CHARACTERIZATION AND AGROECOLOGICAL MANAGEMENT OF SCHOOL GARDENS IN THE SERRA GAÚCHA REGION, BRAZIL

Russi, Alessandra[1]
Da Silva, Danni Maisa[2]

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ABSTRACT

School gardens are an important space for, not only social interaction among students, but also for learning about environmental issues, the sustainability of productive systems, the appreciation of traditional knowledge in agricultural management, food security, healthy eating habits, and quality of life. In this sense, the agroecological management of gardens can contribute to the production of safe, healthy food without the presence of chemical residues. The present study aimed to characterize school gardens in the public education networks of the state and municipal levels in the Serra Gaúcha region of Brazil, as well as to evaluate aspects related to the management of these gardens, aiming to establish strategies for their conservation and the sustainable management of pests and diseases. The methodology consisted of a qualitative-quantitative research with descriptive purposes conducted through a data survey. For this reason, a semi-structured digital questionnaire was developed and sent to public schools in twenty-four municipalities located in the Serra Gaúcha region, in the state of Rio Grande do Sul, Brazil. After receiving the questionnaires, data analysis and tabulation were performed, and finally, educational materials on agroecological techniques for managing pest insects and diseases were developed based on the identified needs. The obtained data revealed that the majority of schools were located in urban areas, predominantly serving elementary school students during the daytime and being part of the state education network. Furthermore, most schools lacked guidance from qualified professionals and had limitations regarding agroecological management of school gardens. Therefore, four educational brochures were developed and made available to elementary school students with the aim of sparking interest in sustainability and agroecology topics, while simultaneously promoting a greater appreciation of school gardens.

Key words: agroecology, environmental education, diseases, pests, interdisciplinarity, Serra Gaúcha, Brazil

RESUMEN

Los huertos escolares son un espacio importante no solo para la interacción social entre los estudiantes, sino también para el aprendizaje sobre cuestiones ambientales, la sostenibilidad de sistemas productivos, la valoración de conocimientos tradicionales, la seguridad alimentaria, los hábitos alimenticios saludables y la calidad de vida. En este sentido, la gestión agroecológica de huertos puede contribuir a la producción de alimentos seguros, saludables y libres de residuos químicos. El presente trabajo tuvo como objetivo caracterizar los huertos escolares de las redes públicas de educación estatal y municipal en la región de Serra Gaúcha, Brasil, así como evaluar aspectos relacionados con la

[1] Doctoral Student in Biotechnology (Universidade de Caxias do Sul-UCS, Brazil); M.Sc. in Biotechnology (UCS, Brazil); Bachelor in Bioprocess and Biotechnology Engineering (Universidade Estadual do Rio Grande do Sul-UERGS, Brazil); Specialist in Viticulture (Instituto Federal de Ciência, Tecnologia e Inovação do Rio Grande do Sul-IFRS, Brazil); Specialist in Agroecology and Food Security (UERGS, Brazil). *Postal address*: Universidade Estadual do Rio Grande do Sul, Unidade Três Passos. Cipriano Barata, 47, Érico Veríssimo. Três Passos, Rio Grande do Sul, Brazil. *ORCID*: https://orcid.org/0000-0002-2487-252X. *Phone*: +55 318 376 2827; +55 (55) 3522 2895. *Fax:* 57 (55) 3522 2895; *e-mail*: alessandra-russi@uergs.edu.br; alessandrarussi@yahoo.com.br

[2] Ph.D. in Soil Science (Universidade Federal de Santa Maria-UFSM, Brazil); M.Sc. in Agronomy (UFSM, Brazil); Bachelor in Agronomy (UFSM, Brazil). Professor of Soil Science of the Universidade Estadual do Rio Grande do Sul (UERGS). *Postal address*: Universidade Estadual do Rio Grande do Sul, Unidade Três Passos. Cipriano Barata, 47, Érico Veríssimo. Três Passos, Rio Grande do Sul, Brazil. *ORCID*: https://orcid.org/0000-0002-3600-0462. *Phone*: +55 318 376 2827; +55 (55) 3522 2895. *Fax:* 57 (55) 3522 2895; *e-mail*: danni-dasilva@uergs.edu.br

gestión de estos huertos, con el fin de establecer estrategias para la conservación de estos espacios y la gestión sostenible de plagas y enfermedades. La metodología consistió en una investigación cuali-cuantitativa con fines descriptivos, realizada a través de una encuesta de datos. Para ello se elaboró un cuestionario semiestructurado digital, que se envió a las escuelas públicas de veinticuatro municipios ubicados en la región de Serra Gaúcha, Rio Grande do Sul, Brasil. Después de recibir los cuestionarios se realizó el análisis y la tabulación de los datos para, finalmente, elaborar materiales educativos sobre técnicas de agroecología para el manejo de insectos plagas y enfermedades, de acuerdo con las necesidades identificadas. Los datos obtenidos revelaron que la mayoría de las escuelas estaban ubicadas en áreas urbanas, atendiendo principalmente a estudiantes de educación primaria durante el día y formando parte de la red estatal de educación. Además, la mayoría de las escuelas carecían de orientación de profesionales calificados y presentaban limitaciones en cuanto a la gestión agroecológica. Por tanto, se elaboraron y pusieron a disposición cuatro folletos educativos dirigidos a estudiantes de educación primaria con el objetivo de despertar el interés en temas de sostenibilidad y agroecología, al mismo tiempo que promover una mayor valoración de los huertos escolares.
Palabras clave: agroecología, educación ambiental, enfermedades, plagas, interdisciplinariedad, Sierra Gaúcha, Brasil

