



Vulnerabilities and Entitlements in the Dairy Livestock in Rio Grande Do Sul, Brazil

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Abstract

This article aimed to analyze the vulnerabilities that permeate the development of dairy activity in Rio Grande do Sul. The theoretical framework used was based on Amartya Sen's understanding of entitlements and on a systemic perspective of understanding vulnerability. Thirty-six (36) vulnerability indicators were established. A total of 110 farmers were interviewed, distributed in 29 municipalities. For the analysis of the quantitative data collected, descriptive statistics, Spearman's correlation and the chi-square test were used. As a result, it is noted that the workforce is presented as a fundamental entitlement. Thus, the availability of workers for the development of the activity, the existence of a successor in the farm and the availability of time for leisure activities are indicators of vulnerability frequently cited by producers. The availability of land for production stands out as an important entitlement for addressing vulnerabilities. The price received for the product, the variations in the price received and the recurrent droughts are sources of vulnerability recognized by at least 84% of the milk producers interviewed in this study. Finally, competition for the area held by soybean production, which has increased land costs, is attributed as a vulnerability by more than half of ranchers.

Keywords: Socio-productive change. Capabilities Approach. Dairy Cattle Farming. Ranchers.

Vulnerabilidades e Intitamentos na Pecuária Leiteira do Rio Grande Do Sul, Brasil

Resumo

Diante das mudanças socioprodutivas recentes na pecuária leiteira do Rio Grande do Sul, esse estudo teve como objetivo caracterizar as vulnerabilidades que perpassam o desenvolvimento dessa atividade. Utilizando um referencial teórico metodológico baseando na compreensão seniana de intitamentos e em uma perspectiva sistêmica de análise da vulnerabilidade, foram estabelecidos 36 indicadores de vulnerabilidade e entrevistados 110 produtores de 29 municípios gaúchos. Para os dados qualitativos coletados técnicas da análise de conteúdo foram utilizadas, ao passo que para a análise dos dados quantitativos, fez-se uso da estatística descritiva, da correlação de Spearman e do teste qui-quadrado (χ^2). Como resultado, nota-se que a mão de obra se apresenta como intitamento fundamental, em que a disponibilidade de trabalhadores para o desenvolvimento da produção, a existência de sucessor no estabelecimento e a disponibilidade de tempo para atividades de lazer, são indicadores de vulnerabilidade frequentemente citados pelos produtores. Em mesmo sentido, a disponibilidade de terra

para a produção se destaca como intitlamento importante para o enfrentamento das vulnerabilidades. Já o preço recebido pelo produto, as variações no preço recebido e as recorrentes estiagens, são fontes de vulnerabilidade reconhecidas por ao menos 84% dos entrevistados. Por fim, a concorrência por área exercida pela produção de soja, que impacta sobre os preços das terras é atribuída como uma fonte de vulnerabilidade por mais da metade dos pecuaristas.

Palavras-chave: Mudanças socioprodutivas. Abordagem das Capacitações. Bovinocultura leiteira. Pecuaristas.

Vulnerabilidades y Derechos en Ganado de Leche en Rio Grande Do Sul, Brasil

Resumen

Teniendo en cuenta los recientes cambios socio-productivos en la ganadería lechera en Rio Grande do Sul, este estudio tiene como objetivo caracterizar las vulnerabilidades que impregnan el desarrollo de la ganadería lechera en el estado. Utilizando un marco teórico metodológico basado en la comprensión seniana de los derechos y una perspectiva sistémica de análisis de la vulnerabilidad, se entrevistó a 110 productores distribuidos en 29 municipios de Rio Grande do Sul. Como resultado, se observa que el trabajo se presenta como un derecho fundamental, en el que la disponibilidad de trabajadores para el desarrollo de la actividad, la existencia de un sucesor en el establecimiento y la disponibilidad de tiempo para actividades de ocio son indicadores de vulnerabilidad frecuentemente mencionados por los productores. Del mismo modo, la disponibilidad de tierras para la producción destaca como un título importante para abordar las vulnerabilidades. A su vez, el precio recibido por el producto, las variaciones en el precio recibido y las sequías recurrentes son fuentes de vulnerabilidad reconocidas por al menos el 84% de los ganaderos entrevistados en este estudio.

Palabras clave: Cambios socio productivos. Enfoque de Capacidades. Ganadería lechera. Ganadero.

1 Introduction

Since the 1990s, Brazilian dairy farming and, above all, dairy farming in the state of Rio Grande do Sul have undergone profound changes, which have transformed the activity and impact its current development (NoreMBERG Schubert; Niederle, 2011; Vilela et al., 2017; Wilkinson, 2008). The causes of the transformations include aspects of an economic, political and technological nature such as greater opening of the market and deregulation of public milk purchases, stabilization of the national currency, adoption of technological innovations throughout the production chain, more foreign investments in the sector and evolution of product quality norms and standards (Bánkuti; Caldas, 2018; Brasil, 2018a, 2018b; Vilela et al., 2017; Wilkinson, 2008).

Broadly speaking, these changes generated two important socioeconomic and productive effects on dairy farming in the state of Rio Grande do Sul. On the one hand, Rio Grande do Sul became the second largest milk producer in the country and the state with the highest average productivity per milked animal in 2017 (Ibge, 2018b). On the other hand, in parallel with the production effect, the last two census surveys confirmed that from 2006 to 2017 the state lost 36% of ranchers who produced milk and 56% of those who sold the product (Ibge, 2006, 2018a), revealing a dynamic of exclusion and concentration of production.

Corroborating this trend, several studies have demonstrated that scale and quality requirements, geographic remoteness of some production units and financial and agro-environmental restrictions of others have led to the exclusion of livestock farmers who do not have access to markets or productive resources necessary to carry out the activity. On the other hand, on the contrary, these same aspects have contributed to the concentration of activity in certain regions and farms (Bánkuti; Caldas, 2018; Telles et Al., 2020; Thies; Schneider; Matte, 2023; Tonin, 2018). Likewise, aspects such as family succession and difficulty in providing labor in the production system are cited as recurring problems that make it difficult to continue production (Breitenbach; Corazza; Brandão, 2020; Breitenbach; Rosolen, 2020; Camilotto, 2018).

In view of this scenario, the present article is based on the assumption that the development of dairy activity involves numerous risks and external threats to producers which, when associated with failures or the unavailability of certain entitlements, constitute situations of vulnerability. Therefore, this study aims to characterize the vulnerabilities that affect the development of dairy activity in Rio Grande do Sul. To this end, the article is organized into four more sections. Next, the theoretical perspective adopted related to vulnerability and entitlements is presented. In the third section, the methodological procedures used are described so that in the subsequent section the research results are discussed. The last section of the article is the fifth section, containing the final considerations.

2 Theoretical Framework

The pandemic caused by the new Coronavirus has made vulnerability a trending concept in many circles. According to Pollan (2020), the public health emergency exposed numerous vulnerabilities and inequalities that were not so apparent in other times. In scientific circles, however, vulnerability is a term with an extensive tradition, which is discussed in various areas of knowledge such as economics, sociology, geography, ecology, engineering and psychology. Given its breadth, the term has been central in studies on poverty and development, livelihoods and hunger, changes in climate and ecosystems, and in work on public health (Adger, 2006; Fussel, 2007).

For Fussel (2007), the incorporation of this term into the analytical toolbox of different disciplines meant that its conceptualization and use was of a polysemic nature, which in some cases was confusing. In any case, there is a certain amount of unanimity in the bibliography, which agrees that the interpretation of vulnerability is based on two main epistemological currents. One of them concerns the understanding of vulnerability as relating to the risks and dangers to which a given individual, system or community is susceptible. In this approach, known as the Environmental Disaster Approach, the identification of vulnerable groups is central.

The second interpretation analyzes vulnerability as resulting from a failure in entitlements, so that situations of vulnerability arise from the lack of rights and assets available to individuals, in such a way that they can face a given crisis situation (Adger, 2006; Fussel, 2007; Janssen ; Ostrom, 2006; Ribot, 2014). In general, it can be said that while the first approach is more related to the studies of

ecology and biology, that is, with disciplines closer to the natural sciences, the second, known as the Entitlements Approach, is directly related to social sciences.

