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POTENTIAL OF ECO-INNOVATION IN AGROECOLOGY

POTENCIAL DE ECOINOVAÇÃO EM AGROECOLOGIA

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Abstract

In the context of the environmental crisis, this study aimed to identify and analyze the potential of eco-innovation in agroecological production in Brazil, by mapping the demand for technological information from users on the access platform to the Brazilian Technical Response Service (SBRT). To this end, we applied the quantitative research methodology, based on the survey of technical responses and technical dossiers related to the following keywords: "sustainability", "sustainable development" and "environment" specifically in the sector of agriculture, which contains 2068 technical documents. As a result of the research, only 79 responses and technical dossiers were retrieved, equivalent to 3,8% of the total documentary sample, having been accessed by 1628 users, representing 41% of the total number of unique accesses to the collection. Regarding the technological information contained in these documents, 38% are associated with organic agriculture, while 24% were categorized as "alternative agricultural practices". The results demonstrate the potential of eco-innovation in agroecology, but also reveal the low contribution of SBRT to the theme and the business profile studied. Therefore, an accurate assessment of the issue of eco-innovation in agroecology is suggested, based on field research, the study of which will contribute to a better understanding of this business profile and support future strategies within the scope of the SBRT, in favor of its engagement with commitments made in global agreements to deal with the environmental crisis.

Keywords: Brazilian Service of Technical Responses. Technological information. Eco-innovation; Small business. Agroecology.

Resumo

No contexto da crise ambiental, o presente estudo teve como objetivo identificar e analisar o potencial de ecoinovação na produção agroecológica no Brasil, mediante o mapeamento da procura

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por informações tecnológicas da parte dos usuários na plataforma de acesso ao Serviço Brasileiro de Respostas Técnicas (SBRT). Para tanto, optou-se pelo uso da metodologia de investigação quantitativa, a partir do levantamento de respostas técnicas e dossiês técnicos relacionados às palavras-chave "sustentabilidade", "desenvolvimento sustentável" e "meio ambiente" na coleção do segmento da agricultura, que contém 2068 documentos técnicos. Como resultados da pesquisa, foram recuperados 79 respostas e dossiês, o equivalente a 3,8% do total da amostra documental, tendo sido acessados por 1628 usuários, representando 41% do número total de acessos únicos à coleção. Com relação à informação tecnológica contida nesses documentos, 38% estão associados à agricultura orgânica, enquanto 24% foram categorizados como "práticas alternativas de agricultura". Os resultados demonstram o potencial de ecoinovação em agroecologia, mas também revelam a baixa contribuição do SBRT para a temática e o perfil empresarial estudados. Diante disso, sugere-se uma avaliação acurada da questão da ecoinovação na agroecologia, a partir de uma pesquisa de campo, cujo estudo irá contribuir para um melhor entendimento da produção agroecológica no Brasil e subsidiar estratégias futuras no âmbito do SBRT, em prol do engajamento dos pequenos negócios agroecológicos aos compromissos assumidos em acordos globais no enfrentamento da crise ambiental.

Palavras-chave: Serviço Brasileiro de Respostas Técnicas. Informação tecnológica. Ecoinovação. Pequenos negócios. Agroecologia.

Introduction

Schumpeter was a pioneer in the studies that relate the introduction of innovations in corporations with the economic growth of countries. His long years of dedication to the topic of innovation resulted in an immense legacy, which to this day guides research around the world. In his second book in 1911, Theory of Economic Development, Schumpeter proposed a broad sense of innovation that is still considered in national and international research, comprising not only the introduction of a product with innovative characteristics, but also a new way of producing, the opening of new markets, the appearance of a new raw material, among others.

In this sense, eco-innovations could be considered within the Schumpeterian innovation categories, however, the emphasis that this type of innovation gives to the environmental variable requires a contextualization and a notion of effectiveness that goes beyond the economic domain. The present article deals with a type of innovation that is still little studied, but very promising, which is in the domain of agro-ecological production.