RÉSUMÉ

Les vergers scolaires sont un espace important non seulement pour l'interaction sociale entre les élèves, mais aussi pour l'apprentissage des questions environnementales, de la durabilité des systèmes de production, de la valorisation des connaissances traditionnelles, de la sécurité alimentaire, des habitudes alimentaires saines et de la qualité de vie. Dans cette optique, la gestion agroécologique des jardins peut contribuer à la production d'aliments sûrs, sains et exempts de résidus chimiques. Le présent travail avait pour objectif de caractériser les vergers scolaires des réseaux d'enseignement publics des niveaux étatique et municipal dans Serra Gaúcha, Brésil, ainsi que d'évaluer les aspects liés à la gestion de ces jardins, dans le but d'établir des stratégies pour la préservation de ces espaces et la gestion durable des ravageurs et des maladies. La méthodologie consistait en une recherche qualitative-quantitative à des fins descriptives réalisée au moyen d'une enquête de données. À cette fin, un questionnaire numérique semi-structuré a été élaboré et envoyé aux écoles publiques de vingt-quatre municipalités situées dans la région de Serra Gaúcha, Rio Grande do Sul, Brésil. Après réception des questionnaires, une analyse et une tabulation des données ont été effectuées, et enfin, des supports pédagogiques sur les techniques agroécologiques pour la gestion des insectes ravageurs et des maladies ont été élaborés en fonction des besoins identifiés. Les données obtenues ont révélé que la majorité des écoles étaient situées en milieu urbain, accueillant principalement des élèves de l'enseignement primaire pendant la journée et faisant partie du réseau d'enseignement étatique. De plus, la plupart des écoles ne disposaient pas d'encadrement présentaient des limites en ce qui concerne la gestion agroécologique. Par conséquent, quatre brochures éducatives ont été élaborées et mises à disposition des élèves de l'enseignement primaire dans le but de susciter l'intérêt pour les thèmes de la durabilité et de l'agroécologie, tout en favorisant une plus grande valorisation des jardins scolaires.
Mots-clés : agroécologie, vergers scolaires, éducation à l'environnement, maladies, ravageurs, interdisciplinarité, Serra Gaúcha, Brésil

RESUMO

As hortas escolares são um importante espaço não apenas para a interação social entre os estudantes, mas também para o aprendizado sobre questões ambientais, sustentabilidade de sistemas produtivos, valorização de conhecimento tradicionais no manejo agrícola, segurança alimentar, hábitos alimentares saudáveis e qualidade de vida. Nesse sentido, o manejo agroecológico de hortas pode contribuir para a produção de alimentos seguros, saudáveis e sem a presença de resíduos químicos. O presente trabalho teve como objetivo caracterizar hortas escolares das redes públicas de ensino estadual e municipal da Serra Gaúcha, Brasil, bem como avaliar aspectos referentes ao manejo dessas hortas, visando ao estabelecimento de estratégias para a conservação desses espaços e para o manejo sustentável de pragas e doenças. A metodologia consistiu em uma pesquisa quali-quantitativa e com fins descritivos realizada através de um levantamento de dados. Para tanto, foi elaborado um questionário digital semiestruturado que foi encaminhado às escolas públicas de vinte e quatro munícipios localizados na região da Serra Gaúcha, estado do Rio Grande do Sul, Brasil. Após o recebimento dos questionários, foi realizada a análise e tabulação dos dados e,

finalmente, a elaboração de material didático sobre técnicas de agroecologia voltadas ao manejo de insetos-praga e doenças de acordo com as demandas levantadas. Os dados obtidos revelaram que a maior parte das escolas estavam localizadas no meio urbano, atendendo predominantemente alunos de Ensino Fundamental, no período diurno e fazendo parte da rede estadual de ensino. Ademais, a maioria das escolas não dispunha de orientação de profissionais qualificados e apresentava limitações em relação ao manejo agroecológico das hortas escolares. Em virtude disso, foram elaborados e disponibilizados quatro folders educativos voltados aos estudantes de Ensino Fundamental, com intuito de despertar o interesse sobre as temáticas da sustentabilidade e da agroecologia, e simultaneamente, promover uma maior valorização das hortas escolares.
Palavras-chave: agroecologia, educação ambiental, doenças, pragas, interdisciplinaridade, Sierra Gaúcha, Brasil

1. INTRODUCTION

The adoption of vegetable gardens in schools represents an opportunity for students to socialize and share experiences, providing an approach to interdisciplinary themes such as environmental education, agroecology, nutrition, food safety, citizenship and preservation of empirical and traditional knowledge involved in implementation and conservation of these spaces (Silva *et al*., 2016; Pastorio, 2020). Consequently, school gardens promote the contextualization of theoretical knowledge with practical experiences, strengthening the connection between agriculture and conservation of natural resources. This, in turn, contributes to the sustainable development and the balance between different ecosystems (Cancelier, Beling & Facco, 2020).

In addition, the management of school gardens can contribute to the introduction of concepts of agroecological practices in the routine of the students. Agroecology aims at sustainable agricultural production with minimal human intervention, following principles of ecology, and avoiding the use of inputs that do not naturally integrate the agroecosystem (Fialho *et al*., 2019). As a result, strategies such as the use of chemical pesticides and fertilizers are avoided due to their negative impacts on human health and the environment (Boubakri, Hadj-Brahim, Schmitt, Soustre-Gacougnolle & Mliki, 2015; Böhm, Böhm, Rodrigues & Santana, 2017).

