



National Program to Strengthen Family Farming: an analysis of the regional distribution of resources in northwestern Rio Grande do Sul

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Abstract

The National Program for Strengthening Family Agriculture (Pronaf) is the Brazilian federal government's primary program to support family farming. Therefore, it is important to evaluate this public policy to verify if it manages to benefit the diverse group of beneficiaries despite the high amounts bestowed. This study aimed to identify factors that influence the distribution of Pronaf resources in municipalities that are part of one of the nine Functional Planning Regions in Rio Grande do Sul State, namely RF7, composed of the COREDEs Celeiro, Noroeste Colonial, Fronteira Noroeste, and Missões. A quantitative approach with a correlational scope was used. Data were collected for 2017 from two public databases: the Brazilian Institute of Geography and Statistics and the Central Bank of Brazil. Univariate and bivariate statistical methods were applied using the statistical software R. The results demonstrate a direct correlation between the resources accessed through Pronaf in the RF7 municipalities and the number of commodities (soybean, maize, and wheat) produced, the number of tractors per capita, and the percentage of establishments that employ pesticides. There is an indirect correlation between the percentage of establishments classified as Pronaf B (lower income) and the percentage of establishments run by women. Furthermore, there were no correlations with the percentage of establishments run by people under 25. We hope our findings will help public policymakers identify the weaknesses of Pronaf and develop improvements to meet the heterogeneity of family farming.

Keywords: Public policy. Family farming. Functional region.

Programa Nacional de Fortalecimento da Agricultura Familiar: uma análise da distribuição regional dos recursos no Noroeste do Rio Grande do Sul

Resumo

O Programa Nacional de Fortalecimento da Agricultura Familiar (Pronaf) é o principal programa do governo federal de apoio à agricultura familiar. Por isso, é importante avaliar esta política pública, para verificar se, apesar dos valores elevados concedidos, consegue atender um grupo diverso de beneficiários. O objetivo é identificar fatores que influenciam a distribuição de recursos do Pronaf em municípios que integram uma das nove Regiões Funcionais de Planejamento do Rio Grande do Sul (RS), a RF7, composta pelos COREDES Celeiro, Noroeste Colonial, Fronteira Noroeste e Missões. Trata-se uma pesquisa com abordagem quantitativa com alcance correlacional. Os dados foram coletados em bases públicas - Instituto Brasileiro de Geografia e Estatística (IBGE) e Banco Central do Brasil (BCB), para o ano de 2017. Para a análise fez-se uso de técnicas estatísticas univariada e bivariada no software estatístico R. Os resultados demonstram que há uma correlação direta dos recursos acessados por meio do Pronaf nos municípios da RF7 com a quantidade de *commodities* (soja, milho e trigo) produzidas pela agricultura familiar, o número de tratores *per capita* e o percentual de estabelecimentos que utilizam agrotóxicos. Há correlação indireta entre o percentual de estabelecimentos classificados como Pronaf B (menor renda) e o percentual de estabelecimentos dirigidos por mulheres. Além disso, não foi verificada relação com o percentual de estabelecimentos dirigidos por pessoas com menos de 25 anos. Espera-se que, com este estudo, os formuladores de políticas públicas consigam detectar algumas fragilidades do Pronaf e aplicar melhorias para atender a heterogeneidade da agricultura familiar.

Palavras-chave: Política pública. Agricultura familiar. Região funcional.

Programa Nacional de Fortalecimiento de la Agricultura Familiar: un análisis de la distribución regional de los recursos en el Noroeste de Rio Grande do Sul, Brasil

Resumen

El Programa Nacional de Fortalecimiento de la Agricultura Familiar (Pronaf) es el principal programa del gobierno federal para apoyar la agricultura familiar. Por ello, es importante evaluar esta política pública, para verificar si, a pesar de los altos valores otorgados, logra atender a un grupo diverso de beneficiarios. El objetivo es identificar los factores que influyen en la distribución de los recursos del Pronaf en los municipios que forman parte de una de las nueve Regiones de Planificación Funcional de Rio Grande do Sul (RS), RF7, compuesta por las COREDES Celeiro, Noroeste Colonial, Fronteira Noroeste y Missões. Es una investigación con enfoque cuantitativo con alcance correlacional. Los datos fueron recolectados en bases de datos públicas - Instituto Brasileiro de Geografia e Estatística (IBGE) y Banco Central do Brasil (BCB), para el año 2017. Para el análisis, se utilizaron técnicas estadísticas univariadas y bivariadas en el software estadístico R. Los resultados demuestran que existe una correlación directa entre los recursos accedidos a través del Pronaf en los municipios de la RF7 con la cantidad de *commodities* (soja, maíz y trigo) producidos por la agricultura familiar, el número de tractores *per cápita* y el porcentaje de establecimientos que utilizan plaguicidas. Existe una correlación indirecta entre el porcentaje de establecimientos clasificados como Pronaf B (menores ingresos) y el porcentaje de establecimientos dirigidos por mujeres. Además, no hubo relación con el porcentaje de establecimientos atendidos por personas menores de 25 años. Se espera que, con este estudio, los hacedores de políticas públicas puedan detectar algunas debilidades del Pronaf y aplicar mejoras para atender la heterogeneidad de la agricultura familiar.

Palabras clave: Política pública. Agricultura familiar. Región funcional.

1 Introduction

In rural areas, the Green Revolution (GR) marked the modernization of agriculture in the '60s and '70s through technological packages that enabled rapid increases in rice and wheat production in developing countries. This occurred by improved varieties combined with applying chemical fertilizers, as Pinstруп-Andersen and Hazell (1985) reported. The authors reported that the GR has brought about social and organizational changes in rural areas that have favored economic growth and poverty reduction.

