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Mapping of Organic Producers and Climate Emergency in Rio Grande do Sul – Brazil

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Abstract
In the month of May 2024, the State of Rio Grande do Sul was hit by a climatic event with high damage and losses, as it was hit by intense rains, flooding, hail, floods, floods, landslides and high-intensity windstorms. In the affected municipalities, agricultural losses occurred in both conventional and organic production. In this sense, this study sought to map organic producers in Rio Grande do Sul and relate them to the municipalities that declared a state of public calamity and emergency in May 2024. The methodology was organized with shapefile files, and the geoprocessing software was ArcGis. The list of organic producers was obtained directly from the MAPA website. The decree used was 57,626 / 2024. In the results, it was found that 78 municipalities were registered in a state of public calamity and 340 municipalities in an emergency situation. Considering all types of certifications, a total of 3,354 owners were found in RS, and of these 79.1% were among those affected. The municipalities that have the largest number of owners are: Viamão, Ipê and Nova Santa Rita. The first two declared an emergency situation and Nova Santa Rita declared a public calamity, all of which are located within the Guaíba hydrographic region. We conclude that family and organic farmers suffered from heavy rains that caused significant losses in the production of several crops. Crops such as soybeans, rice, vegetables, fruits, milk, livestock and vegetable farming were greatly affected and this shows us how difficult this climatic period will be.

Keywords: Losses. Agriculture. Sustainability. Disaster.

Mapeamento dos Produtores de Orgânicos e Emergência Climática no Rio Grande do Sul - Brasil

Resumo
No mês de maio de 2024, o Estado do Rio Grande do Sul, foi assolado por um evento climático com danos e prejuízos elevados, pois foi atingido por chuvas intensas, alagamentos, granizo,

inundações, enxurradas, deslizamentos e vendavais de grande intensidade. Nos municípios atingidos, as perdas agrícolas ocorreram tanto nas produções convencionais como nas orgânicas. Neste sentido, este estudo buscou mapear os produtores orgânicos do Rio Grande do Sul e relacionar com os municípios que decretaram estado de calamidade pública e de emergência em maio de 2024. A metodologia foi organizada com arquivos *shapefile*, e o *software* de geoprocessamento foi o ArcGis. A relação de produtores orgânicos foi obtida diretamente no site do MAPA. O decreto utilizado foi o 57.626 / 2024. Nos resultados, verificou-se que foram registrados 78 municípios em estado de calamidade pública e 340 municípios em situação de emergência. Considerando todos os tipos de certificações, ao total foram encontrados 3.354 proprietários no RS, e destes 79,1% estavam inseridos nos afetados. Os municípios que possuem a maior quantidade de proprietários são: Viamão, Ipê e Nova Santa Rita. Os dois primeiros decretaram situação de emergência e Nova Santa Rita decretou situação de calamidade pública, sendo que todos estão localizados dentro da região hidrográfica do Guaíba. Concluímos, que agricultores familiares e orgânicos sofreram com as fortes chuvas que ocasionou perdas significativas na produção de diversos cultivos. As culturas como soja, arroz, hortaliças, frutas, leite, pecuária e olericultura, foram bastante afetadas e nos mostra o quão difícil será esse período climático.

Palavras–chave: Perdas. Agricultura. Sustentabilidade. Desastre.

Mapeo de Productores Orgánicos y Emergencia Climática en Rio Grande do Sul - Brasil

Resumen
En el mes de mayo de 2024, el Estado de Rio Grande do Sul fue azotado por un evento climático con elevados daños y pérdidas, ya que fue azotado por intensas lluvias, inundaciones, granizo, inundaciones, inundaciones, deslizamientos de tierra y vendavales de alta intensidad. En los municipios afectados se produjeron pérdidas agrícolas tanto en la producción convencional como en la orgánica. En este sentido, este estudio buscó mapear a los productores orgánicos de Rio Grande do Sul y relacionarlos con los municipios que declararon el estado de calamidad pública y emergencia en mayo de 2024. La metodología se organizó con archivos shapefile y el software de geoprocesamiento fue ArcGis. El listado de productores orgánicos se obtuvo directamente del sitio web del MAPA. El decreto utilizado fue el 57.626/2024. En los resultados se encontró que 78 municipios se registraron en estado de calamidad pública y 340 municipios en situación de emergencia. Considerando todos los tipos de certificaciones, en RS se encontraron un total de 3.354 propietarios, de los cuales el 79,1% se encontraban entre los afectados. Los municipios que tienen el mayor número de propietarios son: Viamão, Ipê y Nova Santa Rita. Los dos primeros declararon situación de emergencia y Nova Santa Rita declaró calamidad pública, todos ellos ubicados dentro de la región hidrográfica de Guaíba. Se concluye que los agricultores familiares y orgánicos sufrieron fuertes lluvias que provocaron pérdidas importantes en la producción de varios cultivos. Cultivos como soja, arroz, hortalizas, frutas, leche, ganadería y hortalizas se vieron muy afectados y esto nos muestra lo difícil que será este período climático.

Palabras clave: Pérdidas. Agricultura. Sostenibilidad. Desastre.