Agroecological agriculture encompasses alternative methods for controlling pests and diseases, as well as managing soil biodiversity and fertility. To achieve this, it employs approaches based on agroecological principles that enable the production of safe and healthy food (Fialho *et al*., 2019) while ensuring the sustainability of the production system and, at the same time, respecting the agrobiological and cultural diversity of local communities (Becker & Silva, 2021). Thereby, the inclusion of the theme of agroecological management of school gardens, coupled with environmental education, allows for the promotion of awareness and the formation of social actors. Additionally, it enables the change of eating habits, addresses exacerbated consumerism, and challenges existing paradigms related to agricultural practices (Böhm *et al*., 2017; Fialho *et al*., 2019).

The adoption of agroecological strategies in the implementation and management of school gardens enables the implementation of pedagogical and recreational practices, in a transdisciplinary way, encouraging students to develop a critical environmental sense and a commitment to nature preservation, biodiversity protection, and production of nutritious and safe food (Ribeiro, Almeida & Santos, 2019). In addition, the process of disseminating this information by students to their families and the local community contributes to the strengthening of a less consumerist and more sustainable society (Machado, Tonin & Schneider, 2015; Fialho *et al*., 2019).

The present study aimed to: (i) conduct a survey of school gardens maintained in public

schools located in the Serra Gaúcha region, State of Rio Grande do Sul, Brazil; (ii) characterize the educational activities developed in these spaces; (iii) identify aspects related to sustainable management; and, (iv) propose agroecological strategies to contribute to the learning, sustainability, and food security of these gardens.

2. MATERIALS AND METHODS

The present study consisted of an exploratory research, with a qualitative-quantitative approach, developed through a digital semi-structured questionnaire. Initially, the questionnaire was sent to 151 municipal schools and 71 state schools in 24 municipalities located in the Serra Gaúcha region, Rio Grande do Sul State, Brazil (Figure Nº 1). These municipalities were chosen since they are members of the Regional Council for the Development of Serra (COREDE Serra) and belong to the 16th Regional Coordination of Education (16th CRE – Bento Gonçalves).

COREDE Serra is characterized by having the third-largest population Rio Grande do Sul State, with a predominantly urban population, a high representation of adults and elderly people among its inhabitants, a life expectancy at birth of 74.6 years, Gross Domestic Product (GDP) *per capita* of BRL 34,642, and a Socio-Economic Development Index (SEDI) of 0.812 (COREDE, 2015).

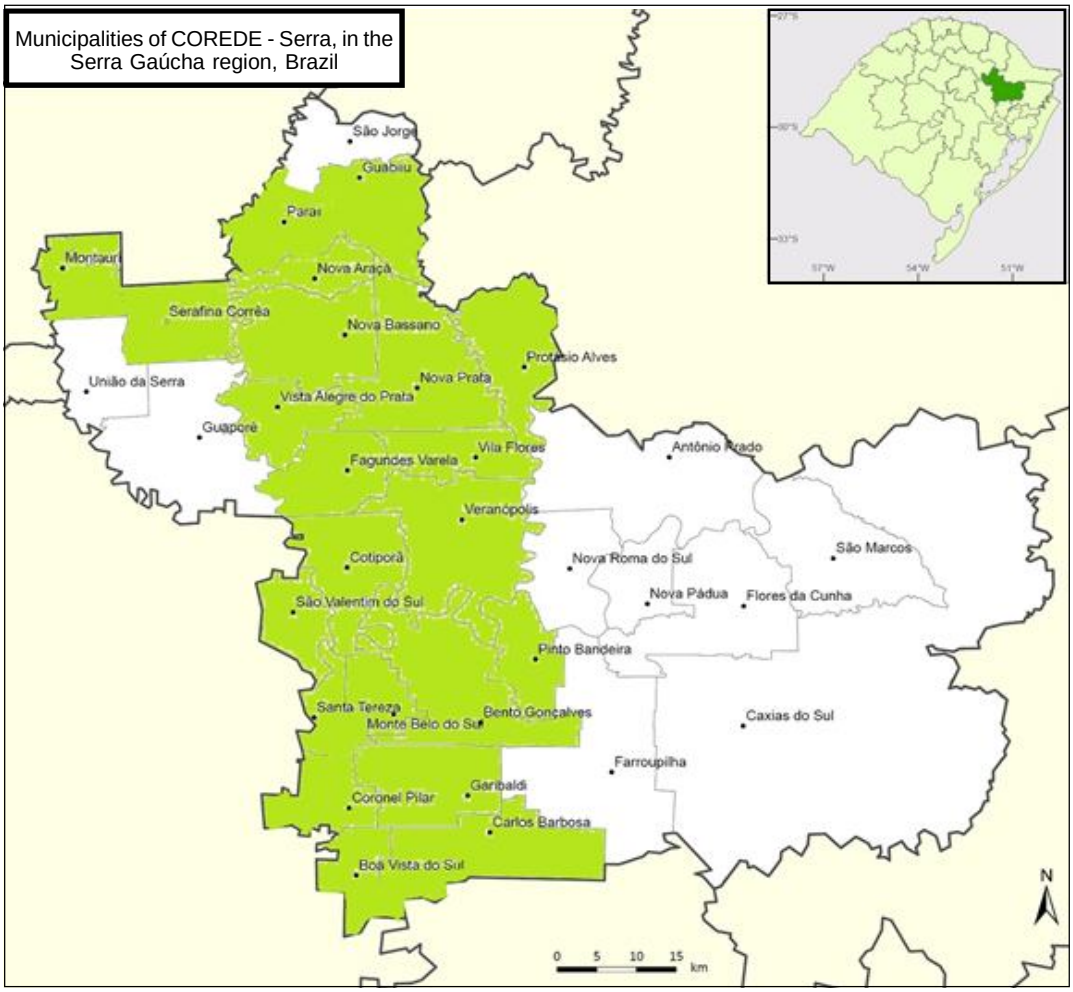

Figure 1. Map of COREDE Serra with municipalities belonging to the 16th CRE. Source: SEPLAG/ DEPLAG (Regional Council for the Development of Serra)