Nonetheless, Moreira (2000) pointed out that the GR intensified inequalities in the sociopolitical sphere with the high concentration of land ownership and public policies that guided the dominant elites in the 1970s/80s, excluding significant masses of the population. Mattei (2014) emphasized that during this modernization process, Brazilian public policies prioritized large estates, as they produced commodities for sale on the international market, which were seen as a possibility to balance the country's trade balance. It was only in the second half of the 1990s that public policies emerged nationwide directed at family farming, and debates began about its very concept (MATTEI, 2014; AQUINO; SCHNEIDER, 2015).

Additionally, in recent decades, sociodemographic changes have fostered the masculinization and aging of the rural population (FROEHLICH *et al.*, 2011). According to Anjos, Caldas, and Pollnow (2014, p. 112), "the rural exodus is clearly young and female." These authors emphasized that population aging and gender imbalance impact more intensely in rural areas. A look at these demographic transformations is necessary to understand the values that guide individuals' choices to migrate or remain in their places of origin.

In this scenario, the creation of the National Program for the Strengthening of Family Farming (Pronaf) was one of the most remarkable events in the scope of public policies for rural areas, representing the recognition of the State in relation to family farmers (SCHNEIDER, CAZELLA; MATTEI, 2021). Brazil pioneered implementing support programs for the sector, albeit Pronaf still requires adjustments.

In its first 20 years of existence, the program has signed over 26 million contracts and transferred, approximately, R\$160 billion to family farming. However, it is necessary to advance regarding Technical Assistance and Rural Extension and expand access of young people and women to the program (BIACHINI, 2015). Medina *et al.* (2015) reported that there is a global concern about making family farming a more competitive sector, contributing to poverty reduction, food security, and economic growth. In exploring the development conditions faced by family farmers in Brazil, the authors noted that most farmers are unable to use basic agricultural technologies for soil preparation and fertilization, irrigation practices are almost non-existent, even in the dry regions of the Northeast, and the level of mechanization is low.

Given these issues, there is a need to adapt/discuss the role of the State and qualify its intervention in the rural environment. According to Gazolla and Schneider (2013), the public policies that emerged in the 1990s to support family farming, especially Pronaf, require adjustments that include the various dimensions of this sector, such as environmental issues and promoting small economic and productive activities, instead of financing only the production of grains and commodities.

Moreover, young people and women encounter limitations/difficulties in accessing Pronaf resources due to power relations within the family (FOSSÁ; BADALOTTI; TONEZER, 2018).

Between 1999 and 2017, Pronaf applied more than R\$160 billion (TROIAN; MACHADO, 2020). Given that it is the main public policy to support family farming, the importance of contributing to the evaluation of this program is justified to meet the diversity of family farming and identify factors that still represent obstacles to the program.

Thus, this study aimed to identify factors that influence the distribution of Pronaf resources in municipalities that integrate one of the nine Functional Planning Regions of Rio Grande do Sul (RS), namely RF7, composed of the COREDEs Celeiro, Noroeste Colonial, Fronteira Noroeste, and Missões. The COREDEs were created in the early 1990s and represent institutional arrangements that contribute to promoting development (ALLEBRANDT *et al.*, 2011).

The article is organized into five sessions. This introduction presents a contextualization of the theme to be addressed; the second session includes the literature review and, subsequently, the methodology that presents the research procedures. The results and discussion are presented in the fourth session of the study, followed by the final considerations and references.

2 Family farming, Pronaf, and regional specificities

In this session, a brief contextualization will be presented on the understanding of family farming and the relationship of Pronaf with the study variables to shed more light on the results and discussions on the factors that influence the distribution of resources of Pronaf in RF7/RS.

According to Garner and Campos (2014), there are multiple concepts of family farming in different countries and contexts. However, in reviewing thirty-six definitions of the term family farming, the authors noted a common understanding in the literature of the importance of family labor and management on the farm. Sometimes the term is also linked with local culture and rural community and used to determine ecological, cultural, social, and environmental purposes.

Hayami (2010) explained that family farming could generate high economies of scale and have a large operational capacity since farms of several hectares can be easily cultivated by one or two family members with the help of modern labor-free machinery. Nevertheless, small family farms, with low-income economies and production geared to the subsistence of family members, are characterized by low rates of marketable surplus.

In Latin America and the Caribbean, most of the food for domestic consumption is produced by family farming, a key sector for ensuring environmental sustainability and eradicating hunger in these countries (BENÍTEZ, 2014). This sector is characterized by its multifunctionality, which goes beyond agricultural production, playing a pivotal role in territorial formation through its labor relations, production, consumption, and preservation of cultural traditions (SILVA, 2015).

In Brazil, Law no. 11.326 (BRASIL, 2006) gave the legal framework to family agriculture, and the term now has an operational definition for access to public policies, including the following criteria:

[...] family farmers and rural family entrepreneurs are considered those who practice activities in rural areas, meeting, simultaneously, the following requirements:

I - Does not hold, for any reason, an area larger than 4 (four) fiscal modules;
II - predominantly use labor from their own family in the economic activities of their establishment or enterprise;

III - Has a family income predominantly derived from economic activities linked to the establishment or enterprise itself;

IV - Manages their establishment or enterprise with their family (BRASIL, 2006).

Belik (2015) highlighted that Brazilian agriculture is quite heterogeneous; therefore, the regional level analysis is fundamental to understanding regional specificities and adapting public policies to them. Matte *et al.* (2022) highlight that the transformations occurring in rural areas, such as intense social inequalities in the countryside, degradation of natural resources, climate change, and agrarian conflicts, contribute to the emergence of rural development research.

Silva, Castro, and Pereira (2019) conducted a cluster analysis and observed that over half of northeastern municipalities belong to the most vulnerable clusters deprived of Pronaf resources. In contrast, southern and southeastern regions access the largest share of Pronaf resources and have 72 and 44% of their municipalities, respectively, inserted in the second group of clusters with the highest economic capacity. This study demonstrates “the heterogeneity existing in the large sphere that encompasses family farming [...] and the contradiction between vulnerability and the targeting of resources of the main program for strengthening family farming in Brazil” (SILVA; CASTRO; PEREIRA, 2019, p. 78).