The idea of innovation in agriculture usually refers to the development of transgenic seeds, of pesticides and chemical fertilizers used to a large extent by Brazilian agribusiness, as well as the various applications of information technology (IT), but this is one of the innovation trajectories typical of conventional agriculture. Agroecology has, according to Nodari and Guerra (2015), a "historical role" in the development of practices and innovations, particularly in cultivation techniques and water use, seed selection and diversification, distribution models, etc.

Innovation is a determining factor for the survival of small enterprises, such as those that predominate in agroecology, which have in their favor greater flexibility and agility in decision-making, but face serious difficulties related to the mobilization of capital for investment. In the agri-food area, the challenges for the promotion of innovations are particularly serious, since it is a branch of activity that has as competitors in the internal market the large business groups, which tend to verticalize production, ranging from extensive production to large global marketing networks.

The ecological pressure on the agri-food area is intense and growing, as this segment has been required to adopt procedures compatible with the requirements of the main international agreements under the United Nations (UN), such as the Convention on Biological Diversity (CBD), the Paris Agreement on Climate Change (COP 21), and the 2030 Agenda for Sustainable Development, which implies, among other things, disconnecting the links of agricultural production with deforestation. Besides large nations and international organizations, the demand also comes from final consumers or intermediaries, who condition their purchases to guarantees that the production complies with ethical principles (no child or slave labor, no cruelty to animals) and socio-

environmental principles (respect for biodiversity, indigenous peoples and traditional populations, etc.). These requirements open for small enterprises, many in the family farming segment, a market niche that can be combined with other elements pointed out by Wilkinson (2003), such as market differentiation via specialization in superior quality products, "based, in practice and in theory, on the French model of building *"appéllations d'origine*" (WILKINSON, 2003, p. 75), associated with values and knowledge inherited by successive generations of artisanal producers in a given territory.

In Brazil, an important niche market, particularly for small enterprises, has been the agroecological production, particularly that of organics, which rejects the use of pesticides in farming, thus avoiding damage to the environment (soil and groundwater contamination), to the health of the rural worker and the final consumer. The conversion of agricultural production to agroecology is a process that implies new learning about specific techniques, not always accessible to agroecological enterprises. This technical transformation, which goes in the direction of greater ecological commitment, is considered an eco-innovation.

The questions that guide this paper can be expressed as follows: what is the potential for eco innovations in agroecological production in Brazil? What types of eco-innovations are most promising? Which states in the federation have the greatest eco-innovation potential in agroecological production? These questions point to the objective of this work, which is to identify and analyze the potential for adopting eco innovations in agro-ecological production in Brazil, by mapping the search for technological information on the part of users of the Brazilian Technical Response Service (SBRT) access platform, which gathers documents on questions asked by individuals and companies to SBRT and the technical answers given by the responding institutions that make up its knowledge network.

The platform also brings together technical dossiers prepared by members of the network, through analysis of the local scenario in which they operate and an understanding of the technological gaps on a given theme.

This article is organized as follows: after this introduction, section 2 analyzes the ecological issue and agroecology in the face of global challenges, particularly the climate emergency. Section 3 discusses eco-innovations and their importance in facing the environmental crisis, while section 4 details the methodological procedures of the research. Section 5 graphically presents the results obtained from the survey conducted on the SBRT platform. In the sixth section, there is the discussion of the results obtained, and then section 7 brings the final considerations of the work.

Environmental crisis and agroecology as one of the proposals to deal with

Humanity faces a number of extraordinary ecological and social challenges. To meet these challenges, it will be necessary to move forward in a transition in the way humanity has been accustomed to produce and consume until now. The degree of complexity involved in the challenges, configures a civilizational change, as Morin (2011) warns. The preliminary report on climate change and land use produced by the Intergovernmental Panel on Climate Change (IPCC, 2019) warned that it will be impossible to keep global temperatures at safe levels unless there is also a transformation in the way the world produces food. More than 1/3 of anthropogenic greenhouse gas (GHG) emissions come from food systems (UNEP, 2016; HENDERSON *et al.*, 2018). Agriculture, forestry, and other land uses produce nearly 1/4 of global GHG emissions. The impact of intensive agriculture-which has helped the world's population rise from 1.9 billion a century ago to 7.7 billion-has also increased soil erosion and reduced the amount of organic material in the soil, which is essential for cultivation (IPCC, 2019).

Agroecology was chosen in 2014 as the central theme of one of the most prestigious events of the Food and Agriculture Organization of the United Nations (FAO), with 2014 being called the International Year of Family Farming. This choice was made based on the realization that "solutions built within traditional paradigms will not be sufficient to overcome the complex situation generated by a combination of crises, and that changes are needed in food production, distribution, and consumption systems" (FAO, 2016, p. 208). The crises mentioned in this quote refer to the combination of environmental, social, economic, energy, and food factors. In addition to its strategic role in addressing these crises, agroecology plays an important role in strengthening community ties, bringing together producers and consumers who share the same set of cultural identities and local values.

In Brazil, the expansion of agribusiness to produce commodities is driving deforestation, replacing forests with pastures and the monoculture of soy, corn, etc. This process compromises the livelihoods of local communities, destroys biodiversity, and further increases GHG emissions from the carbon released by the destruction of vegetation, which contributes to Brazil increasing its participation in global warming (CARNEIRO FILHO, 2018). However, the advance of deforestation finds its limits in the Brazilian agricultural commodities market itself, since some countries, notably Europeans, are trying to put into practice the commitments to reduce GHG emissions assumed in the Paris Agreement in 2015. The prospect is that this deforestation will no longer be tolerated by Brazil's traditional importers. The destruction of the rainforest, which is "imported" indirectly, is not negligible, an example of which is the soybeans produced and sold by South America, especially Brazil. According to Weiss and Leip (2012), in 2010, the European Union imported the equivalent of 30 million tons of soybeans from Brazil and Argentina, of which, in a conservative calculation, 30% comes from the devastation of forests or the Cerrado[4].

As a contribution to reducing global CO2 emissions, the European Union plans to become autonomous by 2050 regarding the consumption of plant proteins, such as soy, thereby reducing the level of "deforestation imports" associated with the purchase of agricultural and livestock products, as well as its level of responsibility for the loss of biodiversity in tropical areas (POUX; AUBERT, 2018). This calls into question the Brazilian agricultural model and its ability to make a full transition to a type of agri-food production compatible with the commitments made by the country in international forums.

The commitment to ecological issues and the concern with food safety are also key issues for a segment of final consumers, who increasingly prefer the consumption of products originating from agroecology, such as organics, and from fair trade, because they want to be more certain about the origin of the products. In these cases, obtaining a certificate, or seal, works as a "passport" for producers to gain access to this market niche. Organic products have the commitment to respect the environment through a production free of chemicals, fertilizers, pesticides, and the like (BAYRAMOGLU *et al*., 2018). In addition, it eliminates the risks that these substances pose to the health of consumers and farmers. Organic farming is defined by the European Commission as an agricultural method that "adheres to strict standards with regard to the use of chemicals, not admitting the use of synthetic fertilizers and pesticides and complies with strict rules on animal medicines (EUROPEAN COMMISSION, 2019, p. 5).

Eco-innovation

The concept of eco-innovation includes the socio-environmental dimension of innovation, in addition to the economic one, aiming to overcome the challenge of the necessary ecological transition. According to the European Commission - EC (2012), eco-innovation is any innovation that results in significant progress towards sustainable development goals, reducing the impacts of our production modes on the environment, increasing the resilience of nature to environmental pressures, or achieving a more efficient and responsible use of natural resources (EUROPEAN COMMISSION, 2012, p. 1). Among the classic definitions, besides the EC, we also have that of Kemp and Pearson (2008), who adopt a conception of eco-innovation closer to the neo-Schumpeterian literature, referring to:

> production, assimilation or exploitation of a product, production process, service or management or business method that is new to the organization (development or adoption) and that results, over its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resource use (including energy use) compared to relevant alternatives (KEMP; PEARSON, 2008, p. 7).

In addition to these definitions of eco-innovation, others are found in the literature, relating environmental concerns to innovation, however, what is common is that eco-innovations seek to rationalize the use of natural resources and reduce environmental impacts and not only increase

[4] The largest savanna region in South America.

competitiveness, as in the case of conventional innovations. In the context of organizations, the issue is challenging, because it is in their nature to aim for competitiveness, which explains that the largest source of eco-innovations are government regulations, which impose technological changes from standards and technical instructions that affect a business segment equally.

The topic of eco-innovation has been gaining notoriety in academic, governmental, and industrial areas (HOJNIK; RYZZIER, 2016), by introducing the socio-environmental variable into a production equation that was merely economic. The development of eco-innovations permeates all sectors of the economy, including the agricultural segment, where innovations are mainly focused on the recovery, conservation, and adoption of new practices aligned with sustainability and food security. The periodic statistics of the Organization for Economic Cooperation and Development (OECD) on innovation show that companies in the manufacturing industry lead the ranking, especially those in information technology and communication, and pharmaceuticals. It also highlights that large companies tend to be more innovative (OECD, 2018). Statistics on eco-innovation in the agricultural segment are not yet systematic, but everything leads us to believe that this trend of large companies leading the ranking will remain.

Family farmers and other small agroecological producers have a relevant participation in the generation of jobs and income in the country, which justifies strengthening the process of eco-innovation in these enterprises. Investing in eco-innovations implies contributing to the process of learning and training in various subjects, which will require the availability of information and financial support as well. In this sense, the SBRT can be an important instrument for agroecology enterprises to have access to relevant technological information to foster eco-innovation.

Methodological Procedures

The present article is based on highly exploratory research, a recommended format when one wants to get to know phenomena that have been little investigated in the literature, such as the knowledge of eco-innovations in small businesses[5]. It was decided to adopt the quantitative research methodology, since a large amount of data from the SBRT platform was collected and treated, aiming to identify users linked to agroecological practices that seek technological information to perform some kind of innovation or solve low complexity technological problems. From there, a set of elementary statistical analyses was conducted aiming to determine the pattern of the data and extract meaning that allowed it to identify and analyze the trends of eco innovations in the agroecological area.

Considering the questions posed in the introduction of this paper, namely: What is the potential for Eco innovations in agroecological production? What kind of eco-innovations are promising? Which states have the greatest potential for eco-innovations in agro-ecological production?

1) Preliminary survey on the characteristics of the data source that guides the research, the SBRT platform;
2) Identification of the profile of SBRT users;
3) Formulation of a search strategy in the SBRT platform, aiming to retrieve technical answers and technical dossiers by responding institution and region of coverage, corresponding to the agricultural segment and related to eco-innovation;
4) Tabulation of the results obtained;
5) Discussion of the results obtained vis-à-vis the theoretical framework presented here.

The following lists the three initial procedures and then the two sections, Results and Discussion, which complete the research procedures.

Preliminary survey of the data source characteristics, the SBRT platform

[5] Small businesses are enterprises with annual gross revenues of up to R$4.8 million and are divided into subgroups (Micro-individual entrepreneurs - MEI, Micro-companies - ME, Small-sized Enterprises - EPP, rural producers, and artisans) according to their annual revenues or number of hired employees.

The Brazilian Technical Response Service (SBRT) was idealized by the current Ministry of Science, Technology and Innovations (MCTI) and launched in 2004. Together with the Brazilian Institute for Information in Science and Technology (IBICT), which provides the technological infrastructure and currently coordinates a service contract for capturing demands for the Portal of the Brazilian Support Service for Micro and Small Enterprises (SEBRAE), SBRT also integrates a decentralized network of nine institutions[6] that provide technological information in various areas of knowledge, located in different regions of the country, each with its respective scope of activity and with institutional support from the MCTI itself. It is a public and free online platform for access to technological information, made available through Technical Responses (RT)[7] and Technical Dossiers [8].

The content of these technical documents is classified by the responding institutions themselves in three ways in their set of metadata: the first in the "subject" field, based on the symbology contained in the National Classification of Economic Activities (CNAE) of the Brazilian Institute of Geography and Statistics (IBGE); the second in the "summary" field, based on the user's request after refining the demand when necessary; and the third in the "keywords" field, based on the controlled vocabulary for standardizing the terminology used in indexing. With these technological information products, the objective of the Service is to intermediate the knowledge generated in Science, Technology and Innovation (ST&I) institutions with users who need this knowledge in their activities, being closely related to the process of innovations and eco-innovations.

Identifying the SBRT user profile

Currently[9], the SBRT platform has almost 128,000 user registrations, including formal (registered as Legal Entities) and informal enterprises, as well as potential entrepreneurs (the latter two registered as Individuals). It also has a total of 33,598 technical documents, including 33,134 technical replies and 464 technical dossiers, with more than 1.5 million direct accesses[10] direct accesses in its 15 years of operation. The identification of users interested in information for agroecological production followed the following steps:

1) Mapping of SBRT users according to their Federation Unit (UF);
2) Mapping of SBRT users as to their economic activity, based on the National Classification of Economic Activities (CNAE) of the Brazilian Institute of Geography and Statistics (IBGE); and
3) Identification of the number of accesses by users to the total number of technical documents stored in the SBRT content base, by CNAE.

Formulation of search strategy in SBRT

In the search strategy for the technical responses and technical dossiers stored on the SBRT platform, referring to the agriculture segment, the equivalent of 2068 technical documents, we used the keywords that are part of the repertoire of terms used for indexing such documents by their responding institutions, considering those related to the concept of eco-innovation presented above:

- Sustainability;
- Sustainable development;

[6] Euvaldo Lodi Institute (IEL-BA); Bahia Regional Center; Euvaldo Lodi Institute; Minas Gerais Regional Center (IEL-MG); Paraná Institute of Technology (TECPAR); Rio de Janeiro Technology Network (REDETEC); National Service for Industrial Learning of Amazonas (SENAI-AM); National Service of Industrial Learning of Rio Grande do Sul (SENAI-RS); University of Brasilia, through the Center for Support to Technological Development (UnB/CDT); Paulista State University Júlio de Mesquita Filho (UNESP/SIRT); and University of São Paulo (USP/DT).

[7] Document that contains technical information to support the punctual solution of problems in specific products and/or production processes. Its elaboration depends on a user's demand for information and is created as long as there is no other RT in the database that meets it (BRAGA, T. E. N *et al*, 2019, p. 10).

[8] Document whose purpose is to disseminate information with greater added value, which comprehensively addresses various aspects of technological nature on a given topic, without the need for the user to explain such demand (BRAGA, T. E. N *et al*, 2019, p. 10).

[9] Data collected on October 19, 2019.

[10] Currently, to send a demand or access the technical responses and technical dossiers stored in the SBRT base, it is necessary to register in the system and be logged in.

- Environment.

The retrieval of the technical documents (RT and DT) resulted in a set of technological information demanded by the users.

Results

The main results obtained in the survey conducted on the Brazilian Technical Response Service platform are detailed below.

Distribution of SBRT users by Federation Unit and activity sector

SBRT's platform has almost 128 thousand registered users. As shown in Table 1, most are located in São Paulo, Minas Gerais, Rio Grande do Sul, Paraná, Rio de Janeiro, Bahia, Santa Catarina, Distrito Federal and Goiás, in order of greatest representation. The nine states with the largest number of users account for more than half (67%) of the small businesses registered on the platform.

Table 1: Percentages of users registered in SBRT, by Federal State.

Federation Unit	%
SP	27%
MG	10%
RS	10%
PR	9%
RJ	8%
BA	5%
SC	5%
DF	3%
GO	3%
Others	23%
Total	100%

Source: Elaborated by the authors (2020).

Table 2 presents the economic activities of the users registered in the SBRT platform, where it can be seen that the sectors of Agriculture, Livestock, Forestry, Fishing, and Aquaculture; and Manufacturing together account for 43% of the total users.

Table 2: Percentages of users registered in SBRT, by CNAE

CNAE	%
Agriculture, Livestock, Forestry, Fishing and Aquaculture	23%
Transformation Industries	20%
Professional, Scientific, and Technical Activities	11%
Accommodation and Food	10%
Commerce; Repair of Motor Vehicles and Motorcycles	5%
Education	5%
Other Service Activities	4%
Others	22%
Total	100%

Source: Elaborated by the authors (2020).

Considering the number of accesses to technical answers and technical dossiers, the sector that most uses the service is the Manufacturing Industry sector, followed by the Agriculture, Livestock, Forestry, Fishing and Aquaculture sector, as shown in Table 3. These sectors are, therefore, the ones with the largest participation in SBRT, both by number of registered users (43%) and by number of accesses to technical documents (83%).

Table 3: Percentages of access to technical documents, by CNAE.

CNAE	%
Transformation Industries	70%
Agriculture, Livestock, Forestry, Research and Aquaculture	13%
Water, Sewage, Waste Management and Decontamination Activities	4%
International Organizations and Other Extraterritorial Institutions	3%
Professional, Scientific and Technical Activities	2%
Construction	2%
Trade; Repair of Motor Vehicles and Motorcycles	1%
Electricity and Gas	1%
Administrative Activities and Complementary Services	1%
Other Service Activities	1%
Others	2%
Total	100%

Source: Elaborated by the authors (2020).

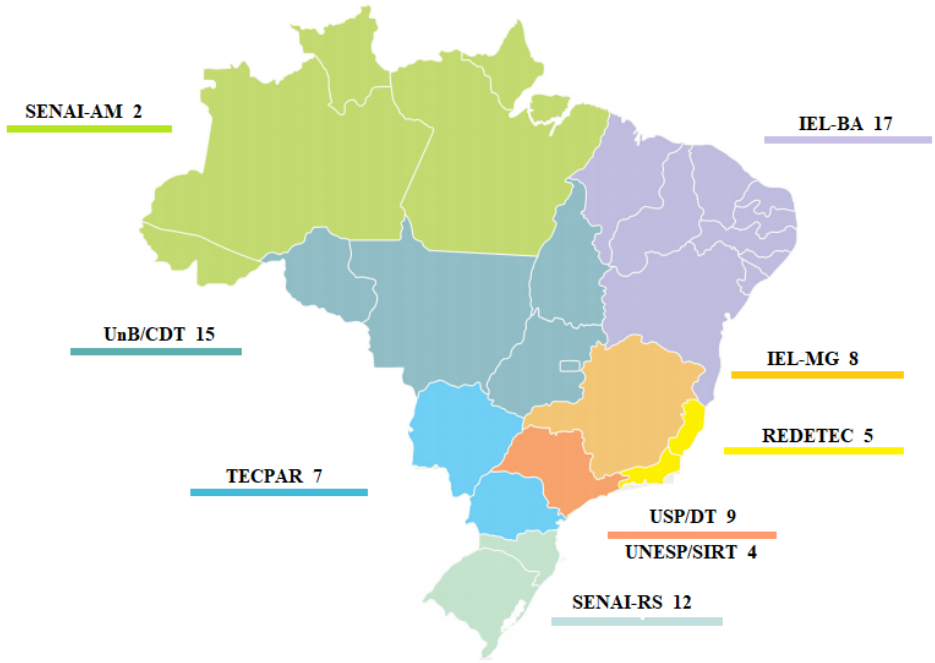
SBRT's technological information users

Through the survey on the SBRT platform, it was found that the agriculture segment, alone, gathers a total of 2068 technical documents in its collection, being 1953 technical responses and 115 technical dossiers.

Based on Figure 1, from the application of the search terms (sustainability, sustainable development and environment), 79 responses and technical dossiers were retrieved, representing 3.8% of the document sample. Of the nine member institutions of the SBRT network, eight have already responded to user demands (with the exception of UNESP/SIRT), whose contents are indexed with the keywords used for retrieval, totaling 57 RTs. Regarding the technical dossiers published, 22 are related to the theme of eco-innovation, having been prepared by seven institutions (with the exception of SENAI-RS and SENAIS-AM).

As for the total number of documents retrieved with the theme of eco-innovation, the IEL-BA is the institution with the largest number of publications. This quantity may be related to the high diversity of cultivation and the strength of family or subsistence agriculture, which plays an important role in the northeastern states that cover its service region.

Figure 1: Number of technical documents retrieved by responding institution and region of coverage.



Source: Elaborated by the authors (2020).

Table 4 shows that, although the search has retrieved a low number of answers and technical dossiers indexed with the keywords used in the search, these documents were accessed by 1628 users from the different federative units of the country, in a total of 3971 unique accesses to the RT and DT referring to agriculture, equivalent to 41% of the total accesses to the entire collection of the segment. The state of São Paulo has the largest number of accesses, followed by Minas Gerais, Paraná/Rio Grande do Sul, Rio de Janeiro, Bahia, Santa Catarina, and Distrito Federal.

Table 4: Distribution of accesses to technical documents, by Federal State.

Federation Unit	Quantity	%
SP	388	24%
MG	167	10%
PR	135	8%
RS	124	8%
RJ	115	7%
BA	112	7%
SC	70	4%
DF	67	4%
Others	450	28%
Total	1.628	100%

Source: Elaborated by the authors (2020).

Figure 2 presents the categorization and description of the contents of the 79 technical documents retrieved with the keywords used in the search. It is observed that most of the documents are related to organic agriculture (38%) presenting information on principles and practices of organic cultivation, production and fertilization applied to banana, sugarcane, and tomato plantations, among others. 24% of the technical documents were categorized as "alternative agriculture practices", namely: intercropping, permaculture, plasticulture, aquaponics, hydroponics, agroecology, biodynamic agriculture and integrated production, i.e., they refer to alternative cultivation techniques as opposed to conventional models, based on the intensive use of agrochemicals. Another 15% of the agriculture segment collection addresses "soil conservation techniques and recovery of degraded areas". 8% of the documents present information about "current legislation for organic products and their certification process". 6% of the documents deal with "ways of cultivating and processing derivatives of the product", namely licuri, sisal, baru and coconut. 5% of the technical documents explain "techniques for the treatment of effluents/residues resulting from the production process", such as manioc and mushroom. And, finally, 4% of the sample discusses "possible environmental impacts resulting from agricultural activities".

Table 1: Categorization and content description of the retrieved technical documents.

Organic Agriculture	38%
Alternative agriculture practices	24%
Sustainable system of conservation and recovery	15%
Legislation and certification of organic products	8%
Cultivation and processing of by-products	6%
Treatment of effluents/residues resulting from the production process	5%
Environmental impacts resulting from agricultural activities	4%

Source: Elaborated by the authors (2020).

Figure 2 data show that, while only 4% of the sample portrays the possible environmental impacts resulting from agricultural activities, consisting basically of technical responses, that is, prepared on demand from users, 88%, among responses and technical dossiers, point out principles, techniques, and practices for mitigating these impacts, and another 8% show interest in product certification as a determinant for reaching new markets.

Discussion

This research allowed us to identify relevant elements for the improvement of knowledge about the potential of eco-innovations in small agro-ecological producers in Brazil.

Of the registered users in the SBRT platform, 23% are classified as Agriculture, Livestock, Forestry, Fishing and Aquaculture, and the Transformation Industries sector is in second place with 20% of the registered users. However, the sector that uses SBRT the most is the transformation industries, with 70% of accesses to technical documents, and the agriculture, livestock, forestry, fishing and aquaculture sector holds 13% of accesses.

First, it is important to characterize some specificities of the SBRT users. The platform has almost 128 thousand registered users, most of them located in the states of São Paulo, Minas Gerais, Rio Grande do Sul, Paraná and Rio de Janeiro. When searching for the number of accesses to the technical documents by Agriculture segment, these same five states (in a different order) are the ones with the highest number of accesses to the technical documents. These are also the five wealthiest states in the federation, concentrating 64.3% of the national Gross Domestic Product (GDP) in the year 2017 (IBGE, 2019). Apart from Rio de Janeiro, the other four are states that concentrate most of the country's agricultural and livestock production. Rio de Janeiro does not have a large area of agricultural cultivation, nor is the value of production expressive, compared to the other UF. Although it maintains the traditional culture of sugar cane, the state still has a number of small rural producers, especially of horticultural products. It is noteworthy that, in Rio de Janeiro, only 32% of the rural establishments declare that they use pesticides, while the figure for Brazil is a little more than 50% of the establishments.

Considering that the SBRT information is geared towards meeting the technological needs of users and that it has the potential for eco-innovations, it is possible to assume that the enterprises and entrepreneurs registered on the Service's platform have adopted or are considering adopting eco-innovations in the broader concept, presented in the section on eco-innovations in this article. The reference to users' accesses by federal units also offers important clues about the dynamism of technological change, as well as pointing to possible productive agglomerations, which would need to be better investigated.

Another thing that calls attention to the results obtained is the low number of technical documents indexed with the keywords used as part of the search strategy. There are 79, in relation to the total of classified documents, specifically in agriculture, which represents only 3.8% of the total collection of the segment, with 41% of unique accesses in comparison to the general number of accesses to the entire collection of the agriculture segment. These results show that other themes overlap with the interest in the environmental theme on the part of users of the SBRT platform, because, as shown in the eco-innovations literature, the manufacturing industry leads the ranking of innovations and the same, possibly, happens with eco-innovations.

When one researches the theme of the technical documents retrieved in the SBRT platform with the terms "sustainability", "sustainable development" and "environment", one can see that they

are quite adherent to agroecology issues, which, in general, meet the demands of small producers. The survey showed that 38% of the technical documents are associated with organic agriculture - presenting information on principles and practices of organic cultivation, production and fertilization applied to banana, sugar cane and tomato plantations, among others -, while 24% of these documents were categorized as "alternative agriculture practices" - consortium farming, permaculture, plasticulture, aquaponics, hydroponics, agroecology, biodynamic agriculture, and integrated production. Thus, most of the answers (62%) are directed to agricultural reconversion, suggesting an interest in converting from conventional to organic agriculture or, perhaps, an interest in starting in the agricultural activity by already choosing the agroecological option. This result is compatible with the trend pointed out in this article, in the section on the environmental crisis and agroecology, where this mode of farming is in line with the necessary ecological transition.

Final Considerations

The work starts from the observation that agriculture is one of the economic segments most vulnerable to climate change because the climate, along with the soil, are key factors in the conditions of agricultural production and productivity.

The results show the types of eco-innovation that can be implemented in small businesses in the agricultural segment, users of the SBRT, based on access to technical documents, as well as the types of information needed for learning in eco-innovation in this business profile, which are largely related to organic/agroecological agriculture.

On the other hand, the fact that only 3.8% of the technical documents are related to "sustainability", "sustainable development" and "environment", with less than half of the unique accesses to the collection from the agriculture segment, reveals the low degree of contribution of SBRT to the thematic and the business profile studied, whose result may subsidize future strategies within the project. It also reveals the need for investment in strategies and public policies in a context of ecological transition management associated with the agri-food segment.

Given this, it is suggested an accurate assessment of the issue of eco-innovation in small agroecology businesses, from field research, as to the knowledge needs of the 1628 users who accessed the technical answers and/or technical dossiers retrieved for the development or adoption of eco-innovative practices, considering their conditioning factors for implementation.

This research followed up studies already done on SBRT (ARAÚJO; RANEFELD, 2006; RAMOS; CARVALHO; CUNHA, 2009) and updated the theme, especially regarding ecological issues in the face of the environmental crisis. It is also suggested for further research, based on the SBRT platform, the search for more information about the users of the service, in order to identify why they are interested in the information retrieved and its applications.

With this, we intend to contribute to future theoretical studies and other initiatives applied to small businesses in view of their engagement with the commitments made in the Paris Agreement and the 2030 Agenda.

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