The questionnaire was prepared using the Google Forms tool and organized in two sections, as described by Bernardon, Schmitz, Recine, Rodrigues, and Gabriel (2014), with modifications (Annex 1). In the first section, the identification and characterization of the school were conducted (name, classification as state or municipal, municipality, urban or rural setting, operating shift, and levels of basic education offered), along with verification of the existence of school gardens in the past, present, and the interest in implementation in the future. If the school had previously maintained a vegetable garden, the reasons for its deactivation were raised.

At this stage, the questionnaire was automatically closed, and only schools with active gardens proceeded to the second section of the research. In this section, aspects such as the existence of a project involving a school garden, teaching practices developed in this location,

the presence of a professional responsible for garden maintenance, the availability of educational materials for garden management, visual detection of pests, strategies for pest and disease control, the primary plants cultivated, engagement of the local community in preserving these spaces, and identification of essential factors for maintaining active gardens were addressed.

The questionnaires were sent to the e-mails of the schools from December 2021 to March 2022, in the first attempt. The school contacts were provided by the 16th CRE - Bento Gonçalves (Regional Education Coordination) of Rio Grande do Sul, Brazil. If the questionnaires were not answered within 15 days, they were sent again, totaling three submissions to each school. In order to increase the number of respondent questionnaires, a second attempt was made. Thus, the school directors were contacted by telephone, and the importance of this study was emphasized.

Subsequently, based on the analysis of the data from the digital questionnaires, educational materials were prepared using the PowerPoint® program. These materials took into account the primary concerns related to alternative pest and disease control in vegetables, in accordance with the principles of agroecology. These materials were made available in digital format to public schools in the Serra Gaúcha region, Brazil, for use in interdisciplinary didactic practices.

3. RESULTS

From the initial 222 questionnaires that were digitally sent to public schools belonging to the 16th CRE in the Serra Gaúcha region, Brazil, only 61 were answered (27.5%). However, after a second attempt, this number increased to 127 respondent questionnaires (57.2%). Thus, the adoption of direct and informal contact with the schools doubled the number of answered questionnaires. In addition, among the schools that returned the forms, the highest number of respondents belonged to state schools in both attempts performed (Table Nº 1).

The municipalities with the highest percentage of schools that returned the questionnaire after the second attempt were Protásio Alves (100%), Cotiporã (71.3%), Paraí (65.0%), Serafina Correa (57.2%) and Carlos Barbosa (51.4%). In the first attempt, none of

Table 1
Questionnaires sent and answered by state and municipal schools gardens in the Serra Gaúcha region, Brazil

Schools	Number of questionnaires		
	Sent	**Answered (First attempt)**	**Answered (Second attempt)**
State	73	37 (50.7%)	49 (67.1%)
Municipal	149	24 (16.1%)	78 (52.3%)
Total	**222**	**61 (27.5%)**	**127 (57.2%)**

the schools belonging to the municipalities of André da Rocha, Fagundes Varela, Guabiju, Montauri, Nova Araçá, Vila Flores, and Vista Alegre do Prata responded to the questionnaire. However, after the second attempt, all the municipalities returned the questionnaires.

In the characterization of schools, it was found that 75.2% of them were located in urban areas, while 24.8% were situated in rural areas. The primary operating shift for schools was in the morning (98.5%), followed by the afternoon (89.7%), and the night (23.2%). Consequently, the prevalence of daytime classes was observed, facilitating practical educational activities and allowing students to maintain gardens. The primary levels of basic education offered by the schools that responded to the questionnaire were Elementary School (79.5%), Pre-school (46.2%), High School (26.3%), and other levels (10.8%).

The analysis of aspects such as the existence and operation of vegetable gardens revealed that 44.2% of urban schools had active gardens, whereas in rural schools, this percentage was 68.4%. Furthermore, it was discovered that 39.8% of the schools had deactivated vegetable gardens, 45.3% had active vegetable gardens, and 14.9% expressed interest in establishing one despite not currently having one. Thus, it was observed that a significant percentage of schools had previously attempted to implement vegetable gardens without success. The main reasons leading to the inactivity of school gardens included a lack of suitable space (46.2%), the COVID-19 pandemic (35.4%), difficulties in maintenance (29.3%), a shortage of staff to coordinate pedagogical activities in the gardens (27.5%), the absence of a garden-related project (7.6%), time constraints (3.7%), and unknown reasons (3.1%) (Figure Nº 2).

On the other hand, schools with active gardens –when asked about the factors considered essential for the gardens to remain operational (Figure Nº 3)–, cited the following: appreciation of the gardens by teachers and students (68.3%), utilization of the garden in didactic-pedagogical practices (54.6%), support from parents and the community (52.1%), assistance from a professional with technical knowledge (50.3%), financial resources (43.4%), and other reasons (9.8%).