1 Introduction

In the month of May 2024, the State of Rio Grande do Sul (RS) declared a state of public calamity due to being affected by the climatic events of "intense rains" that occurred from April 24, 2024. According to the classification of Disasters in relation to their intensity, were considered Level III - characterized by high damage and losses

(Defesa Civil, 2007), as it was hit by intense rains, flooding, hail, floods, floods, landslides and high-intensity windstorms.

Intense and prolonged rains flooded vast agricultural areas, destroying crops and pastures. This scenario directly impacted the current harvest, resulting in significant losses for producers and affecting the local and national supply chain. Rural infrastructure was also seriously damaged, as was the logistics of input delivery and production flow, which should impact the productivity of future harvests (Bateleur, 2024).

The World Meteorological Organization (WMO) recommends that climate change and increasingly extreme weather events have caused an increase in natural disasters over the last 50 years. Among natural disasters, the flooding of Brazilian urban and rural areas stands out, causing serious material damage to the population and in some extreme cases leading to socioeconomic losses (Silva *et al*., 2022).

In the affected municipalities, agricultural losses occurred in both conventional and organic production. It is worth noting that conventional food production systems directly favor climate events, leading to climate change and food insecurity. According to the ONU (2024), intensive agriculture involves environmental and economic disadvantages, which include pollution by nutrients from chemical fertilizers drained into our waters and soils, increased risks of spreading human and animal diseases, loss of biodiversity due to monoculture , in addition to the removal of native grassland and forest vegetation, such as riparian forests, greenhouse gas emissions and the loss of pollinators, which threatens annual crop production, resulting in losses ranging from 235 to 577 billion dollars annually.

A study carried out by Dickel, Santos and Souza (2024) where historical data on agricultural production in the state of Rio Grande do Sul were analyzed, it was found that there is prioritization of an agro-export model, with production of a reduced number of crops, especially commodities, using high agricultural mechanization and external inputs, which leads to the various environmental impacts mentioned above, in addition to generating food insecurity, since according to a report by Rede Penssan (2022) 47.6% of the population of Rio Grande do Sul is at some level of food insecurity. Another aggravating factor pointed out by the authors is that according to MapBiomas, between the years 1985 and 2022, there was a loss of 3.5 million hectares of native vegetation in the state, equivalent to 22% of its original vegetation cover, formed by forests, riparian forests, fields, wetland areas and other areas of native vegetation, at the same time that there was a 366% increase in areas cultivated with soybeans (commodities), forestry and urbanization areas, aspects that directly impact ecosystems and agroecosystems , which associated with intense rains and global warming, led to the major floods that occurred in 2023 and 2024 and the impacts presented.

In this sense, organic production, one of the many agroecological production systems, based on the principles of Agroecology, which prioritize soil care and conservation, the valorization of agrobiodiversity and crop diversification, not the use of external inputs such as chemical fertilizers, pesticides and transgenic seeds and, where agricultural practices reduce environmental impacts and protect natural resources, being identified as an alternative to the current model of food production (Zanetti; Biondo, 2021).

According to Brasil (2003), the organic agricultural production system adopts specific techniques, optimizing the use of available natural and socioeconomic resources and respecting the cultural integrity of rural communities, aiming at economic and ecological sustainability, maximizing social benefits, minimizing dependence on non-renewable energy, employing, whenever possible, cultural, biological and mechanical methods, as opposed to the use of synthetic materials, eliminating the use of genetically modified organisms and ionizing radiation, at any stage of the production process , processing, storage, distribution and marketing, and environmental protection.

Silva (2023), points out that the great environmental advantages of organic production are the non-use of pesticides, the conservation of soil and natural resources, using crop rotation and green manure, practices that prevent erosion and the release of greenhouse gases. greenhouse, which are identified as causing global warming, which leads to the serious climate changes observed in the state, such as floods, as well as maintaining biodiversity in agroecosystems.

The organic agricultural production system has its compliance linked to certification rules and regulations. Organic certification is a way of bringing peace of mind to consumers of organic products, whose numbers are increasing dramatically in our country, especially due to the desire to obtain pesticide-free products, guaranteeing health and peace of mind in relation to environmental sustainability in food production.

Organic certification was established based on Law 10,831 of 2003 (Brazil, 2003) where officially recognized bodies carry out certification and organic producers must be registered in the National Register of Organic Producers (CNPO), where there are three certification mechanisms: a) by audit accredited by a certifier; b) participatory guarantee systems (SPG) and c) social control for direct sales.

In the first, a certifying company is hired to carry out a conformity assessment of the criteria for organic production, which is the most used internationally, with higher costs and technical requirements. Certification in participatory guarantee systems, with social control where the group of organic producers, consumers, technicians, traders and interested parties (system members) and the participatory conformity assessment organization (OPAC) follow and monitor technical requirements. This system occurs with the active participation of interested parties, based on trust and the exchange of knowledge, using social networks as a communication tool. In these two systems, organic products receive the Brazilian Organic Conformity Assessment System – SisOrg seal (Lima *et al.*, 2020)

And in the third social control mechanism for direct sales without certification, it occurs between the family farmer and the final consumer, without intermediaries. The producer, however, must be accredited with a social control organization (OCS) registered with an official supervisory body (federal superintendence of agriculture in the state or other state, federal and Federal District bodies or partners), where sales are carried out directly in fairs, favoring short marketing circuits and exercising trust between consumers and producers, and the National School Feeding Programs (PNAE) and Food Acquisition Program (PAA) (Lima *et al*, 2020).