Aquino, Gazolla, and Schneider (2018) reported a large group of poor producers regarding family farming. Because of this,

the government’s rural credit policy, which, in theory, should work as an equalizing instrument for inequalities, seems to be having the opposite effect by increasing and crystallizing the productive concentration in rural areas. In the case of family agriculture, the strategy of the MDA [Ministry of Agrarian Development] itself of intensifying the technological modernization of a part of the sector through Pronaf Mais Alimentos has contributed to this, leaving the majority of the segment dependent on policies managed by the MDS [Ministry of Citizenship] to survive. This means that, unconsciously or not, the Brazilian government is following the conservative prescription that places technology as the only path to social progress (AQUINO; GAZOLLA; SCHNEIDER, 2018, p. 138).

Silva and Santos (2018) showed that the rural landscape in Minas Gerais State is quite heterogeneous, with many municipalities characterized by poverty, social inequality, and a low degree of rural development. When comparing the allocated Pronaf funds with the degree of rural development of Minas Gerais municipalities, the authors found that the municipalities with the lowest levels of rural development were those that accessed the least Pronaf funding.

Belik (2015) described the importance of recognizing the heterogeneity of family farming and of adjustments in public policies to encompass the different realities of the Brazilian countryside and promote rural development. For Conterato, Bráz, and Rodrigues (2021), the process of commoditization and the specialization of production among Pronaf farmers intensifies existing social and economic inequalities in rural areas. The authors pointed out that in 2019, 88.56% of agricultural costing credit was allocated to the cultivation of soybeans, maize, rice, and wheat in Rio Grande do Sul. Wesz Junior (2021) found a significant drop in the number of contracts between 2014 and 2018, and the selectivity of Pronaf intensified even more. This “drying up” mainly affected differentiated activities and less capitalized producers.

Dalcin *et al.* (2017) observed that Pronaf contracts and resources are distributed differently in the COREDEs of RS, with nine of the 28 COREDEs concentrating roughly 60% of the total volume of resources from 2013 to 2016. COREDE Fronteira Noroeste stands out, with the largest number of contracts, and COREDE Norte, with the highest concentration of resources.

According to Bittencourt (2020), smaller family farmers cannot follow the technological development observed in larger farms, hindering the generation of income and the family succession process and preventing a better quality of life in small properties. Barth, Heck, and Renner (2022) verified that many family farming activities are still performed manually, despite technological advances in agricultural machinery, which requires physical effort from the worker and causes ergonomic problems (pain and discomfort in the lumbar and dorsal spine and shoulders).

In the municipality of Palmeira das Missões (RS), Camara *et al.* (2020) showed that Pronaf Mais Alimentos allows beneficiaries to invest in improving their properties through mechanization. As a result, the labor burden decreases, productivity increases, and children are encouraged to remain on the farm. In addition, technology and the capacity for innovation can contribute to better use of natural resources and make family production more sustainable.

In Brazil, in 2015, 76% of the planted area corresponded to soybean, corn, and sugarcane crops, and 899 million liters of pesticides were used on these crops that same year (PIGNATI *et al.*, 2017). Kageyama (2003, p. 12) verified a positive association between Pronaf credit, pesticide use, and increased soil erosion in the 2000/2001 crop year, demonstrating that the program harms the quality of the environment by popularizing a “productivist technological package” among small farmers.

More recent studies reveal that Pronaf beneficiaries use 52% more pesticides than non-beneficiaries (SOARES, 2019; IBGE, 2017). According to Cunha and Soares (2020), producers opt for pesticides to control pests and diseases instead of seeking more sustainable solutions because they are more economically viable and enable a greater return on production.

Godoi, Búrigo, and Cazella (2016) demonstrated that incorporating the idea of sustainability in Pronaf is a challenge for the future. Although the general guidelines of the program conceptually include sustainability, there are almost no empirical results with family farmers’ establishments. The authors evaluated the operation of Pronaf in the Território do Meio Oeste Contestado (Santa Catarina) and found that in cases where more integrative actions focused on sustainable development are noted, there is a greater influence of other factors, including committed technical

assistance, short marketing circuit policies, and awareness-raising actions carried out by social organizations that value sustainability. This shows that “Pronaf credit alone cannot generate structural transformations in the rural environment capable of breaking the productivist logic of modernized agriculture” (GODOI; BÚRIGO; CAZELLA, 2016, p. 653).

Prochnow, Thesing, and Carneiro (2020) grouped the main Pronaf subprograms into three dimensions (economic, social, and environmental) and found that those linked to the environmental and social dimensions have a lower volume of values and contracts in relation to the subprograms aligned to the economic dimension. For the authors, inserting an environmental bias and making credit available to young farmers and rural women is an advance in the program; however, these subprograms are less far-reaching.

This can be explained by the fact that men mostly make decisions. Women access Pronaf funds under pressure from their husbands or partners after exceeding their financing limits (SPANVELLO; MATTE; BOSCARDIN, 2016). Fonseca *et al.* (2017) observed that Pronaf-Mulher is little accessed by women in northern Minas Gerais (municipalities of Montes Claros and Bocaiúva) due to their husbands’ default on other lines of credit and dependence on technicians from credit access institutions, who often prepare projects that are not in line with women’s interests.

As for young people, Marin (2020) argues that access to the specific credit line (Pronaf-Jovem) is restricted, demonstrating that this subprogram does not contribute to succession in family farming. Most young people in the central region of RS invest in continuing their studies, believing that qualifications and jobs outside agriculture are more promising paths. Barcellos (2017) pointed out the excessive bureaucracy, the prejudice against young people when they participate in decision-making, and the lack of autonomy as barriers to accessing credit.

Given this scenario, it is noticeable that the creation of specific lines of Pronaf was not enough to bring about changes in labor relations between men and women (SPANVELLO; MATTE; BOSCARDIN, 2016), nor to create favorable conditions for the permanence of young people in the countryside and reduce the challenges of rural development (MARIN, 2020). Next, the methodology that guided the study is presented.