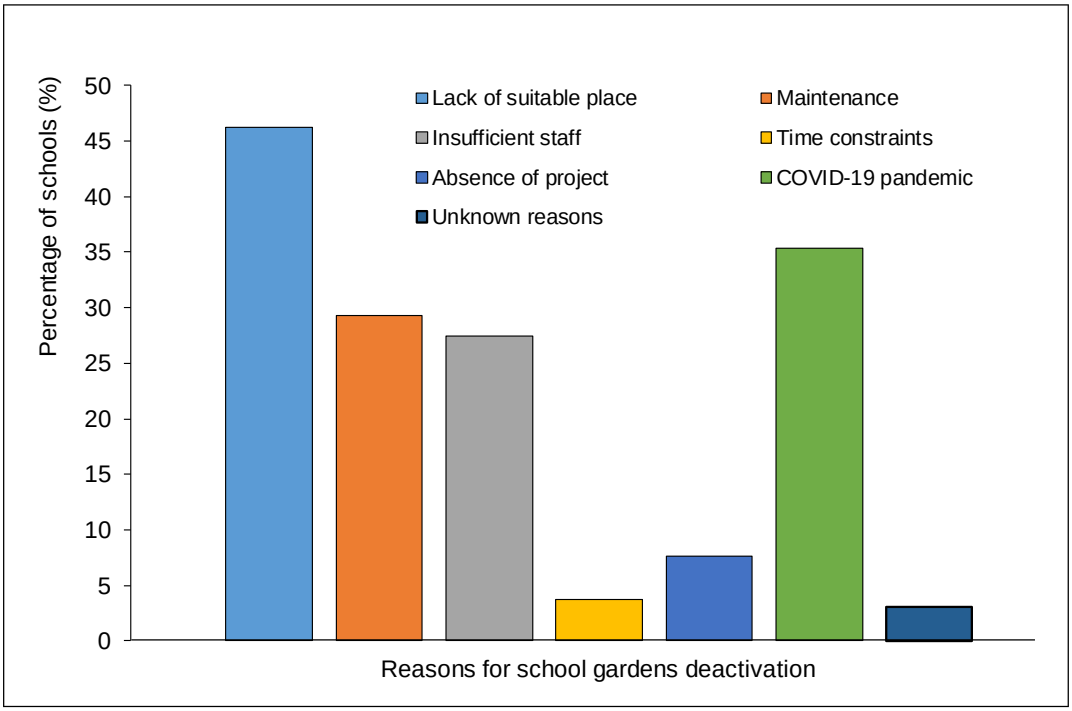

Figure 2. Primary reasons that led to school gardens deactivation in the Serra Gaúcha region, Brazil

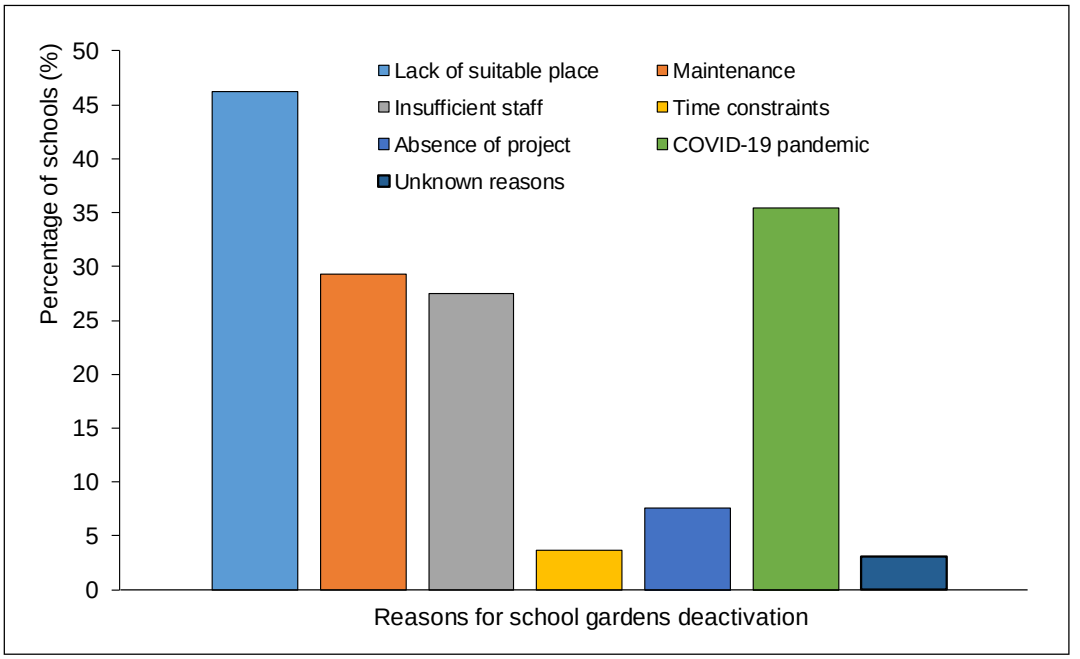

Figure 3. Primary factors cited for public school gardens remain operational in the Serra Gaúcha region, Brazil

The 29 schools with active gardens completed Section 2 of the form, which requested more detailed information about these spaces. The survey revealed that 39.4% of students in the first to fifth grades of Elementary School and 28.5% of those in the sixth to ninth grades participated in practical activities in school gardens. Additionally, other grade levels also engaged in activities in these settings, though with lower participation rates: all grades (16.5%), Pre-school (9.1%), and High School (6.5%).

More than half of the schools (58.9%) indicated their participation in projects involving school gardens, which included initiatives such as «Healthy Eating», «Family Farming with Sustainable Development», «More Land, Less Screen», «Biological Clock of Medicinal Herbs», «Vegetable Garden at School», «Outdoor School», «Flavor of the Orchard», «Nature Care», and others. The most cultivated vegetables in school gardens were condiment plants (97.0%), leafy greens (93.5%), medicinal plants (62.3%), legumes (48.5%), and tubers (38.6%). Furthermore, in 60.8% of the schools with gardens, practical and recreational activities occurred on-site, with subjects prioritized in the following order of importance: Science, Biology, Environmental Education, Physical Education, Portuguese, and Mathematics.

