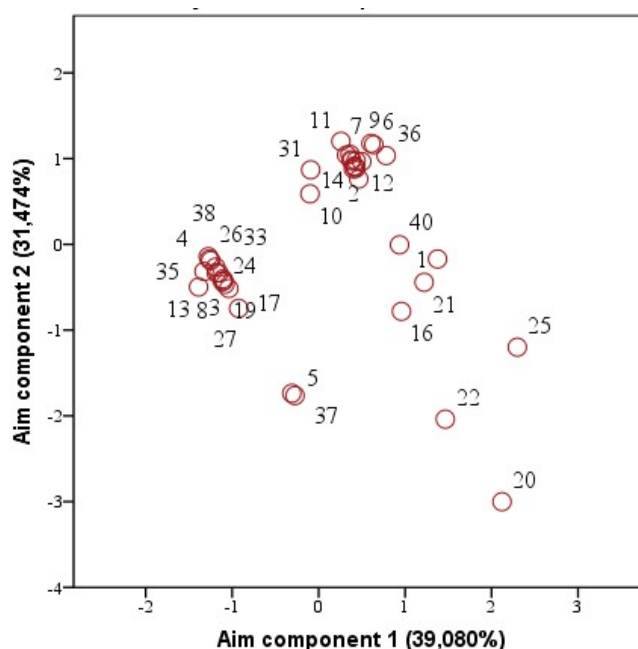
**Table 1.** Main components (MPs), eigenvalues ( $\lambda_i$ ) and percentages of variance explained and cumulative proportion (%) by components.

Main Components	$\alpha$ Cronbach*	Eigenvalues ( $\lambda_i$ )	Explanatory variance (%)	Cumulative variance (%)
1	0.870	5.080	39.080	39.080
2	0.819	4.092	31.474	70.554
Total	0.965	9.172	70.554	-

\* Based on the totals of the eigenvalues

Regarding the behaviour of breeding systems for calf rearing as the variables examined in this study, there is observed the great diversity (Figure 1), similar to that observed by Lopes Junior et al. (2012) when studying systems in the region northwest of the state of Paraná. Each case of the study, which is each property, has one singular contribution to the main components (Table 1; Figure 1). This contribution of each case is occurs by the incidence of each variable within each case

(LOPES JUNIOR et al. 2012), in other words, factors of calf rearing are present in systems of production that correspond to the case studies. This is important, because each case (calf rearing system) was studied as characteristic and single and to be considered the incidence of each variable in each case, in order to guarantee the maintenance and appreciation of the individual properties in this study.



**Figure 1.** Projection and contributions of each property of the settlements of Santana of Livramento contemplated in a characterisation study of breeding systems in the formation of main components 1 and 2 that retains the incidence of each contemplated variable. The numbers represent the “cases” of the study. The position of each case in the graph corresponds to the inertia, that is, the contribution of each case to the formation of each of the main components (MC1 and MC2).

From knowledge of the incidence of each variable within each case, it is possible to know the weight that each property has within the study of system characterisation, that is, that aims to diagnose profiles of production systems. This weight is measured by the inertia and is determined by the degree of correlation that exists between each system and the major constituents (LOPES JUNIOR et al., 2012) in the study (MC1; MC2).

Thus, the greater the variability and diversity in the studied properties, the greater their representativeness and reliability for the study. So, the diversity of behaviours observed in the variables studied in relation to the defined variables is defined by its relation with the main components 1 and 2, which are the synthetic variables obtained from the MCA (Figure 1). If we consider case 20, for example, (Figure 1), it has a higher ratio and consequently contributes more significantly to the formation of the main component 1, (MC1) than the main component 2 (MC2). These main components are called of synthetic variables because they summarise all the variables originally collected at the farms (LOPES JUNIOR et al., 2012).

The explanatory variables, which comprise the two main components in this study (LOPES JUNIOR et al., 2012), are composed of 13 variables (Table 2), which reflect the association between the

original qualitative variables that were used to measure the aspects of calf rearing in the study and the main components. These variables are mainly related to schooling, hygiene, feeding and occurrence of diarrhoea in calves (Table 2). In main component 1, the variables related to the occurrence of diarrhoea: TimeDiarr-time of occurrence of diarrhoea, CausesDiarrhea-cause of diarrhoea, AspectDiarrhea-aspect of diarrhoea, ImprovDiarrhea-improvement of diarrhoea and TreatDiarrhea-diarrhoea treatment was the one that had the most weight in the composition of this component. In main component 2, the variables of greater weight were mainly those related to the feeding of the calves, such as FeedingCalves-feeding of the calves, ReasonFeedCalves-reason for feeding the calves, LocatFeedCalves-place of feeding of calves, ConditWaterCalves-water condition of calves and LocaWaterCalves-place of water supply for calves. From these variables, it is possible to understand that there was a direct relationship between the alimentary management and the occurrence of diarrhoea, and this was the main sanitary problem at the farms. In fact, as the hygiene of milk supply containers fails and there is no consistency in the quality diet, the calves are exposed to low immunity and the pathogens causing diarrhoea (FERREIRA, 2017).