In a review on the topic, Janssen and Ostrom (2006) argue that in social sciences there is a frequent association between vulnerability and the work of the Indian economist Amartya Sen, who in the book “Poverty and Famines: an Essay on Entitlement and Deprivation” (Sen, 1999) presents the first conceptualization of entitlements. For the author, entitlements can be understood as packages of goods over which a person can have control. However, although the relationship between vulnerability and his work is common, it is noteworthy that Amartya Sen did not provide an objective definition of vulnerability. In this regard, the theoretical methodological framework used in the present study attempts to make objective approximation between vulnerability and the concept of entitlements present in the Capabilities Approach. This approximation is carried out in the following subsection.

2.1 Vulnerability and Entitlements: some conceptual interfaces

Although Amartya Sen's thought encompasses several themes, such as the philosophical discussion about freedom and the theoretical discussion about development, it is in the Capabilities Approach that the epistemology of the author's thought is present in a schematic form (Freitas et al., 2016). Thus, the theoretical instruments mobilized by the Capabilities Approach seek to coordinate three fundamental concepts, namely functionings, capabilities and entitlements. The concept of functionings was treated in depth by Sen in the book “Inequality Reexamined”. The functionings were approached as states and actions of an individual, which together constitute what makes a life valuable.

For Sen (2017), a person's functioning ranges from simple things, such as being free from preventable diseases and being well nourished, to more complex issues such as being able to choose to participate in community life. The idea of capabilities is related to the notion of functionings. They represent the various combinations of possible functionings to be carried out, thus reflecting the freedom of individuals to choose between living one or another type of life that they value. Therefore, capabilities can be seen as all the possibilities for carrying out functionings, with their totality forming the so-called set of capabilities (Sen, 1993, 2017).

As for entitlements, they correspond to the set of goods that a person can or is able to consume and thus they are considered as the available means and accesses. According to Sen (2010), entitlements are dependent on three factors, endowments, production possibilities and exchange conditions. Endowments refer to the productive resources and wealth of an individual or family, and these resources can be exchanged on the market. Labor and land are good examples of endowments. Possibilities of production are the second factor that supports entitlements and concern technology and knowledge held by people. Exchange conditions relate to the potential to buy and sell goods. In short, entitlements depend on available resources, the possibility of using these resources for production and the opportunities to exchange goods with other agents. Due to this

intrinsic characteristic, entitlements are commonly represented as the means that allow certain goals-ends to be achieved (Fleck; Kuhn, 2019; Freitas et al., 2016).

In view of this, the theoretical instrument of the Capabilities Approach presupposes that the freedom of individuals is related to the functionings achieved, which are restricted by the set of capabilities, and which in turn is determined by the entitlements. In other words, for the Capabilities Approach, access to different entitlements allows the expansion of the set of capabilities, which in turn endows a given individual with the ability to perform functions considered important. Thus, a greater set of capabilities allows the individual greater possibilities of choice, which ultimately relates to greater freedom.

To demonstrate this conceptual coordination, the classic example presented in Sen (1999, 2017) can be used. According to the author, there are important differences related to capabilities and, consequently, entitlements, between people who fast because of some belief, or protest, and those who suffer from hunger due to the unavailability of food. Through the concepts related to the Capabilities Approach, it can be said that in both cases individuals do not perform the functioning of being free from hunger. However, the individual who carries out any type of fasting, although he does not achieve the functioning of being satiated, has a wide range of skills and, consequently, access to entitlements that allow him to satisfy his hunger whenever he wishes. As for the physical unavailability of food, it arises from the restricted set of capabilities, which makes it impossible for some individuals to have an adequate nutrition.

After presenting the main concepts that are part of the Capabilities Approach, we resume the discussion of vulnerability. As initially argued, the theoretical discussion on vulnerability has two main epistemological roots, one closer to natural sciences and the other linked to the social sciences. Although, as discussed by Adger (2006), there are important differences between the two perspectives, a point of convergence in the ways of perceiving vulnerability concerns the fact that the term is close to the notion of risks, dangers, uncertainties and contingencies. In other words, in both perspectives, vulnerability is involved in the risks and dangers arising from natural or socioeconomic phenomena.

Thus, a theoretical approach between vulnerability and the notion of entitlements is appropriate. According to Sen (1999), entitlements are characterized as the means that expand capabilities, so that, as mentioned above, for Sen (2010) entitlements are dependent on endowments and possibilities for production and exchange. Thus, entitlements are based on the existence, or not, of productive resources, technical knowledge, skills, and access to channels that allow the exchange of different types of goods and commodities. Considering these characteristics, it can be said that entitlements are related to the context in which the individual, or group, is inserted, and can be easily characterized as the means they have at their disposal at a given time and in a given place. Thus, the availability of entitlements involves subjection to risks, dangers and uncertainties, since endowments, production and exchange possibilities are not always easily available.

The contexts of the great famines, presented by Sen (1999), elucidate this coordination. When analyzing the collective famine in Bangladesh, in 1974, the author highlights that it occurred in a year of greater physical availability of food, compared to any other year between 1971 and 1976. In this case, the acute famine

only began months after the harvest and resulted from floods that affected the work possibilities of Bangladeshi workers, who found themselves deprived of earning income and, consequently, of accessing food via money markets. To put it another way, workers were deprived of the functioning of being well nourished, as their set of skills had been reduced due to the decrease in their resources. It should be noted that the lack of entitlements, related to work allocation, was associated to a natural event and institutional unpreparedness to face a crisis. This demonstrates the connection between the lack of entitlements and the notion of risks and uncertainties, that is, aspects that permeate the notion of vulnerability.

Based on this discussion, it can be said that when there is a clear relationship between poverty and reduced capabilities, the lack of qualifications, when related to the context and the notion of risk, is closely related to the concept of vulnerability. Thus, there is a logical equivalence when it is stated that the failure of entitlements, in a given context, reduces the set of capabilities, in the same way that a situation of vulnerability can lead to contexts of deprivation of freedom, poverty or even hunger. Therefore, situations of lack of capabilities, or objectively, situations of deprivation of liberty, arise from situations of vulnerability, which, as Sen explains, are equivalent to failures in entitlements. Similarly, those who have fewer problems with their entitlements also tend to be less vulnerable.

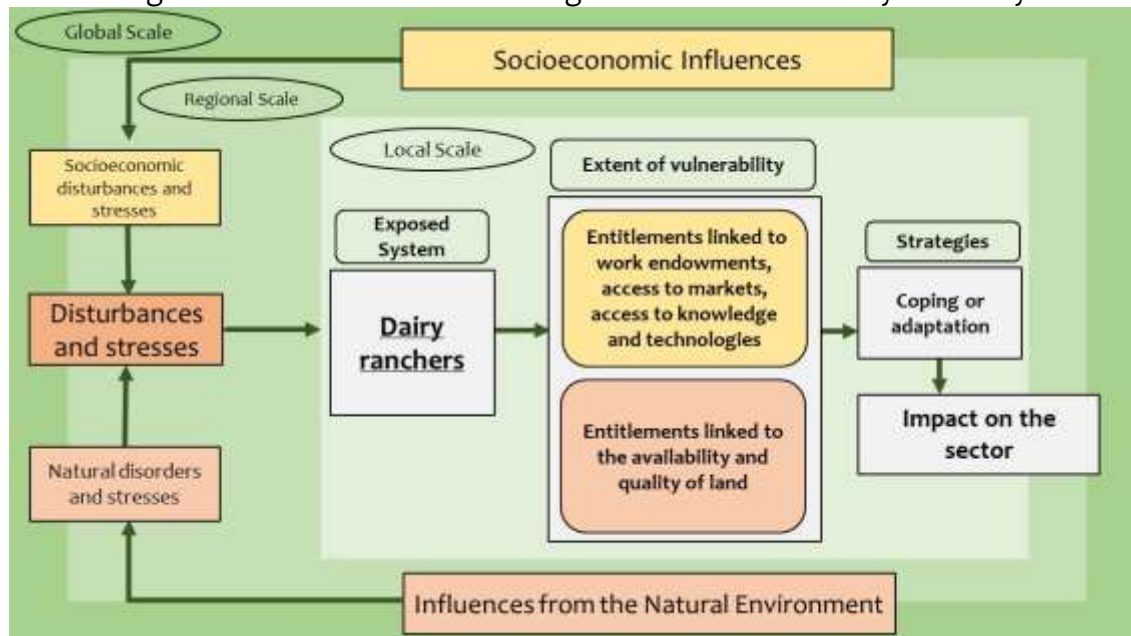
It should be noted that the debates carried out so far have focused on the relationship between the lack of capabilities and situations of poverty and hunger. This was done only to facilitate conceptual discussion in the Capability Approach lexicon. However, it can be affirmed that the reduction in the set of capabilities, due to flaws in entitlements, does not only imply extreme situations but can lead to less serious situations of deprivation, loss of freedom and autonomy of individuals. This aspect is relevant to the scope of this study, as the vulnerability of ranchers may not necessarily imply the configuration of situations of poverty, but rather situations of deprivation of autonomy and freedom.