Among the primary activities carried out by students in the gardens, planting seeds and seedlings (59.7%), harvesting vegetables (32.0%), and preparing school meals (27.5%) were the most prominent. However, other activities aligned with agroecology principles that could contribute to student learning and awareness, such as fertilizing, irrigating, and controlling pests and diseases, were reported less frequently (Figure Nº 4).

Among the schools that responded to the questionnaire, 85.3% did not possess educational materials related to organic or agroecological garden management, and 73.6% lacked guidance from a qualified professional or any other form of technical assistance. Conversely, 27.3% of the schools received assistance from institutions of technical assistance (55.6%), the Municipal Department of Agriculture or the Environment (39.4%), local farmers, and other sources (2.5% each) (Figure Nº 5).

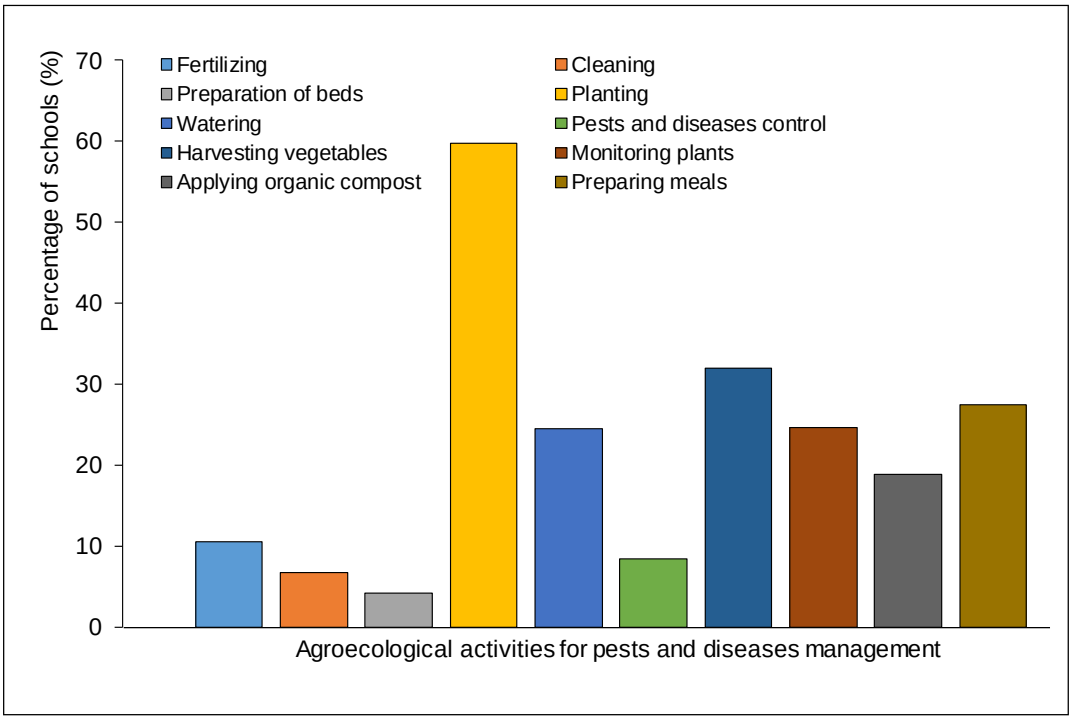

Figure 4. Primary activities developed by students in public school gardens of the Serra Gaúcha region, Brazil

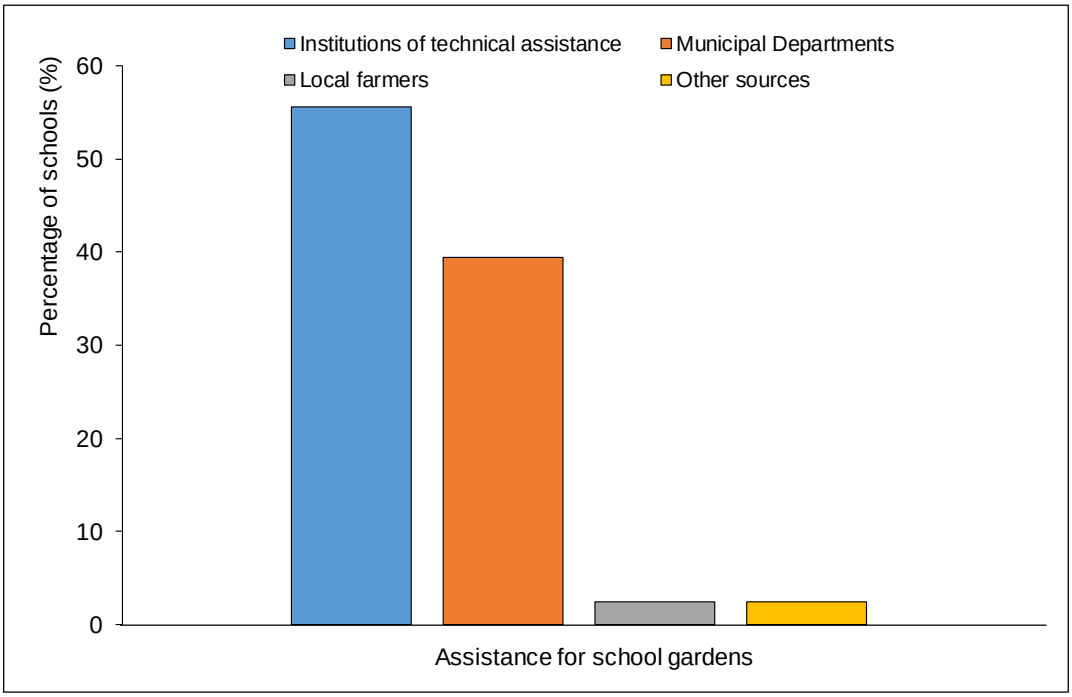

Figure 5. Primary responsible for assistance in public school gardens of the Serra Gaúcha region, Brazil