**Table 2.** Values of each variable in each of the main components used for the characterisation of heifer breeding systems in dairy farms in the municipality of Santana of Livramento-RS.

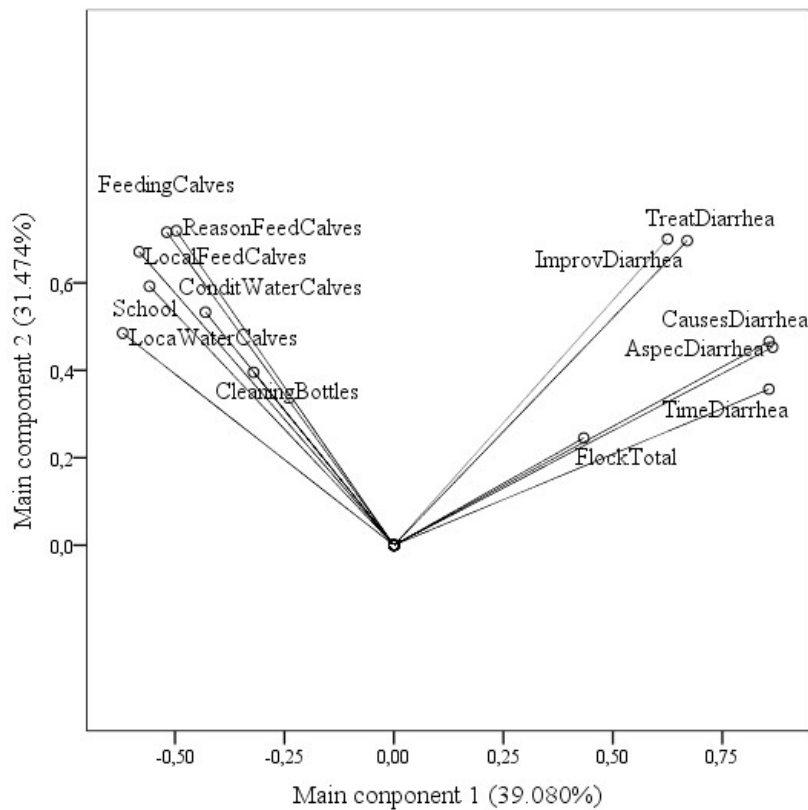
Variable	Description of the variable	Main component	
		1	2
School	School level of owner	-0.430	0.553
FlockTotal	Total flock (animals)	0.434	0.245
CleaningBottles	Method of cleaning the bottles	-0.321	0.396
FeedingCalves	Feeding system of calves	-0.519	0.716
ReasonFeedCalves	Reason of feeding of the calves	-0.497	0.719
LocatFeedCalves	Location of feeding of the calves	-0.582	0.671
LocaWaterCalves	Location of water supply for calves	-0.619	0.485
ConditWaterCalves	Water conditions of calves	-0.558	0.592
TimeDiarr	Time of occurrence of diarrhoea	0.856	0.357
AspectDiarrhea	Aspect of the diarrhoea of calves	0.865	0.453
CausesDiarrhea	Causes of diarrhoea	0.857	0.466
TreatDiarrhea	Treatment for diarrhoea	0.670	0.697
ImprovDiarrhea	Improvement of symptoms of diarrhoea	0.625	0.700

\* Weight of each variable studied in each component.

The values of each variable in the components (Table 2), the relation between the variables identified in the MCA and the two dimensions formed with the two main components identified from the eigenvalues of the variables (Figure 1) explain the variation and enable the characterisation of the systems of calves adopted in the milk producing properties in settlements in the municipality of Santana of Livramento, RS. The age of the producer and the time of work in the dairy activity or as farmers were not significant in determining the formation of the components, as well as the area of the property, the size of the herd and its structure among dry cows, lactating and spare animals. Similarly, the forage base, the dairy breed used and characteristics of facilities were also not significant. When confirming the absence of significance and non-participation of the variables listed in the formation of the main components, it is confirmed that these variables do not interfere directly in the management of calf rearing in the

properties contemplated in the study. However, variables directly related to the general and sanitary management of calves have a direct impact on their breeding system. The schooling of the producers (Schooling), and characteristics related to food and watering (FeedCalves, FeedingCalves, ReasonFeedCalves, LocatFeedCalves, ConditWaterCalves, LocaWaterCalves) container cleaning (CleaningBottles) are correlated, since they form acute angles between them (FRAGA et al., 2016), in the same way as the total herd (FlockTotal) is also related to the sanitary characteristics of diarrhoea (TimeDiarr, CausesDiarrhea, AspecDiarrhea, ImprovDiarrhea, TreatDiarrhea).

However, the two groups of characteristics with correlations between them do not present correlations between the characteristics of one group and another, since they present an angle greater than 90 degrees (HORA et al., 2010).



**Figure 2.** Projection and contributions of each variable measured in dairy farms in Santana of Livramento contemplated in a characterisation study of heifer breeding systems in the formation of main components 1 and 2 that retains the incidence of each variable.