One of the determining factors for the importance of organic agriculture is its ability to conserve and promote ecosystem services, so to corroborate this theme, in recent years, geotechnologies have played a crucial role in obtaining information,

understanding geographic space and its phenomena. This dynamic makes it possible to create scenarios that assist in government management, providing precise indications on the allocation of resources to mitigate risks and natural disasters. (Ferreira *et al*., 2024).

Over the years, several applications have also been developed, providing support in real-time registration and management (via smartphone, tablet or computer) of useful information for disaster risk reduction management (Passos; Goulart; Coelho, 2019).

Bruski, Tognoli and Araújo (2020) emphasize that floods are natural processes that historically affect populations that develop close to watercourses, occupying their banks and floodplain. The authors show in the study of the Taquari-Antas Hydrographic Basin, with the municipality of Encantado, that for 29 recorded flood events, a Return Time of 2 years was obtained, indicating a high probability of occurrence.

In this sense, this study sought to map organic producers in Rio Grande do Sul and relate them to the municipalities that declared a state of public calamity and emergency in May 2024.

2 Methodology

The methodological techniques of this study took into account geotechnologies, which are a set of technologies for collecting, processing, analyzing and offering information with geographic reference.

The creation of a database through a Geographic Information System (GIS) makes it possible to plan the various activities in the territory, designating an instrument to contribute to decision-making by managers in any sphere.

Thus, various geographic themes were organized in the shapefile format, which consists of a file containing geospatial data, a vector format tool widely used around the world, and its use in the most diverse geoprocessing software, including ArcGis, the application that was used in this work.

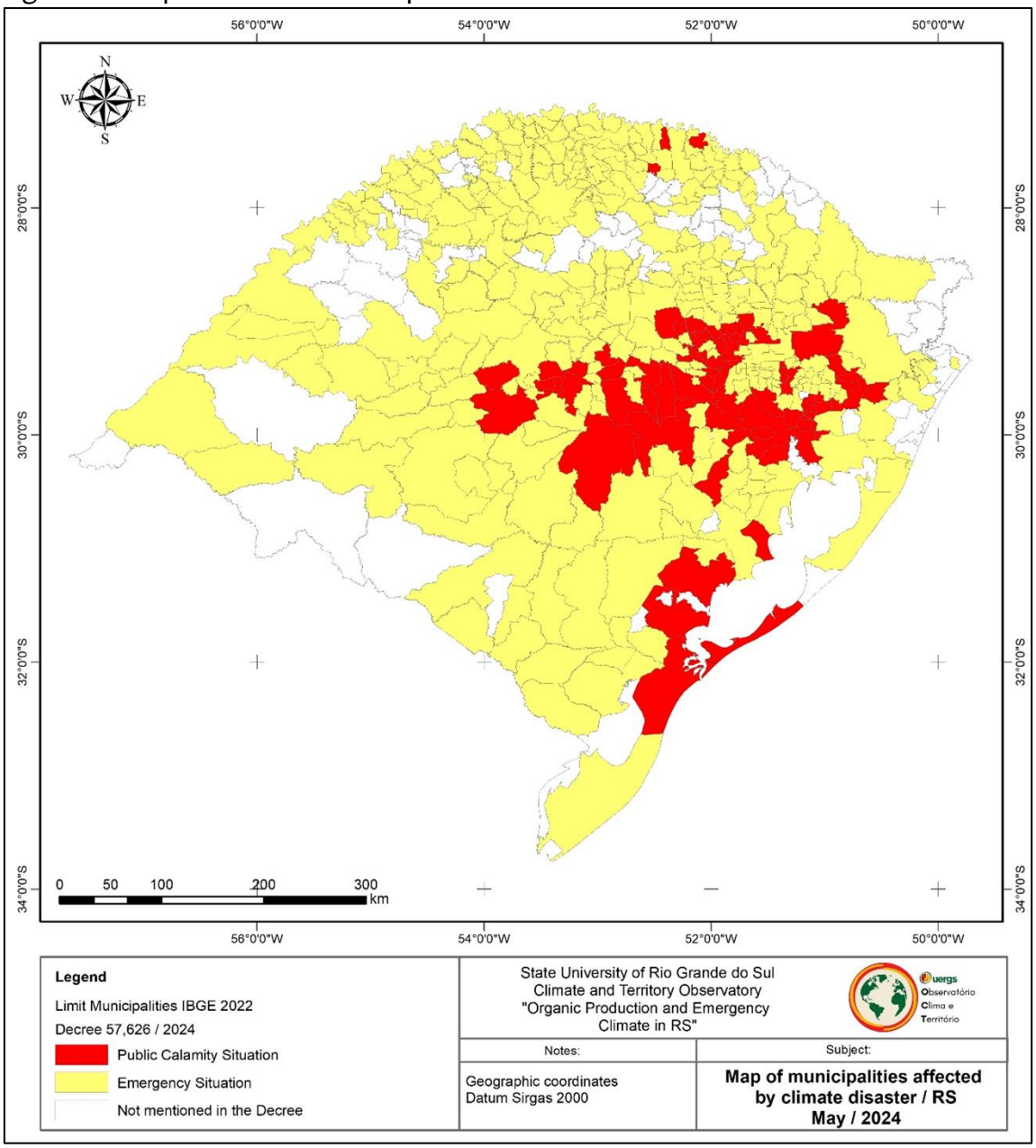
The list of organic producers in the State of Rio Grande do Sul was obtained directly from the website of the Ministry of Agriculture and Livestock / National Register of Organic Producers. The data was downloaded in May 2024, and the section was organized for the area under study, as this website contains a list of Organic Producers from all over Brazil, a list of organizations that control organic quality and a list of organizations of social control, which sell their products directly to consumers.