3 Methodology

In methodological terms, this study is classified as correlational since it aims to know the relationship between different variables (SAMPIERI; COLLADO; LUCIO, 2006) and, therefore, adopted the quantitative approach based on numerical indices and statistical analysis (LAVILLE; DIONNE, 1999). The data collected refer to 2017, the year of the last Agricultural and Livestock Census, and were extracted from databases of the Brazilian Institute of Geography and Statistics (IBGE) and the Central Bank of Brazil (BCB) via the internet.¹ Each variable is described in Table 1.

¹ The tabulated data can be accessed at the following electronic address: <https://docs.google.com/spreadsheets/d/1v5MIU6aog4kEEoXFOz4-WpVvATqchQ-7/edit?usp=sharing&ouid=100189339765787134232&rtpof=true&sd=true>.

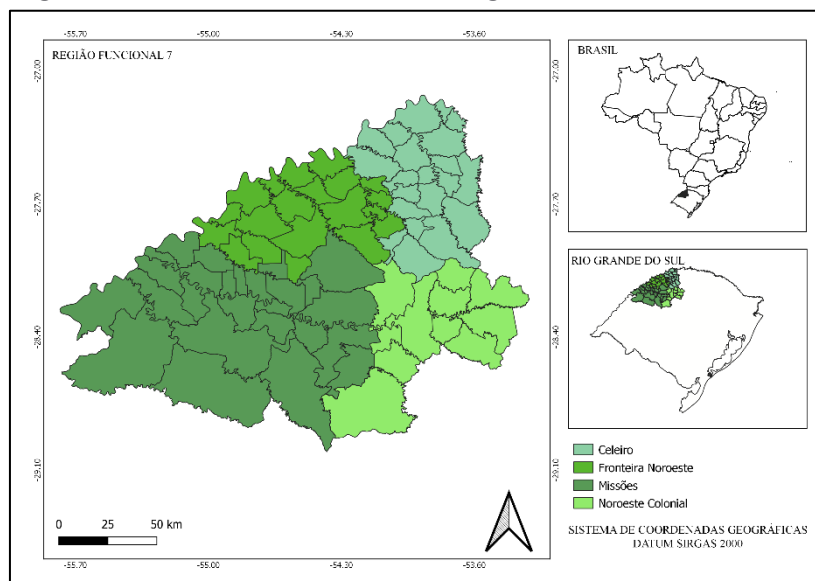
Table 1. Description of the variables

Variable	Description
Pronaf Resources	Amounts (in Brazilian Reais) accessed by family farmers in the municipalities through Pronaf.
Pronaf Contracts	The number of contracts made by family farmers in the municipalities through Pronaf.
Pronaf B	Percentage of family farming establishments that fit into Pronaf B (lower income group, up to R\$20,000 per year) (BANCO CENTRAL DO BRASIL, 2022)
Soybean	Soybean produced by family agriculture (in tons).
Maize	Maize produced by family agriculture (in tons).
Wheat	Wheat produced by family farming (in tons).
Tractors per capita	The number of tractors divided by the number of people employed in family farming.
Agrochemicals	Percentage of family farming establishments that use agrochemicals.
Women	Percentage of family farms run by women.
Youth	Percentage of family farm establishments run by producers under 25 years old.

Source: Prepared by the authors (2022).

This study comprises all the municipalities in RF7, totaling 77 municipalities (Figure 1).

Figure 1. COREDEs of Functional Region 7, Rio Grande do Sul



Source: Prepared by the authors (2022).

The data were submitted to statistical analysis using the R software (4.0.2). In the univariate analysis, descriptive measures were obtained (mean, median, standard deviation, interquartile range, minimum, and maximum). The Shapiro-Wilk test was used to verify the normality of the data. Spearman’s correlation and the 5% significance test were applied in the bivariate analysis. According to Field (2009, p. 129), for the correlation coefficient, “values of ± 0.1 represent a small effect, ± 0.3 represent a medium effect, and ± 0.5 represent a large effect.” The results of the

univariate descriptive analysis are presented in tables and boxplot graphs; the bivariate analysis data are presented in scatterplots.

4 Distribution of Pronaf resources in Functional Region 7 and its determining factors

4.1 Descriptive analysis

The municipalities of RF7 made, on average, 726 contracts through Pronaf in 2017, with the municipality of Três de Maio having the highest number of contracts (2,048) and Porto Vera Cruz having the lowest (99), both in COREDE Fronteira Noroeste (Table 1). The highest average number of contracts can be observed in the municipalities of COREDE Noroeste Colonial (950). Endl (2018) stated that the Noroeste Colonial region has an essentially agricultural economic base, in which production chains interconnect grain cultivation and milk or pig production, generating income for families. In this environment, Pronaf can be an important regional development instrument, directly and indirectly stimulating the local economy (FORTES, 2017).

In COREDE Celeiro, the average number of contracts was 631. Crissiumal was the municipality with the most contracts (1,743) and Barra do Guarita had the least (130). As for COREDE Missões, the municipalities of Giruá and Dezesseis de Novembro had the highest (1,429) and lowest number of Pronaf contracts (114), respectively. For this COREDE, the average number of contracts per municipality in 2017 was 544, the lowest observed in the RF7. This may be related to the fact that COREDE Missões presented the highest rate of population loss in 2000–2010, in addition to the rural population moving to local urban centers and the increasing number of people in advanced age (BERTÊ *et al.*, 2016). In view of this, the easiest option for a retired farmer is to rent the land to third parties (INGRAM; KIRWAN, 2011), with many not having successors and lacking the motivation to continue investing and producing in the family farm unit (GUEDES; CAZELLA, 2019).