Regarding the occurrence of diseases and pests, 34.5% of the schools observed damage to vegetables. These damages were primarily caused by ants, aphids, slugs and snails, caterpillars, beetles, and thrips. For controlling these agents, 45.6% of all schools adopted strategies, including: removing old and diseased leaves (80.4%), composting organic residues (56.5%), applying biofertilizers or animal manure (45.8%), implementing crop rotation (30.9%), using natural insecticides (26.3%), utilizing repellent plants (21.5%), employing traps to capture insects (15.6%), and managing diseases with natural products (12.1%) (Figure Nº 6).

Based on the data obtained in the first part of this study, we considered relevant aspects for creating educational materials focused on the management of school gardens with an emphasis on sustainability and agroecology concepts. The survey revealed that the majority of schools responding to the questionnaire were state schools located in urban areas, offering daytime classes primarily to elementary school students. Furthermore, it was observed that most of these schools lacked technical assistance and materials for garden management.

Using this information, four folders were created in a language accessible to Elementary School students: «Pests Identification and Control», «Repellent plants of pest», «Preventive Management of Pests and Diseases», and «Control of Fungal Diseases in Vegetables» (Figure Nº 7). This material was digitally made available to schools in the Serra Gaúcha region, Brazil.

4. DISCUSSION

School gardens play an essential role in education by providing a space for contextualizing knowledge through practical

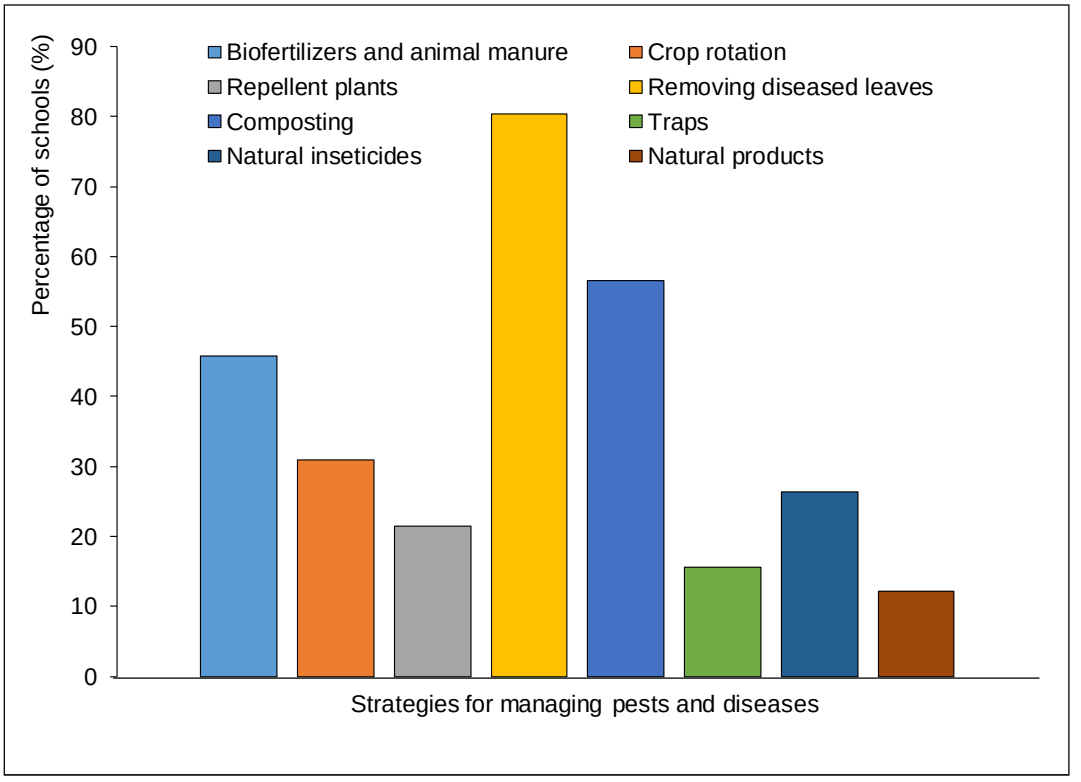

Figure 6. Strategies for controlling pests and diseases adopted in in public school gardens of the Serra Gaúcha region, Brazil

Figure 7. Folders on agroecological management of pests and diseases in school gardens prepared for Elementary School students

experiences (Cancelier *et al*., 2020). They help students assimilate and implement strategies aimed at producing safe and high-quality food using agroecological practices (Silva *et al.*, 2020). Conducting this survey allowed us to gain insights into the reality of public schools in the Serra Gaúcha region, particularly regarding the presence of school gardens and their effectiveness as educational tools for environmental preservation, promoting food security, fostering social inclusion, and nurturing critical awareness (Costa, Souza & Pereira, 2015).