After completion of the conceptual interfaces between vulnerability and the concept of entitlements formulated by Amartya Sen, in order to establish a broader analytical approach, a perspective presented by Turner et al. (2003) for the analysis of vulnerability can be used. In general, the Socio-Ecological System Perspective proposed by the authors assumes that situations of vulnerability originate from shocks of a socioeconomic and natural nature, which occur on a global and regional scale at a given moment in time. In turn, the existence of a situation of vulnerability requires the exposure of a given system to these shocks, so that the extent of vulnerability has an intimate relationship with the sensitivity of the exposed system. From this perspective, vulnerability is both dependent on the occurrence of external shocks and also on the socioeconomic, institutional and environmental conditions of the exposed system, and therefore has a direct relationship with the available entitlements.

Corroborating the relationship between vulnerability and the concept of entitlements, in the proposal of Turner et al. (2003) there is also a relationship between failure in entitlements and sensitivity, so that the most sensitive systems are also the most vulnerable. Likewise, the authors argue that the system's resilience capacity is important for assessing vulnerability, since resilience can lead to adaptation or coping with a contingent situation. Based on the concept of

Entitlements, by Amartya Sen, and from the systemic perspective of assessing vulnerability, the theoretical methodological framework used in this study was conceived. Figure 1 details the concepts discussed.

Figure 1 – Theoretical methodological framework used by the study



Source: Elaborated by the authors (2023).

Considering the scope of this article, the system exposed to different socioeconomic and natural disturbances and stresses are milk producers (Figure 1). In turn, the existence of vulnerable situations is related to the lack of entitlements, which are linked to endowments, production and exchange possibilities. Based on this, two groups of vulnerability-generating factors can be defined. A group related to the environment external to producers, and closely linked to regional trends, therefore being contextual. The other, related to the flaws in the entitlements held by producers and therefore concerns endowments of work, land and livestock, access to the market and access to knowledge and technologies.

Based on exposure related to the context, and sensitivity, depending on entitlements, situations of vulnerability can also be analyzed by the strategies put into practice by producers, in which the options are adaptation to the situation of vulnerability or coping with it. It is worth noting that, as presented by Turner et al. (2003), both adaptation and coping are directly related to the available entitlements, so the quality and extent of such entitlements will be advantages for the creation of strategies.

3 Methodological Procedures

The vulnerability indicators were defined based on the theoretical foundation of entitlements, by Amartya Sen, and from the systemic perspective of vulnerability analysis, proposed by Turner et al. (2003). Thus, two categorical groups of vulnerability were established, related to the entitlements held by farmers and the trends in their external context. Regarding the entitlements, 22 vulnerability

indicators were defined. Of these, 14 were related to the labor, land and livestock allocations available to producers. Two indicators were used to analyze market access, while another six concerned access to technologies and knowledge.

Regarding trends in the external context, 14 indicators were established, four related to available regional infrastructure, two indicators related to climate, five related to the characteristics of the milk purchasing market and three on the expansion of activities that compete with dairy production. In addition to the vulnerability indicators, data on the socioeconomic and productive profile of the respondents were also collected.

Considering the vulnerability indicators developed, closed-ended questions were asked to assess the producers' perception of the contribution of each of them as a source of vulnerability. The use of the Likert scale allowed the measurement of the importance attributed to each of the 36 indicators, thus mapping the sources of vulnerability. Thus, for all vulnerability indicators, producers could assign a value from "1" when the indicator was considered to be "not important", up to a value of "5", when the indicator was considered "very important".

In addition to the closed-ended questions, open-ended questions were included to verify the strategies used in response to existing difficulties. Therefore, when a vulnerability indicator was recognized, producers were asked what their ways of coping or adapting to vulnerabilities were. Thus, the present study was based on a quantitative perspective to characterize vulnerabilities and a qualitative perspective to understand ways of coping or adapting to these vulnerabilities. Producers' responses to open-ended questions were coded and analyzed using content analysis techniques, using NVivo® software.

Regarding producers' responses to the quantitative indicators used, they were tabulated and coded, being analyzed through descriptive statistics, through the use of absolute and relative frequencies. To facilitate the presentation of the relative and absolute frequencies of each indicator, the Likert scale results were recoded into a binary category. The following are the binary categories: "Little or No Importance" as vulnerability, for points 1 and 2, and "Some Importance", for points 3, 4 and 5 of the tool.

For the most relevant indicators, the correlation between variables was calculated by determining Spearman Correlation. Chi-Square Test (χ^2) was also used to compare the association, or not, between two classifications. Such classifications are presented in contingency tables, which expose the observed and expected frequencies in double-entry tables. The null hypothesis (H_0) of the chi-square test admits that there is no association between the classifications evaluated. On the other hand, the alternative hypothesis (H_1) assumes the existence of an association between the variables (Gujarati; Porter, 2011). All quantitative analyzes were performed using the Statistical Package for Social Sciences (SPSS) software.

Given the empirical scope proposed by this study, the sample size definition was based on the number of farms that sold milk in the 497 municipalities of Rio Grande do Sul, considering the data released by the 2017 Agricultural Census (IBGE, 2018a). Thus, based on the equation below, the number of producers to be interviewed was defined.

$$n = Z^2 \times SD^2 / L^2$$

$$n = 1.645^2 \times 110.49^2 / 17.30^2$$

$$n = 2.71 \times 12.207.66 / 299.46$$

$$n = 2.71 \times 40.76$$

$$n = 110.46$$

$$n = 110 \text{ farms}$$

Where:

Z: Corresponds to the confidence level used, which in this study was 90%.

SD: Corresponds to the standard deviation of the population considered, in this case the deviation of the number of farms that sold milk, per municipality in Rio Grande do Sul.

L: Corresponds to a measure of precision around the population average, with a dispersion of 17.30 farms being used here for an average of 115.37 farms per municipality.

n: Sample Size

Considering a 90% sample confidence level, 110 necessary interviews were determined. In order to maintain a coverage proportional to the importance of dairy farming in each of the state's regions, the distribution of the sample attempted to comply with the proportion of agricultural farms that sold milk in each of the seven mesoregions. Table 1 presents, by mesoregion, the number of farms that sold milk in 2017, the number of producers sampled and the number of municipalities in which producers were interviewed.

Table 1 – Proportion and number of farms that sold milk (NEVL), interviews carried out and municipalities sampled

Mesoregions	NEVL ¹		Number of interviews		Number of municipalities	
	No	%	No	%	No	%
Northwest of RS	36,252	64%	71	65%	19	66%
Northeast of RS	4,879	9%	10	9%	2	7%
Western Center	1,700	3%	3	3%	1	3%
Eastern Center	5,832	10%	11	10%	3	10%
POA Metropolitan Region	2,637	5%	5	5%	1	3%
Southwest of RS	2,110	4%	6	5%	2	7%
- Southeast of RS	3.119	6%	4	4%	1	3%
TOTAL	56,529	100%	110	100%	29	100%

¹ NEVL – Number of farms that sold milk, according to data from the 2017 Agricultural Census (IBGE, 2018a).

Source: Elaborated by the author (2020).