The municipalities of COREDE Fronteira Noroeste had the second-highest average number of contracts made (932). In the study by Dalcin *et al.* (2017), in 2013–2016, COREDE Fronteira Noroeste had the highest number of contracts. This region strongly integrates the national economy through soybean production (SOUZA; TORRES, 2022), which obtained 40% of the contracts signed by Pronaf in RS between 2015 and 2019 (CONTERATO, BRÁZ; RODRIGUES, 2021).

Table 1. Descriptive measures regarding Pronaf contracts and resources by RF7 COREDEs, 2017

	COREDE	Mean ± SD**	Median ± IQR***	Minimum	Maximum
Contracts	RF7	726 ± 447	592 ± 586	99	2,048
	Celeiro	631 ± 379	517 ± 449	130	1,743
	Fronteira NO	932 ± 473	874 ± 663	99	2,048
	Missões	544 ± 357	390 ± 499	114	1,429
	NO Colonial	950 ± 510	790 ± 892	375	1,791
Resources*	RF7	18,084 ± 11,218	16,531 ± 12,348	1,327	50,975
	Celeiro	16,160 ± 8,710	16,807 ± 11,907	2,709	36,571
	Fronteira NO	21,326 ± 12,821	20,192 ± 13,858	1,327	50,975
	Missões	13,759 ± 8,525	11,367 ± 7,894	2,772	38,864
	NO Colonial	25,691 ± 13,367	21,390 ± 24,130	10,808	44,843

* Values in Brazilian Reals (R\$) (×1000); ** SD = Standard deviation; *** IQR = Interquartile Range
Source: Prepared by the author (2022).

The municipalities of the RF7 raised, on average, R\$18,083,935.07 of Pronaf resources, and Porto Vera Cruz, located in COREDE Fronteira Noroeste, was the municipality that least accessed resources from the program in 2017 (R\$1,326,637.55). The municipality of Santa Rosa, also located in COREDE Fronteira Noroeste, was the one that most accessed Pronaf resources (R\$ 50,975,094.49) (Table 1). Regarding the study by Dalcin *et al.* (2017), Santa Rosa was in the second position in the ranking of the one hundred municipalities in RS that most raised funds by Pronaf from 2013 to 2016.

The mean amount accessed through Pronaf differs among the four COREDES investigated. The municipalities of COREDE Noroeste Colonial were those that most captured resources from the program, on average R\$ 25,691,291.65. The municipality that less accessed resources from Pronaf in this COREDE was Coronel Barros (R\$ 10,807,830.80), and the municipality that captured more resources was Ijuí (R\$ 44.842,856.09).

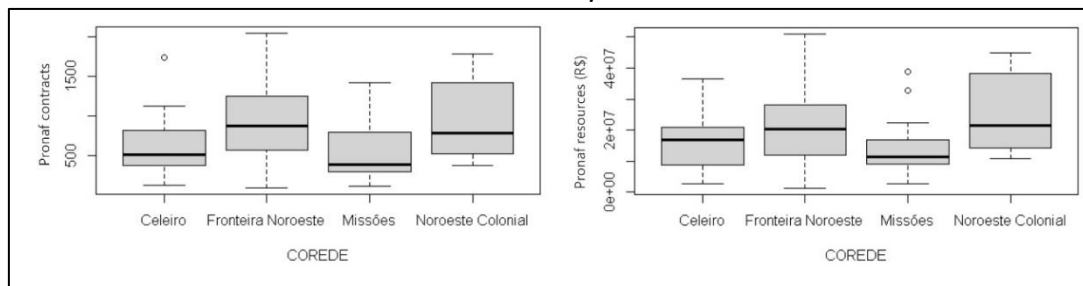
The municipalities of the COREDE Missões accessed, on average, R\$ 13,759,353.29 through Pronaf. The municipalities of Dezesseis de Novembro and Giruá stood out, with the lowest (R\$ 2,772,302.22) and highest (R\$ 38,863,524.30) amounts, respectively. Dalcin and Hartmann (2021) observed that Giruá was the municipality that raised the most funds in COREDE Missões from 2013 to 2018, highlighting agricultural funding for planting wheat and soybeans and purchasing tractors through agricultural investment.

In COREDE Celeiro, the municipalities, on average, raised R\$ 16,160,201.26 through Pronaf. The lowest amount (R\$2,709,494.28) was observed in the municipality of Barra do Guarita and the highest (R\$36,570,789.47) in Crissiumal. According to Berchin *et al.* (2019), government support for family farming brings several benefits, such as higher quality of life due to poverty reduction, better production conditions, and financial independence for families. Nonetheless, it is understood that each territory presents specific characteristics related to culture, labor variability, insertion in markets, and use of technology, which causes the diversity of family farming (FINATTO; LENZ, 2012), and can determine the targeting

of public policy resources. Furthermore, raising funds through Pronaf may be related to the size of the municipalities since larger municipalities may have more rural family farms.

In Figure 2, one can observe three values far from most of the data (outliers). In COREDE Celeiro, Crissiumal made more contracts than the other municipalities. As for the resources accessed, in COREDE Missões, two municipalities (Giruá and Santo Ângelo) captured larger amounts than the others.

Figure 2. Boxplot for Pronaf contracts (A) and resources (B) by COREDEs in RF7, 2017



Source: Prepared by the authors (2022).

The factors investigated that may be related to Pronaf resources are summarized by descriptive measures in Table 2. On average, the municipalities of RF7 have 30.99% of family farming establishments classified as Pronaf B, which are low-income producers. The highest percentage was observed in the municipality of Garruchos (73.52%), located in COREDE Missões, and the lowest in Ajuricaba (9.03%), in COREDE Noroeste Colonial. The municipalities of COREDE Missões presented the highest average percentage of establishments that fit into Pronaf B (40.93%), which can be explained by a greater participation of retired elderly people in the composition of the population (RIO GRANDE DO SUL, 2015), who deactivate agricultural production intended for sale and lease the land, but remain in rural spaces producing only for consumption (THIES; CONTERATO; SCHNEIDER, 2022).