\*MC: main component. School-School level of owner; FeedingCalves-Feeding system of calves; ReasonFeedCalves-Reason of feeding of the calves, LocatFeedCalves-Location of feeding of the calves, ConditWaterCalves-Water conditions of calves, LocaWaterCalves-Location of water supply for calves, CleaningBottles-Method of cleaning the bottles, FlockTotal—Total flock (animals), TimeDiarr-Time of occurrence of diarrhoea, CausesDiarrhea-Causes of diarrhoea, AspecDiarrhea-Aspect of the diarrhoea of calves, ImprovDiarrhea-Improvement of symptoms of diarrhoea, TreatDiarrhea-Treatment for diarrhoea.

The result shows that producers with higher levels of schooling better understand the needs of correct hygiene of the containers used for milk handling, while also understanding the needs and benefits of performing early feeding of calves. The results obtained agree with the literature, which points out that even this apparently subjective information helps in the characterisation of the production systems, since when it comes to owners, information about the age group, education level and number of people in the family that contribute to the development of the activity are relevant because they have a direct impact on the functioning of the productive system (ALMEIDA et al., 2006).

Another characteristic that was relevant in this study was the feeding place of the calves and where they were kept during lactation. In the corrals intended for calves or the nurseries for feeding, there should be characteristics such as moderate slopes and soil with good drainage and infiltration of rainwater. The prevention of mud formation in environments frequented by dairy cows, especially resting areas, is essential to reduce the incidence of clinical and subclinical mastitis (MOTTA et al., 2011). The infection of the mammary gland occurs with greater frequency and intensity when the animals are exposed to places with excess humidity, accumulations of organic matter and dirt. This attention needs to be redoubled when it comes to the environments destined to the rest of the animals during pre- and post-milking, aiming at reducing the presence of mud, soil and waste (DOMINGUES et al., 2008). Applied management for mastitis prevention is directly related to the quality of colostrum that will be supplied to calves. Locations that are excessively wet, uneven or defective may cause hump problems and reduce power consumption. In addition, regarding ownership, the time of ownership, size of property, area intended for activity, pasture area and technological levels assist in the diagnosis of the characteristics of the rural property (ALMEIDA et al., 2006) because they directly affect the development of activities in the production system, especially in the case of calves.

Correlations were also evaluated using Pearson correlation (Table 3), and the significance of schooling was observed with the adopted feeding system (0.529\*\*) and with the feeding place for the calves (0.378\*). This correlation confirms that the lower levels of schooling interfere with the producers' ability to understand the dietary needs of a calf. The producer with the highest level of education understood the importance of the calves ingesting the first colostrum in an amount of approximately 5% of live weight, with protein levels

between 18 and 22% concentrations, fat between 10 and 22% and 0.2% crude fibre, in other words, highly energetic to meet animal requirements (CAMPOS; LIZIEIRE, 2000). However, the same assertion was not true when it came to understanding the need for proper hygiene of the containers used for handling milk (0.286<sup>ns</sup>). The size of the herd did not have a significant correlation with any of the variables compared, confirming that there was no improvement in the management with increase of the herd on the property. The hygienisation of the bottles (CMMV) showed a positive correlation with the feeding sites (0.362\*) and water (0.352\*) for calves, indicating that some owners tended to be more aware of the importance of hygiene and feeding of calves. The calf feed system (CFS) was positively correlated with calf feeding reason (CFR-0.577\*\*) and calf feeding location (CFL-0.674\*\*), indicating that if the farmer adopts a correct feeding system for his calves, consequently he or she will make adjustments in the alimentary management and will be more careful with the place of supplying of this feeding. However, the reciprocal was not true for the location of the water supply for calves (CPSW-0.157<sup>ns</sup>), and the concern with the water conditions supplied to the calves was confirmed by the positive correlation (CCPW-0.444\*\*) can contribute significantly to the proper development of these. Likewise, the location of water supply and feed for the calves had a positive correlation with the conditions of the water supply, indicating the capacity of the producers to adopt technification, but particularly that which provides good results for low cost rearing of calves on their properties. The water supply is of fundamental importance for the ruminal development of calves, because the ruminal flora responsible for development through the fermentation of concentrate and fodder is dependent on water to survive (CAMPOS; LIZIEIRE, 2000).

When correlating the characteristics of the herd, hygiene and food management with those related to the occurrence of diarrhoea (Table 4), a positive and significant correlation was verified only between the size of the herd and the time of occurrence (DAT-0.321\*), aspect (0.414\*\*) and improvement (0.341\*) of cases of diarrhoea. These correlations may indicate that properties with higher numbers of animals tend to have more cases of diarrhoea in calves, possibly due to the greater number of animals, which facilitates transmission. However, it may represent a greater efficiency in the control of this disease in the herd. In addition, the feeding system had a negative correlation with the time of occurrence of diarrhoea (-0.323\*\*),

indicating that the more technified the feeding system was that had been adopted, the earlier diarrhoea occurred in calves, and in these situations, the occurrence of the disease was related to the inadequate use of substitutes and other foods. Diarrhea may be directly related to the management of calves, lack of care with utensil hygiene, places

where the calves receive food and the caretaker, which are factors that lead to contamination. Another determining factor in the cause of diarrhoea is the lack of passive immunity, which is acquired by ingestion of colostrum (FERREIRA, 2017; PERES, 2000).