Due to the concentration of farms that sell milk production in the Northwest, this was the mesoregion with the largest number of producers and municipalities sampled. To ensure greater heterogeneity in production situations, producers from four pre-defined production strata were interviewed, namely:

- a) Stratum I: 21 Dairy producers who produced up to 200 liters of milk per day;
- b) Stratum II: 38 Dairy producers who produced from 201 to 500 liters of milk per day;
- c) Stratum III: 31 Dairy producers who produced from 501 to 800 liters of milk per day;
- d) Stratum IV: 20 Producers with production greater than 801 liters of milk per day.

Finally, it should be mentioned that all data was collected between the months of August and November 2020, with collection being carried out via telephone and video calls. Access to producers occurred through recommendations made by technicians from Emater and the Rural Workers Union of the municipalities.

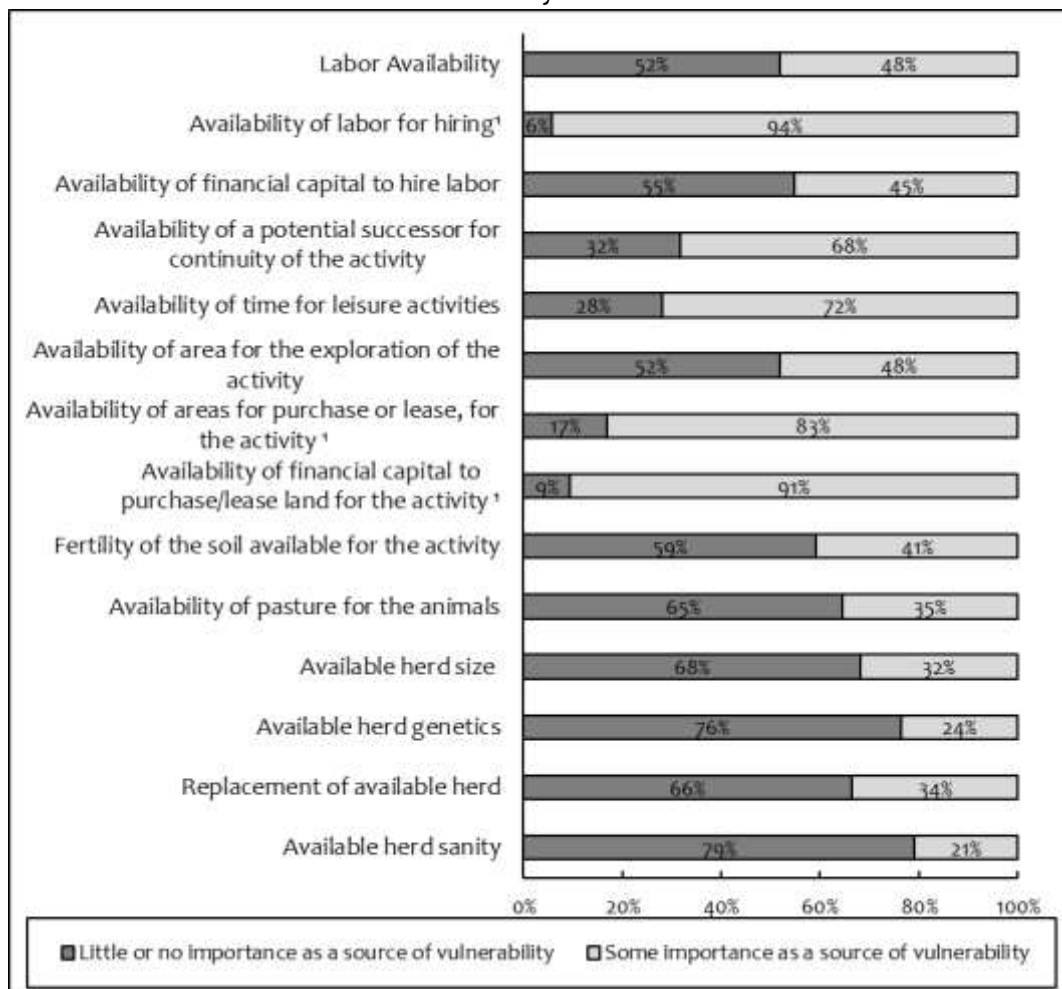
4 Results and Discussion

Due to the theoretical methodological framework used and in order to better present the results of the study, this section was divided into two parts. The first addresses vulnerabilities that are directly related to the entitlements held by the producers, while the subsequent section seeks to present the perception of vulnerabilities that concern the context external to producers.

4.1 Vulnerabilities related to Producer Entitlements

Based on the characteristics of dairy farming, the availability of workers, land and herds to explore the activity were considered as producer endowments. Regarding labor availability, as can be seen in Figure 2, for 48% of respondents this indicator is treated as a vulnerability. In turn, in 68% of the farms the existence of a potential successor is reported as a difficulty, while in almost three quarters of the farms (72%), time for leisure activities was characterized as a vulnerability.

Figure 2 – Relative importance of labor, land and livestock endowments as sources of vulnerability for ranchers



¹ Percentage referring only to producers who stated that the “Availability of Labor” and the “Availability of area for exploration of the activity” are of some importance as a vulnerability. Source: Elaborated by the authors (2023).

In general, the difficulties in recruiting workers are directly related to aspects such as the age of the producers, the number of people residing in the farms and the size of production. For many ranchers, old age has caused, or could cause, in the short or medium term, problems in the continuity of production. Therefore, some of them are already planning to close, or change their activity in the future. Likewise, producers who have fewer workers in their farm report that the daily milking frequency makes it difficult to deal with possible unforeseen events, such as the illness of a family member and even the development of leisure activities. Therefore, this vulnerability occurs in most farms.

In this regard, Spearman's correlation indicates a moderate and negative relationship between the increase in vulnerability and the availability of labor and the number of people living in the farms (-0.242), demonstrating that farms with a greater number of residents tend to have fewer difficulties with workers and consequently improve their capacity for work organization. The difficulty of recruiting workers into the production system is corroborated by other studies on dairy farming in Rio Grande do Sul (Breitenbach; Corazza; Brandão, 2020;

Breitenbach; Rosolen, 2020; Thies; Schneider; Matte, 2023). To address these difficulties, five strategies were listed by producers. The first can be considered a form of adaptation to this situation, in which some ranchers claim to adjust, or maintain, the size of their herds and production according to the amount of labor. However, other producers have sought ways to cope and adapt to this situation, by hiring employees, increasing the mechanization of the activity, exchanging services and, in more extreme cases, changing activities.

Regarding tackling this problem through hiring workers, two other aspects emerge as sources of vulnerability. As shown in Figure 2, 94% of producers who need external collaborators face problems related to the availability of human resources for hiring. The reasons given by the ranchers concern aspects such as the scarcity of people in rural areas and the specificities of dairy production, which requires a qualified workforce with flexibility in terms of working hours and days. In turn, 45% of producers highlight the lack of financial resources as a limiting factor in hiring labor. Furthermore, using chi-square test and contingency tables (Table 2), it can be seen that as daily production increases, there is greater exposure to the difficulties associated with this indicator. Therefore, more than half of the farms that produce more than 501 liters of milk per day face difficulties related to hiring labor.

In addition to problems related to labor availability, there are vulnerabilities in the succession process. As shown in Figure 2, generational succession was cited by 68% of the ranchers as a source of vulnerability. Among the reasons for the difficulties related to this process, the lack of land necessary to increase production was the most cited aspect. Therefore, this vulnerability clearly exposes a flaw in the entitlements available to producers. Corroborating this, chi-square test (Table 2) indicates that farms with lower production have a higher frequency of producers that face difficulties finding successors. Thus, in 81% of the farms in the lowest production stratum, succession is a vulnerability, while this is a difficulty in 50% of the farms with daily a production greater than 801 liters.