Table 2. Descriptive measures referring to the independent variables of the study by COREDEs of RF7, 2017

Variable	COREDE/Functional region	Mean ± SD	Median ± IQR	Minimum	Maximum
Pronaf B (%)	RF7	30.99 ± 13.21	27.36 ± 14.00	9.03	73.52
	Celeiro	28.65 ± 9.45	26.94 ± 7.52	15.81	59.47
	Fronteira NO	27.36 ± 7.19	28.14 ± 8.62	14.53	43.44
	Missões	40.93 ± 15.54	39.86 ± 23.48	15.71	73.52
	NO Colonial	19.04 ± 5.50	21.43 ± 5.91	9.03	25.80
Soybeans (tons)	RF7	14,790 ± 11,913.62	10,894 ± 11,620	440	57,602
	Celeiro	9,706.95 ± 4,842.88	9,214 ± 7,405	957	20,091
	Fronteira NO	15,587.95 ± 10,528.40	14,908.50 ± 14,562.75	440	41,013
	Missões	12,116.60 ± 11,865.51	9,156 ± 6,892	1,934	57,602
	NO Colonial	29,122.00 ± 13,562.51	26,549 ± 17,306	11,148	56,654
Maize (tons)	RF7	8,205 ± 7,863.67	5,850 ± 7,826	402	47,115
	Celeiro	7,960.62 ± 4,448.64	6,535 ± 6,035	1,688	18,753
	Fronteira NO	15,400.95 ± 10,906.80	12,166.50 ± 14,910.50	2,177	47,115
	Missões	5,055.46 ± 3,768.90	3,685.50 ± 4,460.50	703	15,128
	NO Colonial	2,456.73 ± 1,290.49	2632 ± 2,003	402	4,223
Wheat (tons)	RF7	4,592 ± 3,953.32	3,640 ± 3,866	96	22,823
	Celeiro	3,684 ± 2,237.60	3,593 ± 2,354	96	8,196
	Fronteira NO	5,808.5 ± 4,311.87	5,263 ± 5,478	793	16,363
	Missões	3,986.92 ± 4,653.22	3,173.5 ± 3,224.75	399	22,823
	NO Colonial	5,656.91 ± 4,018.40	4,258 ± 1,916.5	2,207	15,034
Tractors per capita	RF7	0.22 ± 0.10	0.22 ± 0.12	0.05	0.46
	Celeiro	0.18 ± 0.07	0.17 ± 0.07	0.07	0.33
	Fronteira NO	0.21 ± 0.08	0.21 ± 0.09	0.05	0.39
	Missões	0.18 ± 0.08	0.18 ± 0.12	0.05	0.30
	NO Colonial	0.36 ± 0.07	0.37 ± 0.05	0.21	0.46
Pesticides (%)	RF7	82.86 ± 16	87.84 ± 8.46	21.73	97.37
	Celeiro	90.66 ± 3.99	90 ± 6.30	84.33	97.03
	Fronteira NO	87.4 ± 6.65	88.99 ± 4.79	63.48	93.75
	Missões	69.13 ± 21.36	76.49 ± 26.40	21.73	93.79
	NO Colonial	90.94 ± 4.97	90.7 ± 5.32	79.84	97.37
Women (%)	RF7	11.61 ± 4.21	10.75 ± 5.35	5.21	26.63
	Celeiro	11.31 ± 4.84	10.34 ± 5.60	5.21	26.63
	Fronteira NO	10.46 ± 2.47	10.86 ± 3.05	5.41	15.04
	Missões	13.77 ± 4.08	13.56 ± 6.07	7.52	21.43
	NO Colonial	9.39 ± 4.07	8.32 ± 3.12	5.44	18.40
Youth (%)	RF7	0.73 ± 0.52	0.60 ± 0.71	0	2.37
	Celeiro	0.81 ± 0.70	0.61 ± 0.83	0	2.37
	Fronteira NO	0.71 ± 0.37	0.71 ± 0.47	0	1.52
	Missões	0.79 ± 0.48	0.60 ± 0.78	0.15	2.01
	NO Colonial	0.46 ± 0.40	0.47 ± 0.35	0	1.45

Source: Prepared by the authors (2022).

Regarding the commodities investigated, the municipalities of the RF7 produced, on average 14,790, 8,205, and 4,592 tons of soybeans, maize, and wheat, respectively, through family farming. The municipalities of Giruá stand out, with the largest quantities of soybean (57,602 tons) and wheat (22,823 tons) produced, and Doutor Maurício Cardoso, which produced 47,115 tons of maize, being the maximum value observed.

The variable tractors per capita presented an average of 0.22, that is, for every 5 people employed in family farming in the RF7, there is approximately one tractor. On average, the municipalities of COREDE Noroeste Colonial have the highest number of tractors per capita (0.36) and the municipalities of COREDE Celeiro and Missões have the lowest (both with 0.18). Agricultural mechanization can be an important approach for family farmers who wish to engage in modern agricultural production and have little labor. According to Hayami (2010), with the help of modern machines, family farming can have a large operational capacity. However, smaller family farmers cannot keep up with the technological development seen on larger farms and continue to perform many activities manually (BITTENCOURT, 2020; BARTH; HECK; RENNER, 2022).

The municipality with the highest percentage of family farms that use pesticides was Ajuricaba (97.37%), in COREDE Noroeste Colonial, and the municipality with the lowest percentage is Santo Antônio das Missões (21.73%). The municipalities of RF7 presented, on average, 82.86% of establishments that use pesticides. According to Cunha and Soares (2020), producers opt for pesticides because they are more economically viable and provide a greater return on production. Paumgarten (2020) described that the benefits of pesticides for the cultivation of agricultural commodities must be balanced with their risks to the environment and human health.

On average, the municipalities of RF7 have 11.61% of family farming establishments run by women, with the highest percentage observed in the municipalities of COREDE Missões (13.77%) and the lowest in COREDE Noroeste Colonial (9.39%). The highest percentage among the municipalities studied was identified in Redentora (26.63%) and the lowest in Sede Nova (5.21%), municipalities of COREDE Celeiro.