In relation to the Decree, 57.626 / 2024 (Rio Grande do Sul, 2024) was used, which updates the list of municipalities in a state of public calamity and in an emergency situation in RS.

3 Results and discussions

According to Decree 57,626, of May 21, 2024, 78 municipalities were registered in a state of public calamity and 340 municipalities in an emergency situation (Figure 01).

Figure 01: Map of affected municipalities.



Source: Authors (2024).

For Bateleur (2024), the impacts on agribusiness in general, taking into account all types of agriculture and livestock, had very aggressive impacts, such as: destroyed properties, impact on soil quality, logistical problems, grains, seeds and stored feed must suffer losses due to deterioration caused by rain, animal deaths and rationalization of resources. Thus, according to the authors, losses in agriculture in Rio Grande do Sul could exceed R$2.0 billion.

In rural areas, more than 206,000 properties were affected, with losses in production and infrastructure, and 34,519 families were left without access to drinking water. These data are contained in the Loss Report referring to the greatest climate calamity that hit Rio Grande do Sul, released by the secretariats of Agriculture, Livestock, Sustainable Production and Irrigation (Seapi) and Rural Development (SDR) (Emater, 2024).

The losses, however, were not distributed evenly across the State nor did they occur with the same intensity. In some regions, the damage was very significant, such as in the Taquari and Caí valleys (dairy cattle, pigs and poultry), in the Rio Pardo Valley (beef and dairy cattle), in the region of the Fourth Colony of Italian Immigration (dairy cattle) and in Vale do Paranhana and Encosta da Serra (beef and dairy cattle) (Emater, 2024).

In organic agriculture, losses were also significant, as these are higher-cost productions. Considering only organic and non-organic rice, Rio Grande do Sul is the largest national producer, with 6.9 million tons harvested in the 22/23 harvest, according to Conab, which corresponds to 70% of national production (Hofmeister, 2024).

According to the author, the flood destroyed the organic rice crops of the Landless Rural Workers Movement – MST, and the damage could reach 10 thousand tons. Organic roots, vegetables and fruits make up the food basket produced in the region, which also delivers industrialized items such as jellies, juices and sauces (Hofmeister, 2024).

In Brazil, for a product to be sold as "organic", it is mandatory that the production unit undergo certification. The certification of organic products is compulsory, as established by Law 10,831, of 2003, (Brasil, 2003) which was regulated by Decree 6,323/2007 (Brasil, 2007).

According to the aforementioned law, in its article 1, "an organic system of agricultural production is considered to be any system in which specific techniques are adopted, through the optimization of the use of available natural and socioeconomic resources and respect for the cultural integrity of rural communities, having The objective is economic and ecological sustainability, the maximization of social benefits, the minimization of dependence on non-renewable energy, employing, whenever possible, cultural, biological and mechanical methods, as opposed to the use of synthetic materials, the elimination of the use of genetically modified organisms and ionizing radiation, at any stage of the production, processing, storage, distribution and commercialization process, and the protection of the environment" (Brasil, 2003)

There are three certification systems provided for in Brazilian standards: audit certification, participatory certification or link to a social control organization. Each of these systems allows different access to the market, with audit certification being the main form of access to the international market for export, due to its historical link with IFOAM (International Federation of the Organic Agriculture Movement), the most recognized accreditation institution. international for organic products (Pereira de Souza; Pereira Batista; Aldara, 2019).

Decree 6,323, of December 27, 2007, regulated the law and defined the different certification systems, whose main characteristics are presented in table 01, below.