Table 2 – Contingency coefficient (C), chi-square statistic (χ^2), absolute and relative frequency for three endowment indicators, considering the four production strata of producing farms

Indicator	Response	Production Strata			
		Up to 200 liters/day	From 201 to 500 liters/day	From 501 to 800 liters/day	More than 801 liters/day
Availability of Labor	Little or no importance	13 (62%)	24 (63%)	13 (42%)	7 (35%)
	Some importance	8 (38%)	14 (37%)	18 (58%)	13 (65%)
	χ^2 / C	Test statistic: 6.28 (Significance = 0.09) / C = 0.233			
Availability of a potential successor for continuity of the activity	Little or no importance	4 (19%)	11 (29%)	10 (32%)	10 (50%)
	Some importance	17 (81%)	27 (71%)	21 (68%)	10 (50%)
	χ^2 / C	Test statistic: 4.77 (Significance = 0.18) / C = 0.204			
Availability of pasture for the animals	Little or no importance	9 (43%)	28 (74%)	18 (58%)	16 (80%)
	Some importance	12 (57%)	10 (26%)	13 (42%)	4 (20%)
	χ^2 / C	Test statistic: 8.36 (Significance = 0.03) / C = 0.266			

Source: Elaborated by the authors (2023).

Thus, it can be assumed that farms with lower production also have a small-scale production infrastructure and more restricted financial conditions for increasing production, which impacts the succession process. Corroborating this finding, Teixeira, Bernardo and Moreira (2013), in a study carried out with children of milk producers in Minas Gerais, found that young people who live in farms with a daily production of more than 500 liters have a positive view of the activity and of the succession process. A similar dynamic is observed in a study developed by Rocha Júnior et al. (2014) in Rio Grande do Sul, where producers with higher productions have a greater probability of succession in dairy farming. In turn, in a review of the factors that influence decision-making for succession in family farming, Matte and Machado (2017) argue that the difficulty of obtaining land is one of the main aspects that contribute to the non-continuity of producers' children in the agricultural sector.

Regarding land, as shown in Figure 2, for 48% of producers, the area available for livestock farming is perceived as insufficient. As expected, there is a negative correlation between this vulnerability indicator and the size of the usable agricultural surface of the farms (-0,435) and with the size of the area owned by ranchers (-0,513). Thus, producers who have larger areas for the development of the production system and those who have more extensive land of their own are less sensitive to this vulnerability and have a larger package of entitlements.

If on the one hand land purchase and leasing are a potential way to deal with area limitations, on the other hand, for 83% and 91% of the ranchers, the unavailability of land areas and the lack of financial capital, respectively, are sources of vulnerability (Figure 2). According to producers, there are two main reasons that make the search for areas for lease difficult. The first is that when there are available land areas, they are far from production units, which limits their use for this activity. The second reason is associated with competition from other

producers in land leasing. In this regard, ranchers from different regions reported the preference of lessors to lease their land to grain producers.

As for the unavailability of financial capital to purchase land, this is due to the increase in its value in recent times, with frequent reports that the “price of land has not kept up with the price of milk” and even that the “price of soybeans has inflated the value of the lands.” Regarding the first aspect, the comparison of the data shown in the Land Market Analysis Reports in the State of Rio Grande do Sul (Incra, 2017, 2020) reveals significant price increases in municipalities belonging to the Northwest and Northeast mesoregions, over a period of just three years. Confirming the second perception of producers, according to Incra (2020), the increase in soybean cultivation is the main reason for the recent appreciation of land capital in several regions of the state.

Considering the difficulties of purchasing and leasing land, the strategy for dealing with the scarcity of land areas has been the same as that used for problems with labor. In turn, to adapt to the lack of land areas, other ranchers have intensified land use through changes in the production system, via raising animals in confinement and semi-confinement production systems. Therefore, of the total number of producers interviewed, 25% use one of these production systems. Confirming this trend, the Socioeconomic Report of the Milk Production Chain, prepared by Emater, points out that between 2017 and 2021 the number of farms with a confinement and semi-confinement production system increased from 2,871 to 4,001 in Rio Grande do Sul (Emater, 2021).

A second form of intensification of land use concerned the increase in the number of animals on pastures and the practice of cutting silage in more than one harvest per year, in the same area. This strategy is characterized by increasing the intensity of agricultural use of land. However, this practice may be associated with increased vulnerabilities related to fertility and soil degradation, since 41% of producers reported having some difficulty with this indicator (Figure 2).

While vulnerabilities regarding the availability of land areas and soil fertility can be considered indicators that affect all producers, the chi-square test in Table 2 shows that restrictions on the supply of pasture for animals are more frequent for ranchers with a production up to 200 liters per day, and thus 57% of producers in this stratum must cope with the referred vulnerability. Furthermore, the correlation between the size of the usable agricultural area and the availability of pasture is -0.322, demonstrating that producers with less available land face more difficulties in feeding their animals.

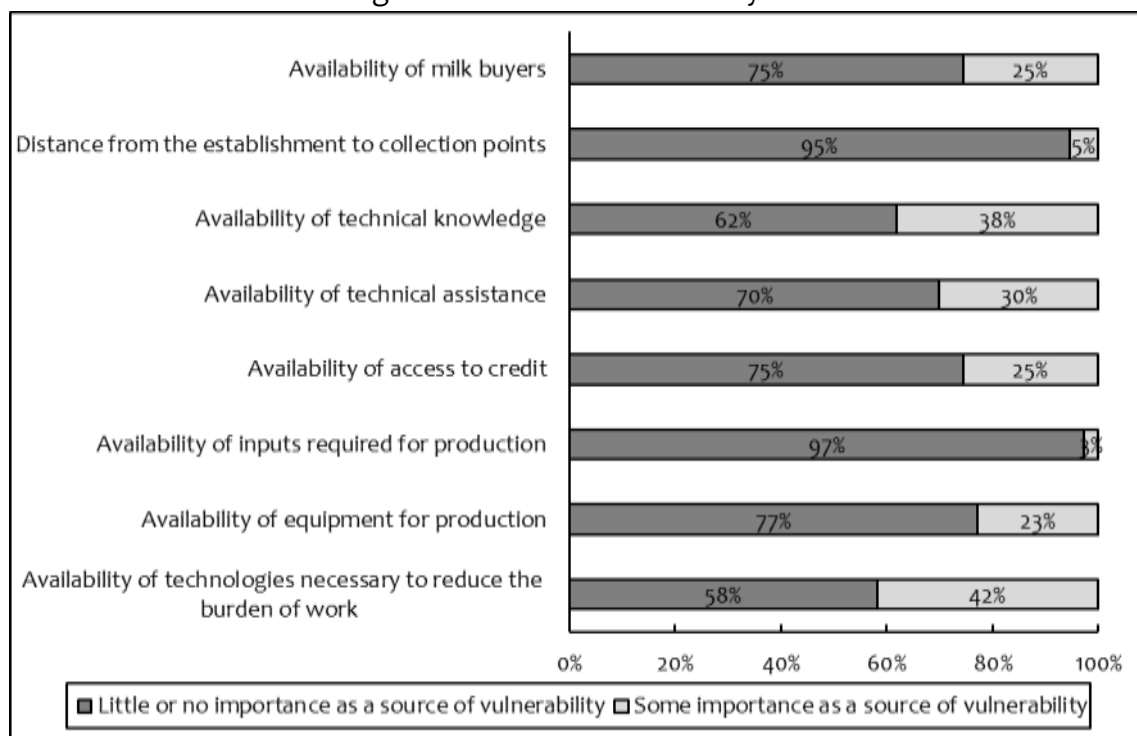
Still regarding endowments, the variables related to the herd were the least cited as vulnerabilities, so that less than a third of producers (32%) said they faced difficulties regarding the size of the herd (Figure 2). In any case, the reason cited as causing this vulnerability is the availability of land areas for the activity, with producers generally seeking to adapt the number of animals according to the available areas. As for the genetics of the animals, the diagnosis presented by most of the 24% of ranchers who have had some problems with this indicator is related to their lack of experience in the activity, which makes it difficult to achieve an adequate genetic standard, or one expected for the farm. In this regard, producers who said they did not have to address this vulnerability argued about the long trajectory of genetic improvement in their facilities. Although low (-0.187),

Spearman's correlation attests to the relationship between longer time in activity and reduced difficulties with the herd's genetics.

Regarding the replacement of animals, of the 110 producers, 34% reported having difficulties in replacing the herd, with the main issues being limitations of land areas for raising calves and heifers, as well as the degree of knowledge and technical management associated to raising these animals. There is a significant and moderate correlation (-0.213) between the time spent working in dairy farming and the difficulties in replacing heifers in the herd. This correlation demonstrates that experience in the activity is essential for the development of one of the most complex technical tasks within the production system. Finally, in addition to being the indicator least frequently mentioned as vulnerability (21%), herd sanity did not have a greater impact on any group of producers, with no significant correlations with this indicator.