According to Anjos, Caldas, and Pollnow (2014), gender imbalance is more intense in rural areas. Young women are more likely to leave rural areas than young men, which is related to the difficulty of finding work, lack of access to education, and as an alternative to disentangle themselves from patriarchal imposition (FARIA; FERREIRA; PAULA, 2019).

The municipalities of RF7 presented, on average, 0.73% of rural family establishments run by people under 25 years of age. Seven municipalities (Bom Progresso, Bozano, Pejuçara, Santo Augusto, São Martinho, Sede Nova, and Tucunduva) had no establishment run by a young person. The municipality of Braga, in COREDE Celeiro, had the highest percentage for this variable (2.37%). These low numbers can be explained by the succession problem in rural areas. Leonard *et al.* (2017) stated that the intergenerational transfer of farms is essential for the sustainability and development of global agriculture, but many farm owners do not have a succession plan to be implemented (NUTHALL; OLD, 2016).

The regional analysis allowed us to understand the specificities of family farming in the RF7, as well as being useful to explain the existing distortions in the

uptake of public policy resources. According to Li, Westlund, and Liu (2019), rural areas differ in several aspects, such as population density, economic pattern, climate, natural resources, institutional arrangements, access to metropolitan regions with their markets and resources, social capital, and culture, among others. These conditions can contribute to the advancement of economic activities and sustainable rural development. Nevertheless, they can make rural decline an inevitable process.

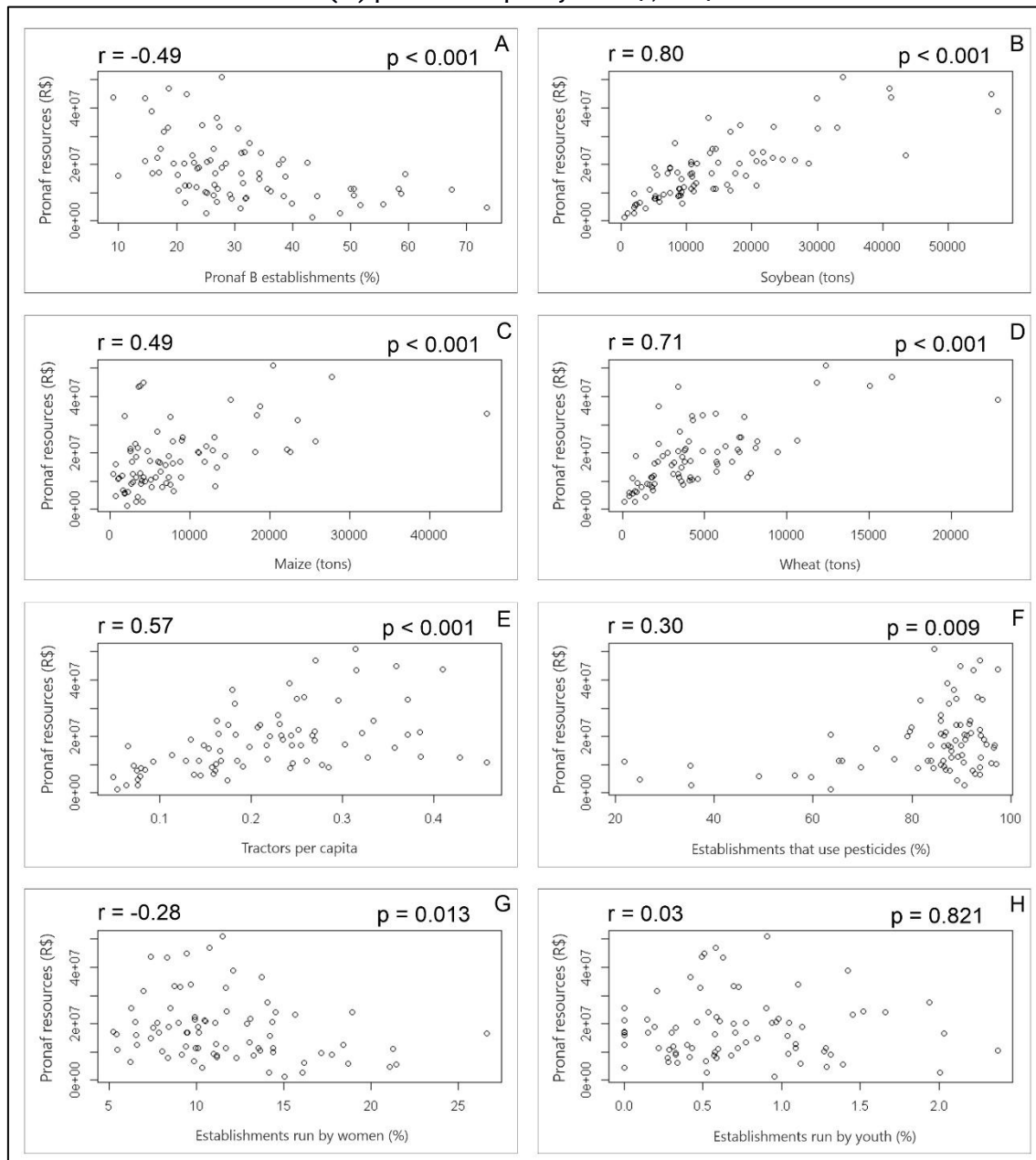
4.2 Correlation analysis

To verify the existence of a relationship between the resources accessed through Pronaf and the factors investigated, a correlation analysis was performed. One can see this in Figure 3A, in which the higher the percentage of establishments classified as Pronaf B in the municipalities, the fewer resources are raised by Pronaf. Troian and Machado (2020) pointed out that the low access of more impoverished family units to credit is a limitation of Pronaf, which intensifies the selectivity of more capitalized farmers and amplifies the structural and productive inequalities of rural establishments (TOLEDO; ZONIN, 2021). Monteiro and Lemos (2019) suggested that the program should rescue its goals of reducing social inequalities and poverty in the countryside, since by privileging family farmers with better economic conditions, Pronaf sets aside the diversity of agricultural activities and does not address the heterogeneity of family farming (TROIAN; MACHADO, 2020).