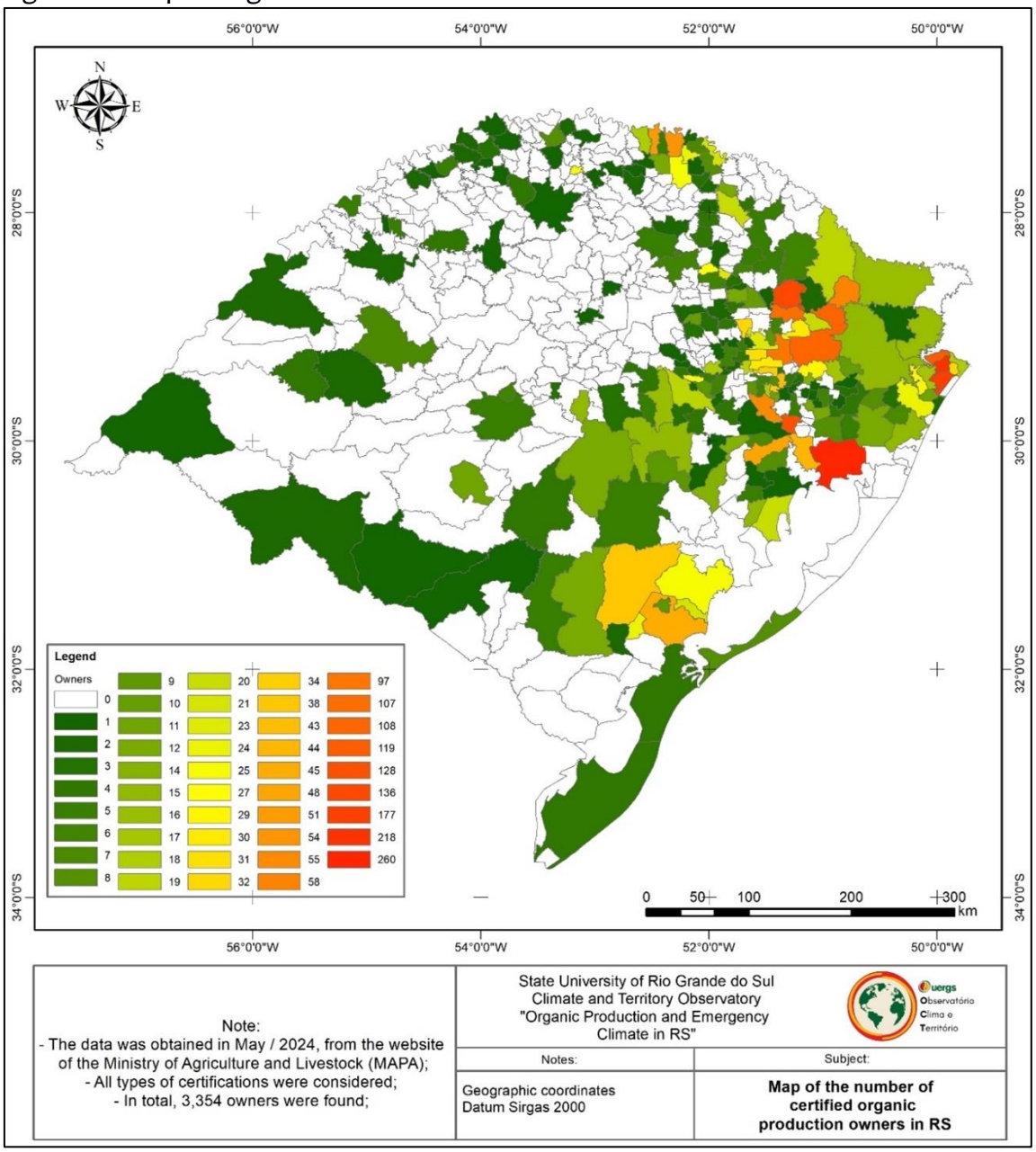
Table 01: Types of organic certification in Brazil.

Certification systems	Features	Access to markets
Audit Certification	Legal entities accredited by the Ministry of Agriculture, Livestock and Supply (MAPA), which apply Audit criteria to assess compliance with organic production standards. They cannot carry out technical assistance or inspection activities in production units.	National and International (long marketing chains) They can use the Brazilian Organic Conformity Assessment System (SISORG) seal on products.
Participatory Organic Conformity Assessment Bodies (OPACs)	Set of activities developed within a given organizational structure, aiming to ensure that a product, process or service meets specific regulations or standards and has been subjected to a conformity assessment, in a participatory manner.	Regional and National (long marketing chains). They can use the Brazilian Organic Conformity Assessment System (SISORG) seal on products.
Social Control Organization (OCS)	Group, association, cooperative or consortium to which the family farmer in direct sales is linked, previously registered with the Ministry of Agriculture, Livestock and Supply, with an organized process of generating credibility through the interaction of people or organizations, supported by participation, commitment, transparency and trust, recognized by Society.	Restricted to direct sales in the local market (short marketing chain). They cannot use the Brazilian Organic Conformity Assessment System (SISORG) conformity seal on products.

Source: Prepared by the authors, based on Decree 6,323/2007 and Lima *et al.* (2020).

According to data obtained in May / 2024, on the website of the Ministry of Agriculture and Livestock (MAPA), considering all types of certifications, a total of 3,354 owners were found in RS (Figure 02). Some producers were identified with duplicate CPFs, so only 1 record was considered.

Figure 02: Map of organic owners.