Also based on the definition of entitlements made by Sen, production possibilities and exchange conditions were evaluated. Regarding exchange conditions, as shown in figure 3, for 25% of producers, the availability of milk buyers is a vulnerability. In turn, the distance of the dairy farms from the collection points was reported by only 5% of the producers.

Figure 3 – Relative importance of market access, access to technologies and access to knowledge as sources of vulnerability for ranchers



Source: Elaborated by the authors (2023).

Although compared to endowments market access indicators are less frequently perceived as vulnerabilities, the use of the chi-square test reveals that this is a vulnerability associated with the region in which producers are located. Thus, producers who have production units located in the Northwest are less frequently faced with difficulties in finding buyers for their milk (13%), while in other

regions, this indicator was considered a vulnerability for 49% of the respondents (Table 3). This result is based on the concentration of milk collection and processing infrastructure in the Northwest, exposed by Lucca and Arend (2020).

Table 3 – Contingency coefficient (C), chi-square statistic (χ^2), absolute and relative frequency for the indicators of market access and access to technologies, considering the region where the farms are located and the four production groups

Indicator	Response	Region of Rio Grande do Sul			
		Northwest	Other regions		
Availability of milk buyers	Little or no importance	62 (87%)	20 (51%)		
	Some importance	9 (13%)	19 (49%)		
χ^2 / C		Test statistic: 17.23 (Significance = 0.01) / C = 0.368			
Indicator	Response	Production stratum			
		Up to 200 liters/day	From 201 to 500 liters/day	From 501 to 800 liters/day	More than 801 liters/day
Distance of the dairy farm from the collection points	Little or no importance	18 (86%)	37 (97%)	29 (94%)	20 (100%)
	Some importance	3 (14%)	1 (3%)	2 (6%)	0 (0%)
χ^2 / C		Test statistic 4.98 (Significance = 0.17) / C = 0.208			
Availability of technologies necessary to reduce labor hardship	Little or no importance	12 (57%)	17 (45%)	20 (65%)	15 (75%)
	Some importance	9 (43%)	21 (55%)	11 (55%)	5 (25%)
χ^2 / C		Test statistic: 5.67 (Sig = 0.13) / C = 0.221			

Source: Elaborated by the authors (2023).

The dynamics of regional concentration of the processing industry and dairy production itself is not unique to Rio Grande do Sul, as this is the trend observed in several producing regions (Marks Machado; Waquil, 2020; Telles et al., 2020). However, in addition to demonstrating that producers who are not from the northwest region of the State are more exposed to difficulties in accessing the market, the chi-square test indicates that compared to the other three productive strata, ranchers who produce up to 200 liters per day are those who most frequently mention the distance of their dairy farms to the collection points as an indicator of vulnerability (Table 3). It is worth considering that this vulnerability does not appear to be associated only to the distance of dairy farms of this productive stratum to collection points, but rather to the strategy of purchasing companies that choose not to create or maintain collection lines in distant locations, where there are generally few producers or producers with lower milk production (Bánkuti; Caldas, 2018; Machado; Miguel; Tonin, 2021; Tonin, 2018).

Regarding the possibilities of production, indicators on access to knowledge and technologies were used. For 62% of the producers, their technical knowledge was not considered insufficient (Figure 3). The others, in turn, stated that this was a recurring vulnerability. Although there is not a dynamics for differentiation by production stratum, or between producing regions, there is a correlation between the availability of technical knowledge and the time dedicated by producers to the activity (-0.238). Therefore, more experienced ranchers tend not to point out this indicator as a source of vulnerability.

To overcome difficulties related to technical knowledge, talks and requests for help from more experienced ranchers, in addition to seeking technical assistance, were the most cited resources. The availability of technical assistance was addressed as a vulnerability by 30% of the producers, who argued that they did not have sufficient technical support for their dairy activity (Figure 3). Regarding the quality of the guidance received, some producers regretted the lack of permanent assistance, as the technical assistance provided is generally intended to solve specific problems. To adapt to this vulnerability, some ranchers have periodically hired private assistance. However, the periodic hiring of technicians is not a viable alternative for the vast majority of producers in Rio Grande do Sul.

Although vulnerability related to technical assistance does not differ by productive stratum, Spearman's correlation shows an association between the availability of technical assistance and the productive infrastructure of the farms. Therefore, there is a negative and moderate correlation with the size of areas for dairy production (-0.230), size of herds (-0.231) and size of monthly milk production (-0.275). This correlation shows that farms with small infrastructure tend to attribute a greater degree of vulnerability to the availability of technical assistance. This result is in line with the recognized trend of greater access to technical assistance, provided mainly by private companies and cooperatives to producers that use more intensive production and, consequently, to the use of inputs external to the production system (Acosta; Souza; Bankuti, 2018; Neto; Basso, 2005; Vilela et al., 2017).

The last internal vulnerability indicators concerned access to technologies. Although rural credit is used by 86% of the respondents, as shown in Figure 3, for 25% of the ranchers, access to credit is a vulnerability. The justifications listed are related to the bureaucracy necessary for contracting rural credit, the interest rates charged in investment programs and the uncertainties of dairy farming. This is rather a perspective of aversion to the risks embedded in contracting credit in the financial system than a flaw in their entitlements. Similar behaviors are found in some studies with beef cattle ranchers in Rio Grande do Sul (Waquil et al., 2016).

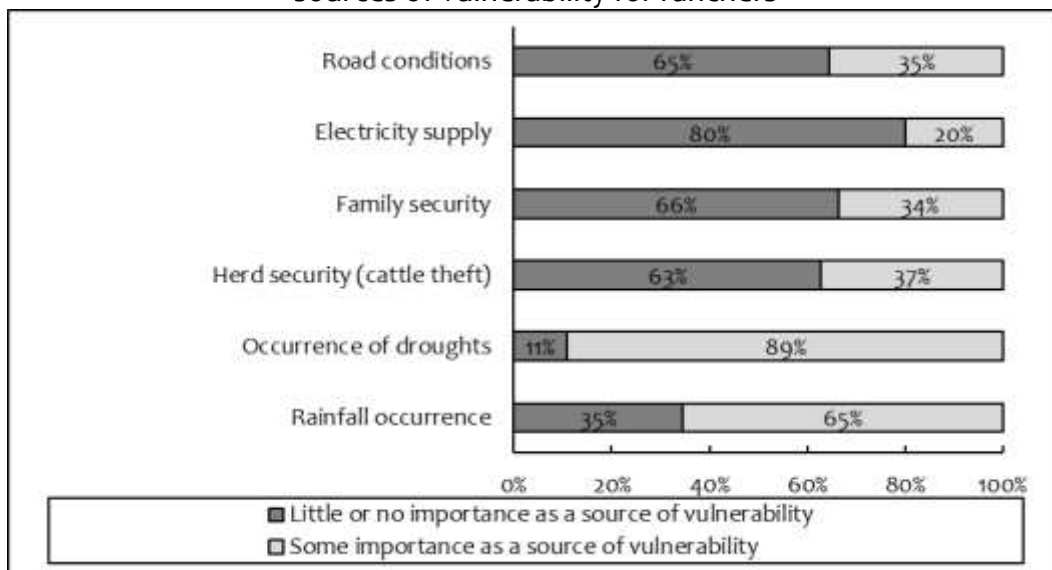
The availability of inputs for production was not highlighted as a difficulty by the vast majority of the respondents. In turn, the availability of equipment was a vulnerability factor for 23% of the producers. The equipment most reported to be missing in production units were forage harvesters and seed drills, since according to producers, the unavailability of this equipment reduces the autonomy for carrying out activities related to planting and cutting crops for silage.

On the other hand, the lack of technologies to reduce the burden of work is the most frequently cited vulnerability among the indicators shown in Figure 3, being addressed as a difficulty for 42% of the respondents. Interestingly, this vulnerability is more prevalent in the farms in strata with daily production of up to 800 liters (Table 3). Then, most farms in the upper productive stratum have technologies that improve ergonomic working conditions. As it is a daily task and carried out manually by 66% of producers, the practice of removing silage was repeatedly cited as the hardest and most difficult work. Of the 72 producers who do not have a desilting machine, 21 (29%) said they planned to purchase the referred equipment to address this vulnerability.