**Table 3.** Correlations between variables related to owner education, herd, hygiene and feeding of heifers in dairy farms of Santana do Livramento settlements surveyed in the characterization of the breeding systems of calves.

	STH	CMMV	CFS	CRF	CLF	CPSW	CCPW
EDU	0.087 <sup>ns</sup>	0.286 <sup>ns</sup>	0.529**	0.185 <sup>ns</sup>	0.378*	0.221 <sup>ns</sup>	0.251 <sup>ns</sup>
STH		0.041 <sup>ns</sup>	-0.129 <sup>ns</sup>	0.166 <sup>ns</sup>	-0.017 <sup>ns</sup>	-0.027 <sup>ns</sup>	-0.093 <sup>ns</sup>
CMMV			0.237 <sup>ns</sup>	0.184 <sup>ns</sup>	0.362*	0.352*	0.266 <sup>ns</sup>
CFS				0.577**	0.674**	0.157 <sup>ns</sup>	0.444**
CFR					0.707**	0.290 <sup>ns</sup>	0.533**
CFL						0.562**	0.496**
CPSW							0.433**

\*\*; \*: significant at 1 and 5% probability, respectively. Education (EDU), size of the total herd (STH) cleaning management of milk vessels (CMMV), calf feeding system (CFS), calf feeding reason (CFR), calf feed location (CFL), calf place supply of water (CPSW) and calf conditions of provided water (CCPW).

**Table 4.** Correlations between the variables related to owner education, herd, hygiene, feeding and occurrence of diarrhoea in heifers in dairy farms of Santana do Livramento settlements surveyed in a characterisation study of heifer breeding systems.

	DAT	DAS	DCAU	DTR	DIT
EDU	-0.196 <sup>ns</sup>	-0.122 <sup>ns</sup>	-0.075 <sup>ns</sup>	0.002 <sup>ns</sup>	-0.052 <sup>ns</sup>
STH	0.321*	0.414**	0.244 <sup>ns</sup>	0.238 <sup>ns</sup>	0.341*
CMMV	-0.095 <sup>ns</sup>	0.037 <sup>ns</sup>	0.076 <sup>ns</sup>	0.089 <sup>ns</sup>	0.033 <sup>ns</sup>
CFS	-0.323*	-0.001 <sup>ns</sup>	0.055 <sup>ns</sup>	0.185 <sup>ns</sup>	0.175 <sup>ns</sup>
CFR	-0.213 <sup>ns</sup>	0.084 <sup>ns</sup>	0.044 <sup>ns</sup>	0.288 <sup>ns</sup>	0.309 <sup>ns</sup>
CFL	-0.161 <sup>ns</sup>	0.023 <sup>ns</sup>	0.102 <sup>ns</sup>	0.167 <sup>ns</sup>	0.213 <sup>ns</sup>
CPSW	-0.153 <sup>ns</sup>	-0.260 <sup>ns</sup>	-0.220 <sup>ns</sup>	-0.031 <sup>ns</sup>	-0.003 <sup>ns</sup>
CCPW	-0.290 <sup>ns</sup>	-0.112 <sup>ns</sup>	-0.044 <sup>ns</sup>	0.155 <sup>ns</sup>	0.162 <sup>ns</sup>

\*\*; \*: significant at 1 and 5% probability, respectively. Education (EDU), size of the total herd (STH) cleaning management of milk vessels (CMMV), calf feeding system (CFS), calf feed reason (CFR), calves feed location (CFL), calf place supply of water (CPSW) and calf conditions provided water (CCPW) and conditions provided water for heifers (CPWH) and characteristics related to diarrhoea, as the time of appearance (DTA) aspects (DAS) causes (DCAU) applied treatment (DTR) and improvement time (DIT).

When correlated with the characteristics of the occurrence of diarrhoea in the properties (Table 5), a positive correlation was found between all the characteristics studied. This result is important because it demonstrates the concern of producers with this disease that causes losses and mortality in dairy farms, as well as the underdevelopment of affected and inadequately treated calves. The causes could be contamination in the environment where they are housed, the utensils with which they feed,

the careless caretaker with contaminated hands or even food that may be contaminated, intoxicating the animal and causing diarrhoea. Some very common causative agents of the disease, *Eimeria* spp., rotavirus, *Escherichia coli*, *Clostridium perfringens* and *Salmonella* spp., easily cause death in calves (FERREIRA, 2017). The control of the disease mainly consists in the hygiene care of the places and utensils used to provide food. Hydration early on and changing the location, while exposure

to sunlight and ventilation are very important in the disinfection of the house (PERES, 2000).

**Table 5.** Correlations between the characteristics related to diarrhoea of heifers in dairy farms of Santana of Livramento settlements contemplated in a characterisation study of calf breeding systems.

	DAS	DCAU	DTR	DIT
DTA	0.654**	0.754**	0.562**	0.653**
DAS		0.829**	0.545**	0.684**
DCAU			0.722**	0.821**
DTR				0.827**

\*\*; \*: significant at 1 and 5% probability, respectively. Time of appearance (DTA), aspects (DAS), cause (DCAU), applied treatment (DTR) and improvement time (DIT).