It was observed that the vast majority of schools that responded to the questionnaire were state schools located in urban areas. However, urban schools had a lower percentage of active gardens compared to schools in rural areas. In this sense, Bernardon *et al*. (2014) conducted an analytical study by distributing surveys to schools in the Federal District, Brazil, between 2008 and 2009. They found that rural schools, in general, had more functional gardens than urban schools, primarily due to the availability of space and knowledge about agricultural practices required for maintenance. Probably, these factors also contributed to a higher adoption of vegetable gardens in schools located in rural areas, as observed in the present study.

It is worth mentioning, however, that the establishment of a school garden does not necessarily guarantee its preservation and use in practical activities. In this perspective, Machado *et al*. (2015) emphasize that despite the existence of numerous active school gardens, many of them are underutilized in the educational process or fail to fully realize their potential in producing safe and high-quality vegetables due to inadequate management practices.

Thus, the lack of suitable space, challenges stemming from the COVID-19 pandemic, and a shortage of staff for maintenance were the primary factors leading to the inactivation of school gardens, as revealed by this study. Similarly, Tavares, Fernandes, Silva &Moreira (2014) reported space unavailability as one of the main challenges in establishing school gardens, suggesting the adoption of vertical gardens as a solution. On the other hand, Branco & Alcântara (2011) identified obstacles such as the absence of technical assistance, limited community support, financial constraints, and irrigation difficulties, while Bernardon *et al*. (2014) cited the lack of maintenance personnel as the primary reason for abandoning these gardens.

Another question was raised to understand the reasons schools with active gardens might have for discontinuing these spaces. From the experiences and daily school routines, the lack of interest among teachers and students in maintaining and utilizing vegetable gardens was highlighted. In this perspective, Tavares *et al*. (2014) pointed out the lack of motivation and reluctance of some students to work with soil as factors that need to be overcome to ensure greater participation in garden activities. Freitas *et al*. (2013) emphasized the challenges teachers face in balancing their daily school responsibilities with additional tasks related to school gardens. Therefore, it is essential to foster engagement and collective efforts for the success of school gardens.

In the present work, several subjects used school gardens as a living laboratory for implementing recreational activities. Similarly, a study conducted in Picuí (Brazil) in 2012 reported garden-based lectures in subjects such as Mathematics, Science, Geography, and Arts (Santos, Azevedo, Freire, Arnaud & Reis, 2014). In another study by Oliveira, Pereira & Pereira Junior (2018), classes in Portuguese and Science, specifically Botany, included practical activities in school gardens. Santos *et al*. (2014) and Cancelier *et al*. (2020) also observed the integration of theoretical knowledge with experimentation in subjects like Mathematics, Science, and Geography. Thus, gardens can serve as valuable tools for sharing knowledge and experiences, contributing to a comprehensive and integrated education of students (Silva *et al*., 2016; Ribeiro *et al*., 2019).

Among the most cultivated vegetables in school gardens in the Serra Gaúcha region of Brazil, spice and condiment plants, greens, and medicinal plants were prominent. Condiment plants are often cultivated because they can produce year-round and require minimal care (Venzke, 2020). Similarly, the cultivation of these vegetables was observed in schools in

Brasilia, Brazil (Bernardon *et al*., 2014), and in a school garden in Gurjão, Brazil (Costa *et al*., 2015). Additionally, the cultivation of medicinal plants in school gardens has also been reported in other studies (Costa *et al*., 2015; Fialho *et al*., 2019). On the other hand, the cultivation of unconventional food plants could be encouraged, as these vegetables are hardy and easy to grow, do not require the use of chemical inputs (Paschoal, Gouveia & Souza, 2016), promote cultural appreciation (Martinelli & Cavalli, 2019), and have high nutritional value, which can contribute to diversifying students' diets (Souza *et al*., 2021).

Furthermore, the survey enabled the identification of several pests in school gardens, causing damage to vegetables and affecting productivity and food quality. Similarly, Venzke (2020) reported the presence of pests such as slugs, aphids, beetles, and birds in urban rooftop gardens in Pelotas, Brazil. The same author suggested preventive measures like crop rotation, removal of diseased plants, and therapeutic measures such as the use of tobacco or soap solutions, repellent plants, attractive traps, and manual removal of insects for pest control. Strategies such as consortium of plants using medicinal herbs, application of cattle manure, and insect elimination were cited by Costa *et al*. (2015). Cabral & Souza (2013) mentioned the use of natural insecticides and manual removal of insects and diseased seedlings as alternative methods for managing pests and diseases in school gardens.

The maintenance of vegetable gardens in schools was the responsibility of the students, with support from internal collaborators, teachers, directors, and the local community. Corroborating these observations, Fialho *et al*. (2019) emphasized the assignment of responsibilities as a means to encourage children to collaborate with other stakeholders in preserving school gardens. In this sense, Pastorio (2020) highlighted the importance of engaging different individuals in maintaining vegetable gardens to avoid overburdening a few individuals with numerous tasks.

Finally, the development of educational brochures facilitated the dissemination of information regarding the sustainable management of gardens. These materials can be used as support materials in teaching practices and as tools to assist in the management of gardens and backyard gardens outside of schools.

5. CONCLUSIONS

The present survey provides an overview of public school gardens in the Serra Gaúcha region, Brazil. The findings demonstrate that several schools do not have gardens, indicating the possibility of implementing or reactivating these spaces. Additionally, it is possible to point out some constraints in the management of active gardens due to limited support from qualified professionals and scarcity of relevant literature.

After identifying the limiting factors in maintaining vegetable gardens, educational materials were developed with the aim of providing a pedagogical tool for engaging students in agroecological and sustainable management of school gardens. Furthermore, these materials also aim to encourage students to develop a critical perspective on environmental preservation, healthy eating habits, and food security.

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