4.2 Vulnerabilities related to the Context External to Producers

Considering the systemic perspective of Turner et al. (2003), the vulnerability analysis also included the perception of risks external to producers. Figure 4 presents indicators related to available regional infrastructure and climate. For 35% of producers, poor road conditions have a negative impact on production flow. It should be noted that 73% of the total producers in the sample do not have access to paved roads at a distance of less than one kilometer from their farms, so the maintenance of local roads is crucial for the development of the activity.

Figure 4 – Relative importance of available regional infrastructure and climate as sources of vulnerability for ranchers



Source: Elaborated by the authors (2023).

Although difficulties related to road conditions are a concern for more than a third of producers and an aspect referred to as limiting factor for dairy production in some regions of Brazil (Carvalho; Pocard-Chapuis; Tourrand, 2015; Waquil et al., 2015), the data collected does not suggest regionalization of this vulnerability indicator. In turn, when analyzing the supply of electricity, which is perceived as a vulnerability by 20% of the ranchers, it appears that this is a difficulty mainly faced by producers not located in the Northwest of the state. According to the chi-square test shown in Table 4, 38% of producers in other regions face problems in the supply of electricity, while in the Northwest this vulnerability affects only 10% of producers.

Table 4 - Contingency coefficient (C), chi-square statistic (χ^2), absolute and relative frequency for the electricity supply indicator considering the region where the producers are located and the type of supplying company

Indicator	Importance as difficulty	Region of Rio Grande do Sul	
		Northwest	Other regions
Electricity supply	Little or no importance	64 (90%)	24 (62%)
	Some importance	7 (10%)	15 (38%)
χ^2 / C		Test statistic: 12.81 (Significance = 0.01) / C = 0.324	
Indicator	Importance as difficulty	Type of Electricity Supplier Company	
		Cooperative	Private
Electricity supply	Little or no importance	49 (96%)	39 (66%)
	Some importance	2 (4%)	20 (34%)
χ^2 / C		Test statistic: 15.363 (Sig = 0,01) C = 0.350	

Source: Elaborated by the author (2023).

In addition to being a difficulty that mainly affects producers in “other regions”, problems with electricity seem to be directly related to the type of supplying company. As can also be seen in Table 4, only 4% of producers who rely on energy distributed by cooperatives report some difficulty with this type of service, while this percentage reaches 34% of producers served by private companies. The perception of the better quality of service provided by electric power generation cooperatives is consistent with the historical importance of electrification cooperatives in rural areas in Rio Grande do Sul and, above all, in the Northwest of the state (Locatel; Lima, 2018; Ocb, 2019; Steffens et al., 2021).

Family security was considered a vulnerability by 34% of producers and covered the risks of robbery and theft on farms. In turn, herd security was cited as a vulnerability by 37% of the respondents. Also, corroborating the results presented, Waquil et al. (2015) in a study conducted in Rio Grande do Sul reported the great concern of farmers regarding problems with cattle theft. As reported by the author, the way of coping with this difficulty has been to keep animals close to where the owners live, to ensure the constant presence of residents in the farm and the watch by neighbors.

Regarding climate, the occurrence of droughts was cited as a source of vulnerability by 89% of the ranchers. The high vulnerability for this indicator is directly related to the fact that data collection coincided with a time when all regions of the state were facing, or had recently faced, lack of rainfall events. According to the last two technical bulletins from the Department of Environment and Infrastructure of Rio Grande do Sul (SEMA – RS), from December 2019 until the end of the first half of 2021, the state faced a drought scenario with water deficits in all regions (Sema RS, 2020, 2021).

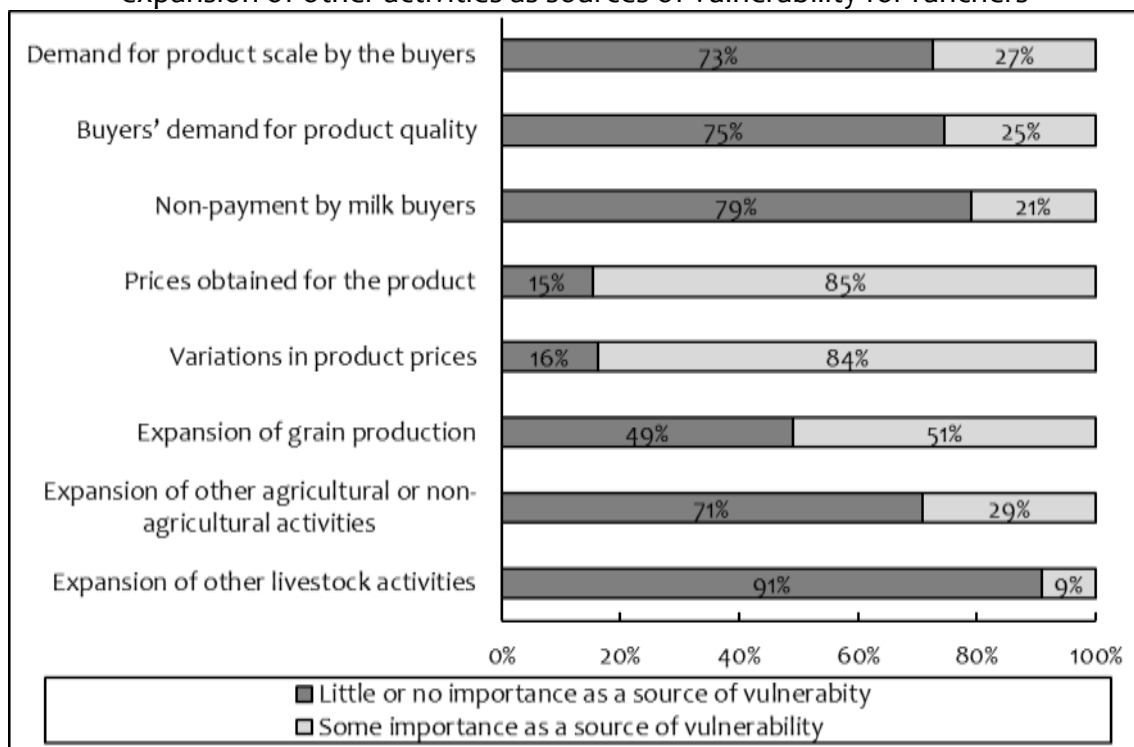
In view of this, numerous producers said that the lack of rain led to recent losses in pasture and silage production, leading to a drop in milk production. To fight this vulnerability, many producers suggested the immediate implementation of the Agricultural and Livestock Guarantee Program (PROAGRO), which is an insurance that exempts rural producers from meeting financial liabilities in rural working credit operations in case of income loss as a consequence of climatic

adversities or diseases. However, producers said that although PROAGRO is a tool to settle debts with the financial system, it does not guarantee the possibility of feeding the animals. To address this difficulty, irrigation has been used, which, however, has benefited only 19% of the respondents. Another strategy has been to increase food stocks, with some ranchers increasing corn production for silage in the summer and using the silage on grasses in the winter. However, as has been argued, this strategy is based on a more intensive use of the soil and tends to make problems worse due to degradation.

On the other hand, excess rainfall was also addressed as a vulnerability factor by most respondents (65%). According to producers, periods with excessive rain directly affect the availability and quality of pastures, since grazing on wet soil increases compaction and loss of pasture quality. This vulnerability is greater in farms with clayey soils, such as oxisols and ultisols, and on farms that use a high number of animals on pastures. Likewise, rainy periods make milk quality control difficult, as the risk of product contamination increases.