As illustrated in Figures 3B, 3C, and 3D, there is a direct and significant ($p < 0.05$) relationship between resources accessed by Pronaf and the quantities of soybeans, maize, and wheat produced by family farmers. These results corroborate Conterato, Bráz, and Rodrigues (2021): most agricultural costing credit is destined for soybean, maize, and wheat cultivation in Rio Grande do Sul. Medina *et al.* (2015) reported that public policies must consider not only family farmers with the potential to become highly competitive in commodity markets but also those who do not fit the modernization paradigm. Conterato and Bráz (2019) signaled that the tapering of agricultural production, most notably with soybean, contributes to the widening of inequalities in family farming and demonstrates that it is more attractive to supply the foreign market than the domestic market.

A statistically significant relationship ($p < 0.05$) was verified between the number of tractors *per capita* in the municipalities of RF7 and the number of resources raised by Pronaf (Figure 3E), demonstrating that the program contributes to the beneficiaries to invest in improving their properties through mechanization. We also observed that the higher the percentage of family farms that use pesticides, the more resources are accessed in the municipalities through Pronaf (Figure 3F). This reveals that this policy contributes to worsening environmental impacts and demonstrates that the idea of sustainability in Pronaf is a challenge for the future (GODOI, BÚRIGO; CAZELLA, 2016). What may explain this result is the increase in the production of commodities by family farming caused by the expansion of the capitalist mode of production, which uses more and more pesticides to increase productivity (SOUSA; SILVA, 2020). This demonstrates that “Pronaf credit alone cannot generate structural transformations in rural areas capable of breaking the productivist logic of modernized agriculture” (GODOI; BÚRIGO; CAZELLA, 2016, p. 653).

Figure 3. Scatterplot diagrams of Pronaf resources concerning the percentages of Pronaf B establishments (A), soybean (B), maize (C), wheat (D), tractors per capita (E), percentage of establishments using pesticides (F), percentage of establishments run by women (G), and percentage of establishments run by youth (H) per municipality in RF7, 2017



Source: Prepared by the authors (2022).

It is observed that the higher the percentage of establishments run by women in the RF7 municipalities, the fewer resources are accessed through Pronaf (Figure 3G). This can be explained by the fact that many times, the technicians of the credit access institutions elaborate projects that are not according to women's interests (FONSECA *et al.*, 2017), and most of the decisions involving the management of the family property are made by men (SPANEVELLO; MATTE; BOSCARDIN, 2016).

Figure 3H shows no significant relationship ($p>0.05$) between the percentage of establishments run by people younger than 25 and the resources raised through Pronaf. This result can be explained by the prejudice against young people when they participate in decision-making spaces and the lack of autonomy, in addition to the bureaucratic obstacles young people face regarding the release of credits (BARCELLOS, 2017).

5 Conclusions

The study aimed to identify factors that influence the distribution of Pronaf resources in the RF7, RS. The factors evaluated were the percentage of establishments classified as Pronaf B — with an annual income of up to R\$20,000, the number of commodities (soybean, maize, and wheat) produced by family farming, the number of tractors per capita, the percentage of family farming establishments that use pesticides, the percentage of establishments run by women, and the percentage of establishments run by young people (< 25 years old).

We observed a direct relationship between resources accessed through Pronaf in the RF7 municipalities with the number of commodities (soybean, maize, and wheat) produced by family farming, the number of tractors per capita, and the percentage of establishments that use pesticides. An inverse correlation with the percentage of establishments classified as Pronaf B (lower income) was also observed with the percentage of establishments run by women. Furthermore, no correlation was found with the percentage of establishments run by people under 25. We hope our findings will allow policymakers to detect some of Pronaf's weaknesses and apply improvements to address the heterogeneity of family farming.

The public policy under analysis can be considered an important mechanism for regional development and for improving activities on rural properties, especially when it comes to implementing technologies and bringing family farming into the agricultural market. However, these aspects are only related to the economic dynamics surrounding rural areas. It is therefore considered that Pronaf needs to be re-evaluated so that the resources take into account the heterogeneity of family farming, such as the different natural and historical characteristics, the different types of exploitation, and degrees of integration with the market, in order to reduce inequality in rural areas and encourage sustainable development in its multiple dimensions (economic, social, environmental, cultural, political, and territorial).

Pronaf has generally strengthened the production of commodities in family farming, integrating family farmers into the agribusiness chain through the modernization of the production system. This distances family farming from traditional agricultural systems, including knowledge, historical experiences, and forms of social organization, and causes production diversification to decrease. Furthermore, encouraging the use of pesticides does not contribute to the sustainable development of family farming. Nonetheless, financing tractors, for example, can reduce labor burden and improve quality of life.

Pronaf equates family farming with the large landowners who produce for the international market by promoting the production of commodities with modern inputs and pesticides. This is contrary to the discourse of the 1990s, which sought to

consolidate this segment on the Brazilian political scene and highlight its importance in producing food for the domestic market in a sustainable way and anchored in the socio-historical characteristics of the different regions. This can help ensure that resources are accessed by more capitalized segments of family farming that are part of agribusiness. In this sense, public authorities, especially through public policies, must strive to combat socio-spatial inequalities in the countryside, support the sustainable reproduction of family farming, and boost the socio-economic development of less favored areas, which reveals major regional challenges.

For future research, we suggest that other factors (sociodemographic and cultural) that can explain the distribution of Pronaf's resources be considered. Furthermore, it would be interesting to consider expanding the study to all the RFs of RS, enabling comparisons between regions. Regarding the limitations of the research, the resources raised by the municipalities were not segmented by specific lines of Pronaf and represent the total value, which may have compromised the analysis of some variables.

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