The cluster analysis allowed the formation of six clusters where differences between the significant variables for the characterisation of the properties were significant by the Tukey test (5%). The first cluster consisted of four properties, with a mean time of activity of 19 years. The total herd was 34 animals in an area of 24 hectares, with calves corresponding to 10% of the herd. The properties that make up this cluster are managed by young producers who are taking ownership in place of parents, or have left the parent's house to take over their plot of land and produce, but that have been in activity since very young helping the family. While there is the technical knowledge acquired over time, this, however, needs adjustments to the current needs of milk production. In addition, managerial capacity needs to be developed so that these young farmers have the ability to properly manage all the resources of the property, including human, food, financial and herd resources.

The second cluster consisted of 17 properties, with average time in the activity of 15 years, a mean total herd of 43 animals and total area of the property of 27 hectares, with 9.3% of the total herd being calves. The properties that make up the second cluster are conducted by better-structured families, and have a tradition in agricultural activity and milk production. The family structure and the tradition in the activity are reflected in better conditions of hygiene and feeding of the calves, culminating with less occurrence of diarrhoea or of more quickly treatable and reversible diarrhoea. The early treatment of diarrhoea is fundamental to enable recovery of the calves. This treatment should be accompanied by electrolyte replacement, soothing the dehydration thus caused (FERREIRA, 2017). In addition, for the effectiveness of the treatment, it is essential to know the origin of diarrhoea, allowing the adoption of the most appropriate treatment (SIGNORETTI, 2017).

The third cluster consisted of 12 properties, with average time in the activity of 12 years, total average of the herd of 30 animals, total area of the property 24 hectares, with 10% of the herd represented by calves. In these properties, most have a member who attended agricultural technician classes or alternatively are the women who manage the calves. The management of calf rearing when performed by a person with specific technical training for agriculture or of women is differentiated, allowing greater care with the hygiene of the containers and feeding of the calves culminating with a lower incidence of diarrhoeas that are also more easily reversible. This environment is favourable for the development of calves, as it reduces mortality and morbidity rates and allows growth at an adequate pace and the attainment of an age at first calving close to 26 months. For the good performance with the reduction of the age of puberty, and consequently, the first calving, the nutrition of the calves is of fundamental importance, and results in the reduction of animals and costs in the system, since the stages of calves and calves do not have immediate financial return, thus ceasing to be a priority in the property, thereby reducing the production potential of these animals (BITTAR et al., 2016). Still, in these clusters, the feminine work has remarkable form not only in the rearing of the calves, but also in the domestic environment. This aspect is frequent in family farms as seen in other studies (FERRANTE; DUVAL, 2012). However, it is important, especially in the properties that make up this third cluster and that have superior results due to female labour, to encourage the valorisation of this, so that they do not occupy a lower position in the family hierarchy, especially due to the nature of the work they perform (GASPARI; KHATOUNIAN, 2016).

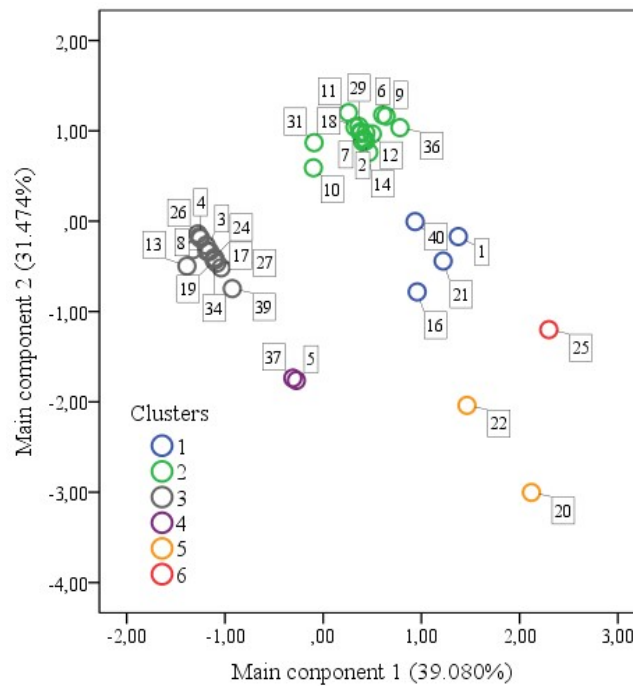


**Table 6.** Number of cases and main characteristics of the clusters formed from the analysis of main components for the characterisation of systems for breeding dairy heifers in the town of Santana of Livramento – RS.