The latest vulnerability indicators for trends in the external context are shown in Figure 5. Regarding market characteristics, for 27% of the respondents the fact that buyers must purchase minimum quantities is a difficulty. According to the ranchers' statements, the companies have established different mechanisms to encourage increased production. One of them is the imposition of minimum daily production limits to ensure the permanent purchase of the product. This strategy is already recognized and addressed in the bibliography. To reduce costs, some companies concentrate collection on a few routes and on producers with greater production volume (Costa; Martinelli; Bánkuti, 2022; De Mendonça et al., 2020; Vilela et al., 2017). Similar to what occurs with the requirements related to product quantity, quality requirements were expressed as a vulnerability by 25% of producers. However, the justifications given were restricted to specific problems, within the production system. In the vast majority of cases, producers said that they face problems in the control of somatic cells in milk at certain times of the year, which makes it difficult to meet the quality standards established by the Normative Instructions.

Figure 5 – Relative importance of the characteristics of the market accessed and the expansion of other activities as sources of vulnerability for ranchers



Source: Elaborated by the authors (2023).

As for buyers' non-payment, it was perceived as a difficulty by 21% of the respondents. One of the main reasons justifying this vulnerability is the total dependence of producers on buyers, as payment for the product is made at least one month after delivery. Another reason that explains this risk perception concerns the experienced or known non-payment cases. It is noteworthy that of the 110 respondents, 21 (19%) reported having not been paid for their products by dairy companies.

In this context, the trust and reputation of companies were aspects widely cited as a way of coping with this vulnerability, in which many producers try to maintain ties with a particular company, because of the bond of trust already established. Thus, most producers (72%) have been supplying milk to only one purchasing dairy company for more than five years. Of these, 25% reported that they have been supplying milk to the same dairy company for more than ten years. In this regard, in a study aimed to analyze the factors that determine producers' loyalty to dairy products in Minas Gerais, Simões et al. (2021) reported that paying for products on time is one of the three key aspects to ensure that producers continue to sell their milk to these companies in the long term.

As was the case with the supply of electricity, there is a regional difference regarding the perception of the risks of non-payment by milk buyers. Table 5 shows that in the Northwest of the State there is a tendency towards a greater perception of risks related to non-payment. It is noteworthy that in the referred region most milk sales are made to private companies, while in other regions, respondents reported selling the product to cooperatives. Using the chi-square test, and considering the type of market, it can be seen that the risk perception of

cooperative producers is significantly lower (Table 5). This result corroborates Chayanov's (2017) argument that cooperativism is an important form of organization because it reduces the risks of those farmers whose products benefit from economies of scale and are sold in long dairy value chains.

Table 5 - Contingency coefficient (C), chi-square statistic (χ^2), absolute and relative frequency for the indicator of non-payment of milk buyers and expansion of grain production

Variable	Importance as difficulty	Region of Rio Grande do Sul	
		Northwest	Other regions
Non-payment by milk buyers	Little or no importance	51 (72%)	36 (92%)
	Some importance	20 (28%)	3 (8%)
χ^2 / C		<i>Test statistic: 6.38 (Significance = 0.01) / C = 0.234</i>	
Variable	Importance as difficulty	Type of Milk Purchasing Company	
		Private Companies	Cooperatives
Non-payment by milk buyers	Little or no importance	46 (72%)	41 (89%)
	Some importance	18 (28%)	5 (11%)
χ^2 / C		<i>Test statistic: 4.82 (Significance = 0.03) / C = 0,205</i>	
Variable	Importance as difficulty	Region of Rio Grande do Sul	
		Northwest	Other regions
Grain production expansion	Little or no importance	29 (41%)	25 (64%)
	Some importance	42 (59%)	14 (36%)
χ^2 / C		<i>Test statistic: 5.45 (Significance = 0.02) / C = 0.217</i>	

Source: Elaborated by the authors (2023).

As expected, the price obtained for milk was a highly sensitive indicator of vulnerability, highlighted as a difficulty by 85% of producers (Figure 5). In statistical terms, it was not possible to determine a difference between the strata and the producing regions. However, the survey of prices obtained for the product in July 2020 revealed differences between the four production strata, in which the price paid per liter of milk to producers in the largest stratum was 15.2% higher than the value obtained by small-scale producers.

As was the case with the prices obtained, variations in prices paid were frequently perceived as a vulnerability (84%). For producers, the inconsistency of product remuneration makes production planning difficult. Since the opening of trade in Brazil, milk prices in Rio Grande do Sul have had a more unstable behavior, as the possibility of importing dairy products from Mercosur directly affects prices in the local market (Viana et al., 2010). Anyway, as pointed out by some authors, a seasonal behavior of increasing prices paid to producers in the cold season followed by falling prices during the summer months still persists in the Rio Grande do Sul dairy market (Cepea, 2021; Ciechowicz et al., 2018; Viana et al., 2010).

Among the activities that compete with dairy farming, the expansion of grains, in particular, soybean production, stood out as a frequently cited vulnerability, reaching a percentage of 51% of cases (Figure 5). It is noteworthy that producers' high perception of the threat of soy to milk production exceeds the risk

attributed to this indicator by beef cattle farmers, in a study developed by Matte and Waquil (2020) in the Pampa biome. There were two forms of competition by soybean planting, one related to pressure for land use and the other related to the possibility of converting ranchers into soybean farmers.

The productive conversion of the farm was a strategy mainly advocated by producers without succession and about to retire. In turn, competition for grains in the land purchase and rental market is what worries most producers. Using the chi-square test (Table 5), it can be seen that producers in the Northwest tend to perceive threats from grain expansion more frequently. Although it must be considered that the homogenization of other regions limits the recognition of other regional dynamics, from 2010 to 2020 there was a 12% increase in the area cultivated with soy in the Northwest of Rio Grande do Sul (Ibge, 2021).

Finally, the expansion of other agricultural or non-agricultural activities is a difficulty for 29% of producers. The risk considered in this indicator concerns competition from other activities for dairy farming labor. In turn, the expansion of other livestock activities was cited as a vulnerability for 9%. In this case, unlike what happened with soybeans, competition for area is not a problem, and the risk reported by producers concerns the prospect of changing activity, especially for those producers who do not have rural succession and therefore tend to migrate to another activity in the short or medium term.

5 Final Remarks

This article aimed to characterize the vulnerabilities that affect the development of dairy farming in Rio Grande do Sul. Based on the analysis undertaken, it can be affirmed that land and work, in addition to being indispensable production factors for dairy farming, are decisive assets for coping and adapting to different situations of vulnerability. Specifically, regarding difficulties with labor, it appears that the number of people in the family involved with production is an advantageous asset for confronting vulnerabilities. Thus, farms with more available labor have greater possibilities of increasing and maintaining production and tend to deal better with the organization of work within the production system.

Associated with labor, the availability of land is also a beneficial entitlement for the resilience of producers, as it is clear that the greater extension of this entitlement makes it easier to deal with the vulnerabilities of the production process and also appears to increase the possibilities of social and generational reproduction in the farms. Thus, although this is a challenge faced by all farms, it is notable that producers who have larger areas and who generally sustain larger productions, have greater possibilities of generational succession. This result reaffirms the fact that land and work have a systemic relationship, so that the availability of labor, which arises in many farms from the existence of succession, is affected by the available area itself. Considering the current situation, in which land is a scarce and highly valued asset in several regions of the state, this is a key issue to the development of dairy farming in Rio Grande do Sul.

Regarding exchange conditions, the market access indicator is a regionalized vulnerability, in which due to the agro-industrial concentration of milk processing in

the Northwest region, producers in other regions tend to be more exposed to market access problems. As for production conditions, it can be seen that the time spent working in the activity is an important asset for reducing the difficulties of technical knowledge in production. In turn, access to technical assistance is a vulnerability significantly correlated with the productive characteristics of establishments, in which establishments with larger areas, larger herds and greater production are less sensitive to this vulnerability indicator.

As for external vulnerabilities, although they are referred to as a vulnerability by only 20% of producers, it is notable that producers in the Northwest are less exposed to problems related to the supply of electricity. The lower exposure to this indicator is directly associated with the type of electricity supplying company predominant in the region, which are rural electrification cooperatives. Regarding the climate, it is worth mentioning that the prolonged drought events that have plagued Rio Grande do Sul were addressed as a source of vulnerability with a high impact on producers, regardless of the production stratum and region of origin of the producers. Finally, it should be emphasized that the expansion of soybeans, and the consequent competition for area with dairy production, is seen as a source of vulnerability by most of the producers analyzed.

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