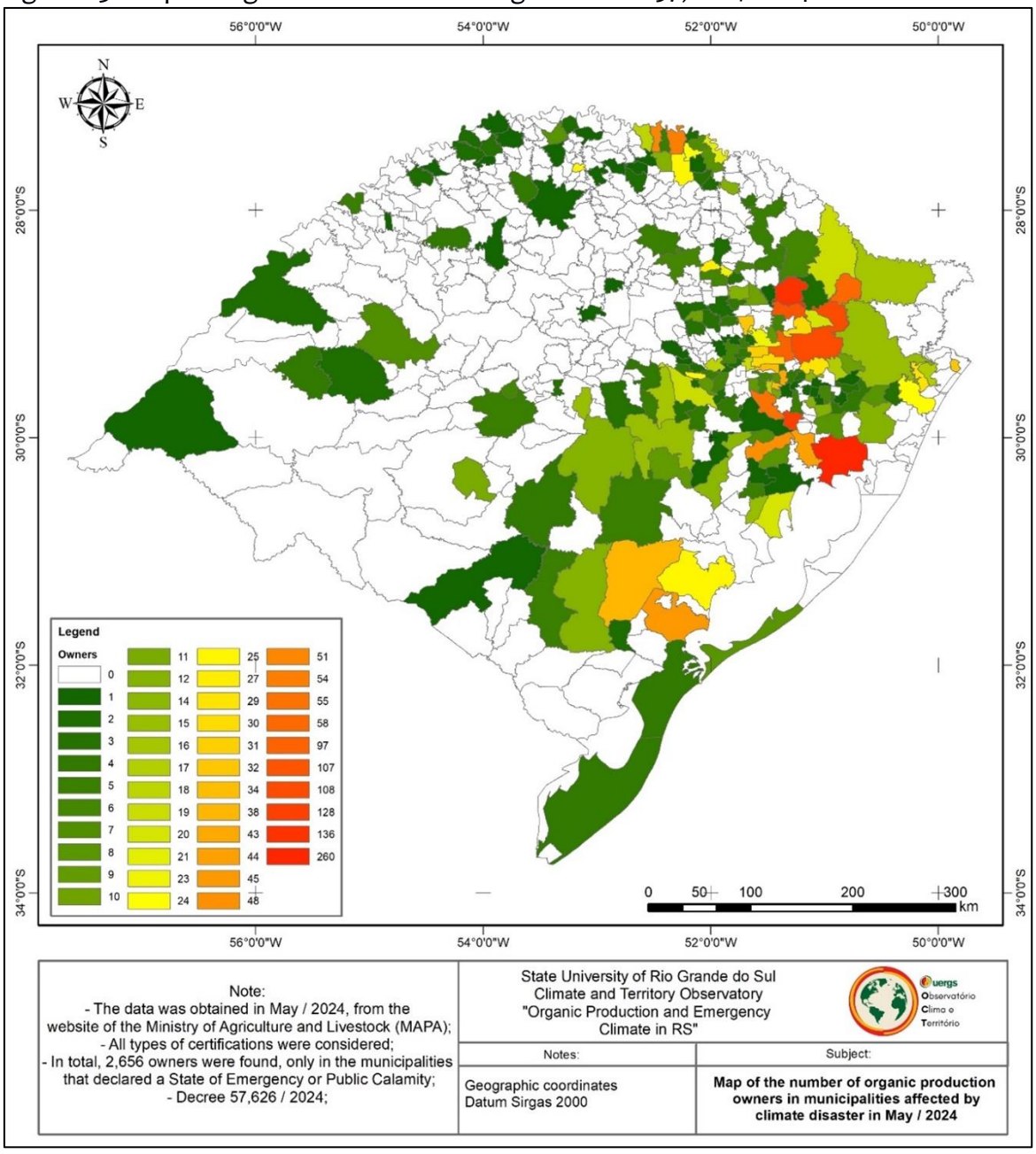
Source: Authors (2024).

In the survey carried out for this work, all types of Certification Systems were present in Rio Grande do Sul and had 3,354 registered farmers, according to data obtained from the Register of Organic Producers, in May 2024, distributed as follows:

- Certification by Audit – 499 farmers;
- Participatory Organizations (OPACs) – 2,636 farmers;
- Social Control Organization (OCS) - 219 farmers;

In relation to data obtained in May / 2024, on the website of the Ministry of Agriculture and Livestock (MAPA) and according to the municipalities that declared a situation of emergency or public calamity (Decree 57,626 / 2024), considering all types of certifications, 2,656 were found owners (Figure 03).

Figure 03: Map of organic owners according to Decree 57,626 / 2024.