Cluster	Number	Time in the activity	Total herd	Number of Calves	Space (ha)
1	4	19	34	3	24
2	17	15	43	4	27
3	12	12	30	3	24
4	2	13	37	3	27
5	2	12	27	1	20
6	1	10	75	3	45

The fourth cluster consisted of two properties (with great representativity at work), with an average time in the activity of 13 years, a total herd of 37 animals, a total area of the property of 27 hectares and with 10% of the herd corresponding to calves. These are units where the whole family works in the dairy activity or have other activities within the property, such as fairs two or three times a week or cereal production, but as a parallel activity to complement the family income, without neglecting the dairy productivity, which is the main activity. However, in the handling of the calves, there are many activities that involve the whole family. The responsibilities of people that work with the animals are not routine; each person has their own method of work, and the supply of food and water runs out, which causes stress to the animals and harms their development, which in the case of

calves becomes irreversible. This erroneous management has a direct impact on the development of calves, since it is known that calves that are not properly nourished will not have a good productive and reproductive performance (CAMPOS; LIZIEIRE, 2000). In addition, when it comes to water supply, this determines the ruminal development of the calves, because the ruminal bacteria that ferment concentrated and voluminous, thus developing the rumen, are highly dependent on water to survive (BITTAR et al., 2009). The clusters formed when represented graphically (Figure 3) allow the observation of the distribution of the properties in the Cartesian plane, so that some approach the main component 1 and others of the main component 2. This indicates that in some properties in different groups of variables interfere most notably in the calf rearing system.



**Figure 3.** Representation of the clusters formed from the analysis of main components for the characterisation of the breeding systems of dairy heifers of the town of Santana du Livramento-RS-Brasil.

The problems observed in previous clusters interfere significantly in the development of calves, since basic aspects in their management are neglected, causing mortality and underdevelopment. These negative points occur because it is fundamental to provide better and adequate environmental conditions of hygiene, correct nutritional management and control of all diseases that can affect animals, to maintain the health of each animal, allowing them to express their natural behaviour, genetic potential of production and reproduction in all phases of life, propitiating greater individual production, and consequently, longer productive useful life (MACHADO FILHO et al., 2010).

Numbers represent the “cases” of the study. The position of each case in the graph corresponds to the inertia, that is, the contribution of each case to the formation of each of the main components (1 and 2).

The fifth cluster also consisted of two properties, with average times in the activity of 12 years, a total average herd of 27 animals, a total area of the property of 20 hectares, and with 3.7% of the herd corresponding to heifers. The main factor that determined the formation of this cluster and made it different from the others is that they were two properties where only one person is responsible for all activities within the property. These people are single and/or separated and take on all household chores and property, which require more labour, but in the daily activities, they take responsibility for all tasks. This characteristic causes the same problem as in the previous clusters; besides the work overload, with many activities, a single person does not develop anything with quality, and the calves are left without water and food. These, when provided, do not obey a schedule or routine, causing stress to animals by hunger or thirst and routine disruption.

The sixth cluster is formed by a single family, with 10 years in the activity, a herd of 75 animals on 45 hectares and with 4% of the herd corresponding to the calves. What defines the formation of this property as a cluster is the methodology of work adopted, where there is a partnership between two brothers. However, one works in a private company, with the other being responsible for the two production units. Although

the partnership models are positive, in this case, all agricultural activities of the two properties are the responsibility of only one person. This organisational model of production has a direct impact on the development of activities, productive indices and, therefore, their profitability (GASPARI; KHATOUNIAN, 2016).

At the end of this work, it was possible to understand by the techniques of multivariate data analysis, mainly the factorial analysis in main components and by multiple correspondences, combined with the cluster analysis, the tools that contributed significantly to the elucidation of the characteristics of the properties of Santana of Livramento family settlements in relation to calf breeding (ALEIXO et al., 2007). Through this study, it was possible to investigate breeding systems for calves and to generate results that composed the diagnosis of the current state of the properties and their differences regarding the rearing of calves (ALEIXO et al., 2007). In the same way, the study and the data analysis allowed the summary of the variables of the study and clarified how much they affected the rearing of the calves (LAROS, 2005). Also through the cluster analysis, it was possible to identify the differences and the similarities between the properties that composed the clusters (LAROS, 2005), thus assisting in future extension actions on these properties.

## CONCLUSIONS

The variables that most affected the calf rearing system in dairy farms in the Santana du Livramento agrarian reform settlements were related to feeding and diarrhoea occurrences in calves. The 40 properties studied were grouped into six clusters that differed, especially in relation to who was responsible for the management of the calves inside the property, regarding the infrastructure for the calves, time in milk production and concern regarding the care in the breeding of the calves.

Based on these differences between the correctly identified clusters, the technicians who work in these properties can establish strategies to work with settled families, emphasising the points where the obstacles are known to affect the rearing of calves.

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**RESUMO:** Em assentamentos da reforma agrária há entraves na criação das bezerras, porém, não se conhece os principais aspectos que causam esses entraves. Assim, objetivou-se com este estudo, diagnosticar os principais entraves no manejo destas bezerras leiteiras para direcionamento de ações de extensão. Para tal, foram aplicados questionários guia semiestruturados à 40 famílias de 20 assentamentos. O questionário

continha questões sobre as características da família, propriedade e manejo geral, alimentar e sanitário das bezerras. Os dados foram tabulados em Excel, transformados em variáveis e estudados por meio de análise multivariada de componentes principais. Após as propriedades foram agrupadas em clusters segundo a similaridade. As variáveis que mais afetam o sistema de criação de bezerras em propriedades leiteiras nos assentamentos da reforma agrária de Santana do Livramento, RS, estão relacionadas à alimentação e ocorrência de diarreia nas bezerras. As 40 propriedades estudadas foram agrupadas em seis clusters, que se diferiram especialmente em relação à com quem fica a responsabilidade pelo manejo das bezerras dentro da propriedade, quanto à infraestrutura destinada às bezerras, tempo na produção de leite e preocupação em relação aos cuidados na criação das bezerras. Com base nestas diferenças existentes entre os clusters e corretamente identificadas, os técnicos que atuam nestas propriedades poderão estabelecer estratégias para trabalhar com as famílias assentadas, enfatizando os pontos onde sabidamente estão os entraves para deslançar a criação das bezerras que irão substituir as matrizes leiteiras.

**PALAVRAS-CHAVE:** Aleitamento. Bovinos leiteiros. Nutrição animal.

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## REFERENCES

- ALEIXO, S. S.; SOUZA, J. G. d.; FERRAUDO, A. S. Técnicas de análise multivariada na determinação de grupos homogêneos de produtores de leite. **Revista Brasileira de Zootecnia**, Viçosa, v. 36, n. 6, p. 2168-2175, nov./dez., 2007. <https://doi.org/10.1590/S1516-35982007000900029>
- ALMEIDA, A. C. S. d.; FERREIRA, R. L. C.; SANTOS, M. V. F. d.; SILVA, J. A. A. d.; ANDRADE LIRA, M. Caracterização de produtores e propriedades rurais em três municípios do estado de Pernambuco. **Revista Caatinga**, Mossoró, v. 19, n. 4, p. 323-332, out./dez., 2006.
- BITTAR, C. M. M.; FERREIRA, L. S.; SANTOS, F. A. P.; ZOPOLLATTO, M. Desempenho e desenvolvimento do trato digestório superior de bezerros leiteiros alimentados com concentrado de diferentes formas físicas. **Revista Brasileira de Zootecnia**, Viçosa, v. 38, n. 8, p. 1561-1567, ago., 2009. <https://doi.org/10.1590/S1516-35982009000800021>
- BITTAR, C. M. M.; SILVA, F. L. M.; PAULA, M. R. d.; SILVA, J. T.; GALLO, M. P. C.; OLTRAMARI, C. E.; NAPOLES, G. G. O.; SOARES, M. C. Desempenho e parâmetros sanguíneos de bezerros em sistema de desaleitamento precoce suplementados com probiótico de bactérias ruminais. **Revista Brasileira de Saúde e Produção Animal**, Salvador, v. 17, n. 2, p. 249-261, abri./jun., 2016. [tps://doi.org/10.1590/S1519-99402016000200012](https://doi.org/10.1590/S1519-99402016000200012)
- BODENMÜLLER FILHO, A.; DAMASCENO, J. C.; PREVIDELLI, I. T. S.; SANTANA, R. G.; DE OLIVEIRA RAMOS, C. E. C.; SANTOS, G. T. d. Tipologia de sistemas de produção baseada nas características do leite. **Revista Brasileira Zootecnia**, Viçosa, v. 39, n. 8, p. 1832-1839, ago., 2010. <https://doi.org/10.1590/S1516-35982010000800028>
- CAMPOS, O. F.; LIZIEIRE, R. S. **Desaleitamento precoce e alimentação de bezerras**. In: SIMPÓSIO SOBRE MANEJO E NUTRIÇÃO DE GADO DE LEITE, 1., 2000, Goiânia. Anais... Goiânia: Colégio Brasileiro de Nutrição Animal, 2000. p. 1-20.
- DOMINGUES, P. F.; FERREIRA, B. L. S.; GALDINO, M. C.; CARNEIRO, D.; FOCHI, F. Mastite em bezerra por *Arcanobacterium pyogenes* - Relato de Caso. **Veterinária e Zootecnia**, Botucatu, v. 15, n.1, Jan-Apr., p. 257-262, 2008.
- FÁVERO, L. P. L.; BELFIORE, P. P.; SILVA, F. L. d.; CHAN, B. L. **Análise de Dados - Modelagem Multivariada para Tomada de Decisões**. Rio de Janeiro: Elsevier, 2009. 646 p.

FERRANTE, V.; DUVAL, H. **Mulheres assentadas na região central do estado de São Paulo: apresentado dados de pesquisas**. In: 17º ENCONTRO NACIONAL DA REDE FEMINISTA E NORTE E NORDESTE DE ESTUDOS E PESQUISA SOBRE A MULHER E RELAÇÕES DE GÊNERO, 2012, João Pessoa. Anais... João Pessoa: Portal de Conferências do Laboratório de Tecnologias Intelectuais, 2012. p. 1-24.

FERREIRA, M. R. Causas e Tratamento da diarreia em Bezerros. <<http://ruralpecuaria.com.br/tecnologia-e-manejo/bezerros/causas-e-tratamento-da-diarreia-em-bezerros.html>>, 2017. Accessed on:16/11/2017

FRAGA, A. B.; DE LIMA SILVA, F.; HONGYU, K.; SANTOS, D. D. S.; MURPHY, T. W.; LOPES, F. B. Multivariate analysis to evaluate genetic groups and production traits of crossbred Holstein × Zebu cows. **Tropical animal health and production**, New York, v. 48, n. 3, p. 533-538, mar., 2016. <https://doi.org/10.1007/s11250-015-0985-2>

GASPARI, L. C. D.; KHATOUNIAN, C. A. Características das Famílias, Estruturação da Produção e Estratégias de Comercialização em um Assentamento de Reforma Agrária. **Revista de Economia e Sociologia Rural**, Brasília, v. 54, n. 2, p. 243-260, abr./jun., 2016. <https://doi.org/10.1590/1234.56781806-947900540203>

HORA, H. R. M. d.; MONTEIRO, G. T. R.; ARICA, J. Confiabilidade em Questionários para Qualidade: Um Estudo com o Coeficiente Alfa de Cronbach. **Produto & Produção**, Porto Alegre, v. 11, n. 2, p. 85-103, jun., 2010. <https://doi.org/10.22456/1983-8026.9321>

KUBRUSLY, L. S. Um procedimento para calcular índices a partir de uma base de dados multivariados. **Pesquisa Operacional**, Rio de Janeiro, v. 21, n. 1, p. 107-117, jun., 2001. <https://doi.org/10.1590/S0101-74382001000100007>

LANGE, M. J.; ZAMBOM, M. A.; RAMOS, C. E. C. d. O.; CASTAGNARA, D. D.; BÂNKUTI, F. I.; NEUMANN, M. E.; MOREIRA, M. M. d.; TININI, R. C. d. R. Typology of dairy production systems based on the characteristics of management in the Region of West Paraná. **Semina: Ciências Agrárias**, Londrina, v. 37, n. 1, p. 473-482, jan./fev., 2016.

LAROS, J. A. O uso da análise fatorial: algumas diretrizes para pesquisadores. In: PASQUALI, L. (Ed.). **Análise fatorial para pesquisadores**. Brasília: LabPAM, 2005. p. 163-184.

LEITE, R. F.; BACCILI, C. C.; SILVA, C. P. d. C. e.; NOVO, S. M. F.; BALDACIM, V. A. P.; BENITES, N. R.; GOMES, V. Transferência de imunidade passiva em bezerras alimentadas com colostro de vacas com mastite subclínica. **Arquivos do Instituto Biológico**, São Paulo, v. 84, e0022015, p. 1-7, mai., 2017. <https://doi.org/10.1590/1808-1657000022015>

LOPES JUNIOR, J. F.; RAMOS, C. E. C. d. O.; SANTOS, G. T. d.; GRANDE, P. A.; DAMASCENO, J. C.; MASSUDA, E. M. Farmer's conduct analysis in dairy systems and its results in production and quality of milk. **Semina: Ciências Agrárias**, Londrina, v. 33, n. 3, p. 1199-1208, mai./jun., 2012. <https://doi.org/10.5433/1679-0359.2012v33n3p1199>

MACHADO FILHO, L. C. P.; HÖTZEL, M. J.; KUHNEN, S.; HONORATO, L. **Bem-estar de vacas leiteiras e qualidade do leite**. In: IV CONGRESSO BRASILEIRO DA QUALIDADE DO LEITE, 2010, Florianópolis. Anais... Florianópolis: Conselho Brasileiro de Qualidade do Leite, 2010. p. 1-16.

MARTINS, N. R. d. S.; SANTOS, R. d. L.; MARQUES JUNIOR, A. d. P.; SILVA, N. d. Criação de Bezerras Leiteiras. **Cadernos Técnicos de Veterinária e Zootecnia**, Uberlândia, v. 1, n. 81, p. 1-107, jun., 2016.

MOTTA, R. G.; RIBEIRO, M. G.; PERROTTI, I. B. M.; MOTTA, D. G.; DOMINGUES, P. F.; LUCAS, T. M.; ZAMPROGNA, T. O.; LISTONI, F. J. P. Surto de mastite bovina causada por *Arcanobacterium pyogenes*. **Arquivo Brasileiro de Medicina Veterinária e Zootecnia**, Belo Horizonte, v. 63, n. 3, p. 736-740, jun., 2011. <https://doi.org/10.1590/S0102-09352011000300027>

PERES, J. R. Alimentação de bezerros com diarreia. <

<https://www.milkpoint.com.br/artigos/producao/alimentacao-de-bezerros-com-diarreia-16647n.aspx>>, 2000.

Accessed on: 08/09/2017.

PETROCHI, D. L.; FISHER, P. F.; SOUZA, J. d.; ARALDI, D. F. **Aspectos importantes no manejo e criação de terneiros.** In: XVI SEMINÁRIO INTERINSTITUCIONAL DE ENSINO, PESQUISA E EXTENSÃO, 2011, Santa Cruz, Anais... Santa Cruz: Universida de Cruz Alta, 2011. p. 1-5.

SIGNORETTI, R. D. Práticas de Manejo para correta criação de bezerras leiteiras. <

<http://www.coanconsultoria.com.br/images/Artigos/Pr%C3%A1ticas%20na%20Cria%C3%A7%C3%A3o%20de%20Bezerras%20Leiteiras.pdf>>, 2017. Accessed on: 12/03/2017.