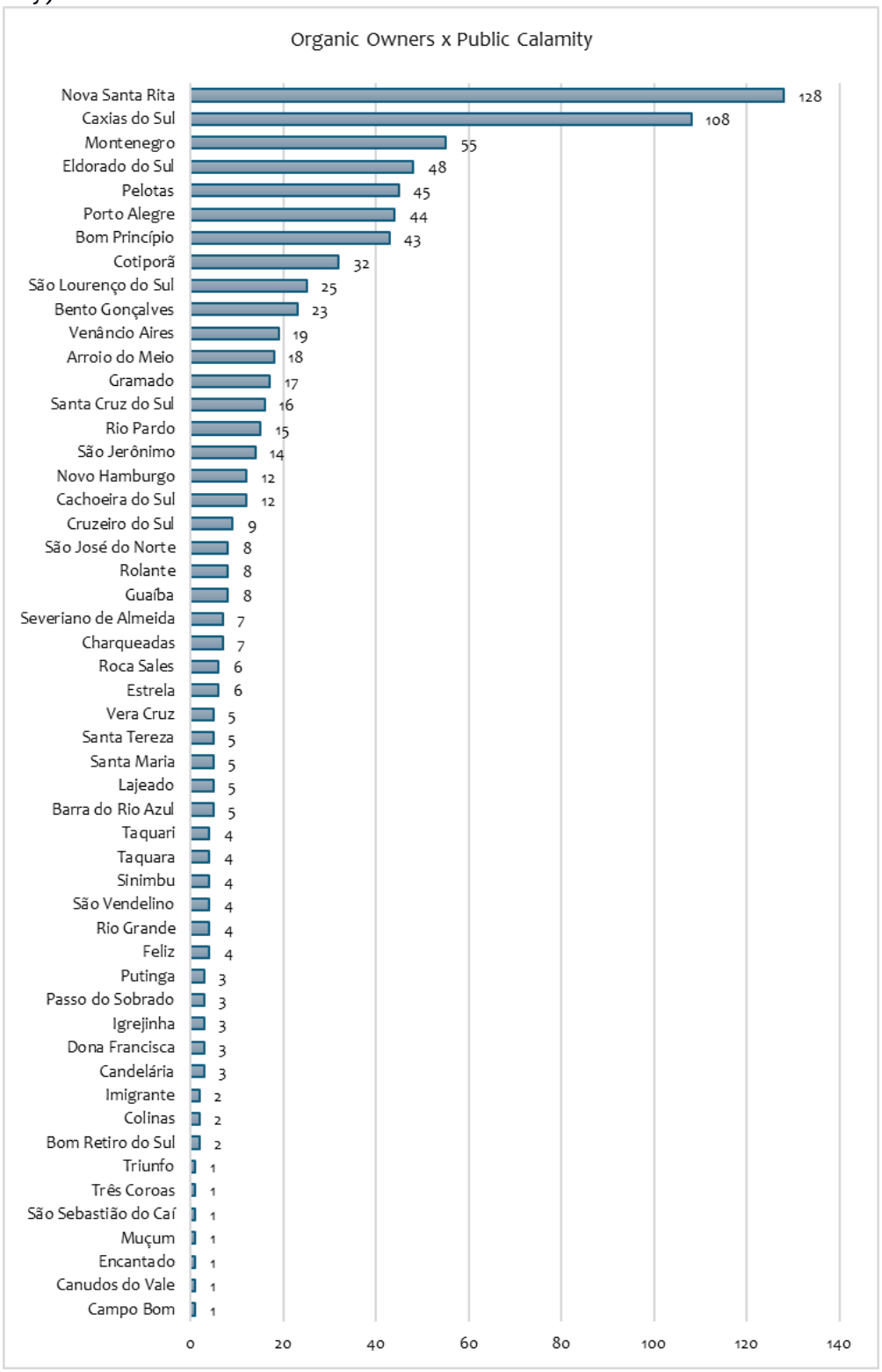


Source: Authors (2024).

There were approximately 79.1% of organic owners in the State, who were located in the affected municipalities. The municipalities that have the largest number of owners are: Viamão (260 prop.), Ipê (136 prop.) and Nova Santa Rita (128 prop.). The first two municipalities declared an emergency situation and Nova Santa Rita declared a public calamity, all of which are located within the Guaíba hydrographic region.

According to figure 04, it appears that 52 municipalities with organic owners also had public calamity decrees published.

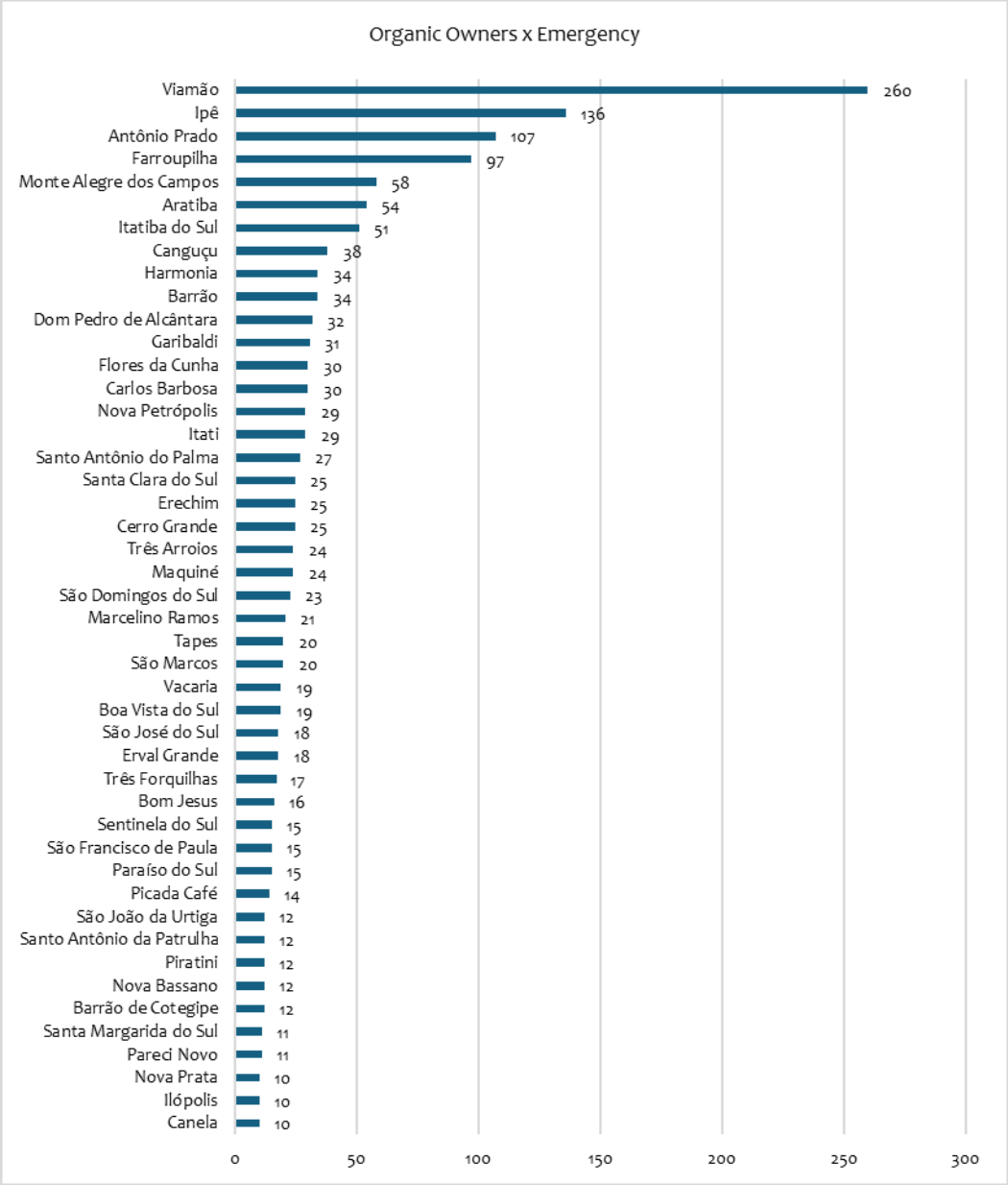
Figure 04: Graph of organic owners according to Decree 57,626 / 2024 (Public Calamity).



Source: Authors (2024).

Already, considering emergency situations, 266 municipalities with organic owners have organized the decree, due to the intense impacts. In figure 05, municipalities with more than 10 owners are shown.

Figure 05: Graph of organic owners according to Decree 57,626 / 2024 (Emergency).



Source: Authors (2024).

Organic producers, mostly small (family farming), were affected by the flood, whether in direct losses to crops and animals, the impossibility and/or delay of the harvest, the lack of electricity, product distribution logistics, in preparing areas for the next harvest, among others; in short, incalculable losses at various stages of the production chain.

In addition to the greater spread of diseases due to high humidity, these conditions harm the development of plants. The high cloudiness and consequently, the lack of sunlight, combined with excess humidity, causes excessive etiolation of plants, with yellowing and subsequent senescence; As a result, there is a reduction in productivity in some crops (Nascimento, 2024).

Thus, reconstruction requires a drastic change in the model of environmental management and agricultural production, entities representing family farming, such

as FETAG and CONTAG, as well as entities representing organic producers, need to lock in public policies with the federal and state for the implementation of emergency and long-term measures.

4 Conclusion

We conclude that family and organic farmers in Rio Grande do Sul suffered from heavy rains that caused significant losses in the production of several crops. Crops such as soybeans, rice, vegetables, fruits, milk, livestock and horticulture were greatly affected and this shows us how difficult this climatic period will be.

In relation to organic products such as arugula, lettuce, cabbage, carrots, beets, cassava, onions and strawberries, they are the most affected, as the volume of water was excess, causing their roots to rot.

It should be noted that approximately 79.1% of organic owners in the State were located in the affected municipalities. Therefore, it has become extremely necessary to evaluate the development of organic agriculture in the affected regions based on data from the National Register of Organic Producers (CNPO) of the Ministry of Agriculture, Livestock and Supply (Mapa).

Without exhausting the subject, it is a priority to have goals that include the promotion of sustainable agricultural production systems, the promotion of people's health and environmental balance, ensuring biodiversity and the efficient use of natural resources, to avoid future environmental catastrophes.

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Submetido em: **Aprovado em:**

CONTRIBUIÇÃO DE CADA AUTOR

Conceituação (Conceptualization)
Curadoria de Dados (Data curation)
Análise Formal (Formal analysis)
Obtenção de Financiamento (Funding acquisition)
Investigação/Pesquisa (Investigation)
Metodologia (Methodology)
Administração do Projeto (Project administration)
Recursos (Resources)
Software
Supervisão/orientação (Supervision)
Validação (Validation)
Visualização (Visualization)
Escrita – Primeira Redação (Writing – original draft)
Escrita – Revisão e Edição (Writing – review & editing).

Fontes de financiamento: