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Research Article

AGTechs and the innovation ecosystem of the Espírito Santo

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Abstract

Objective: to identify the most relevant incentives available to agtechs - also known as agritechs or agrotechs; the challenges they face to reach the scalability phase; and the relationship of these challenges with possible limitations of the local innovation ecosystem**. Methodology/approach**: the data were collected through qualitative research and examined using the content analysis technique**. Main results**: (1) the entrepreneurs of the interviewed Agtechs identified different market demands and opportunities; (2) the agtechs relied mainly on support, through incubation and mentoring; (3) these nascent companies had greater difficulty in the prototyping stage, in the identification of resource sources, and the formation of a team, which indicates the need to expand support and offer ecosystem solutions in this direction, as well as to facilitate the access to investors; and (4) the Espírito Santo's innovation ecosystem still presents a series of challenges so that it can fully fulfill the role of encouraging, in a structured way, startups called agtechs**. Theoretical/methodological contributions**: the results obtained demonstrate the need for an entrepreneurial ecosystem to foster the development of agtechs and reflect the main difficulties faced by entrepreneurs of these nascent companies in the Brazilian state of Espírito Santo**. Relevance/originality**: the issues involved in the study comprise themes of central interest for a deeper understanding of the applied dynamics of entrepreneurial ecosystems and Agtechs in the context of the Espírito Santo.

Keywords: Agribusiness; Challenges; Opportunities; New business models.

Resumo

Objetivo: identificar os incentivos mais relevantes disponíveis para as agtechs – também conhecidas como agritechs ou agrotechs; os desafios por elas enfrentados para chegar à fase de escalabilidade; e a relação desses desafios com eventuais limitações do ecossistema de inovação local**. Metodologia/abordagem**: os dados foram coletados por meio de uma pesquisa qualitativa e examinados pela técnica de análise de conteúdo**. Principais resultados**: (1) os empreendedores das agtechs entrevistadas identificaram demandas e oportunidades diversas de mercado; (2) as agtechs contaram principalmente com suporte, por meio de incubação e mentoria; (3) essas empresas nascentes tiveram maior dificuldade na etapa de prototipagem, na identificação de fontes de recurso e na formação de equipe, o que indica a necessidade de ampliar o apoio e a oferta de soluções do ecossistema nessa direção, bem como de facilitar o acesso aos investidores; e (4) o ecossistema de inovação do Espírito Santo ainda apresenta uma série de desafios para cumprir plenamente o papel de incentivo, de maneira estruturada, às startups denominadas agtechs**. Contribuições teóricas/metodológicas**: os resultados obtidos demonstram a necessidade de haver um ecossistema empreendedor para fomentar o desenvolvimento das agtechs, e refletem as principais dificuldades dos empreendedores dessas empresas nascentes no estado brasileiro do Espírito Santo**. Relevância/originalidade**: as questões envolvidas no trabalho compreendem temas de interesse central para um mais profundo entendimento da dinâmica aplicada dos ecossistemas empreendedores e das agtechs, no contexto do Espírito Santo.

Palavras-chave: Agronegócio; Desafios; Oportunidades; Novos modelos de negócio.

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INTRODUCTION

The participation of agribusiness in the Brazilian Gross Domestic Product (GDP) has grown significantly in recent years. On average, from 2008 to 2018, this share corresponded to 20.9%. In 2019, GDP presented a positive variation of 3.8% concerning 2018, totaling R $ 1.55 trillion. The share of inputs for agriculture grew by 5.54%, that of agroindustry, by 4.99%, and that of agribusiness services, by 6.77%. On the other hand, the primary sector dropped 3.03% (Center for Advanced Studies on Applied Economics [Cepea], 2020).

The latest available data regarding the participation of agribusiness in Espírito Santo's GDP indicate a percentage of 30% (Secretaria de Desenvolvimento [Sedes], 2020). According to the 2017 Agricultural Census, the number of agricultural establishments, compared to 2006, grew by 28.03% in the state, totaling 108,010 establishments, while Brazil presented a 2% decrease (Brazilian Institute of Geography and Statistics [IBGE], 2019).

Despite this growth, agricultural activities around the world still have several challenges to be overcome, such as food waste, CO2 emissions, chemical residues and other types of production residues, droughts, shortages of labor, health issues and sugar consumption, disconnected supply chains, distribution inefficiencies, food safety, and traceability, efficiency and profitability, and unsustainable meat production (Agriculture and Agtech Investment Opportunities [AgFunder], 2019). In Brazil, the challenges are even greater. Besides these, we can mention increased productivity, technification, management, compliance with labor and environmental laws, tax system, family succession, education, marketing channels, among others.

The wide range of challenges that agricultural activities face is, on the other hand, an opportunity for new businesses that can, through technology, provide scalable improvements throughout the entire agribusiness production chain, filling the various gaps that exist today. In this context, we have observed the growth of startups focused on this sector.

According to the Brazilian Startups Association (2018), Agtechs are startups specialized in developing solutions for the agribusiness sector. The number of these startups jumped from 75 to 184 between the end of 2016 and the first half of 2018, according to the 2nd Agtech Startups Brasil Census (Mondin and Tomé, 2018), conducted by the Luiz de Queiroz College of Agriculture (Esalq) and by AgtechGarage.

The census shows that 75% of the Agtechs were created in 2015, 36% in 2017, characterizing companies in an early stage. It also shows that 31% of them did not receive any investment and that 38% received investments of angel capital, accelerators, or venture capital; however, without pointing out values.

The documents AgFunder AgriFood Tech Investing Report for the years 2018 and 2019 reveal investments of US$ 19.8 billion in 2019, against US$ 16.9 billion in 2018, in the so-called Agrifood Techs, which represents a growth of 17.15% in just one year. The United States ranks first in terms of investments: in 2019, there were US$ 8.7 billion (10% more than in 2018) in 653 deals (15.16% above 2018). Regarding Brazil, approximately US$ 204 million was contributed in 2019, US$ 24 million more than in 2018 (AgFunder, 2020). It is concluded, therefore, that, although Brazil is extremely relevant in the world agribusiness, its experience is still incipient regarding Agtechs, when compared to the amounts invested in the United States.

Despite the growing demand for Agtechs, the environment is not always favorable, or there are efficient and appropriate incentives for the development of this type of company: the executive report of the Global Entrepreneurship Monitor (GEM) project, cycle 2019, shows that the vast majority of new businesses they bring little innovation, as only 10% of early entrepreneurs claim that their products or services are or will be considered new by customers.

There are several entities, programs, and interinstitutional arrangements to stimulate the emergence of innovative businesses. The locations where these arrangements have been most successful, constituting "clusters", poles, or ecosystems of innovative companies, have been the object of study by countless academics, from which one seeks to replicate good practices to encourage the multiplication of these.

Poles with a large concentration of nascent agricultural technology companies can be called "agtech ecosystems". An example is the municipality of Piracicaba, known as Agtech Valley, which has become an important center for the generation of agricultural knowledge and technology in Brazil, bringing together complementary initiatives and propelling innovative businesses, such as incubation, acceleration, hubs, and coworking (Dias et al., 2019).

Research related to the innovation environment in the state of Espírito Santo has no specific focus on agribusiness. In the current context of lack of information about the innovation ecosystem in this state and its contributions to the development of so-called Agtechs, the main objective of this paper is to identify the most relevant incentives available to these startups in the Espírito Santo innovation ecosystem, as well as the challenges they face to reach the scalability phase.

For the development of this study, the paper is divided into five sections. After this brief introduction on the importance of agribusiness for the Brazilian economy and the relevance of technology-based startups for agribusiness (Agtechs), the second section presents a literature review on startups, Agtechs, and policies for Science, Technology, and Innovation (ST&I) for these nascent companies and about innovation ecosystems. The third section presents the methodology used for the execution of the article; later, the results and discussions with the main findings of the article are presented and ends with the conclusion.

THEORETICAL FRAMEWORK

This section presents the foundations on which the study presented in this paper was based.

Startups

The emergence of the term startup dates to the early 1990s and has triggered the growth of internet adoption, the so-called "internet bubble" (Feld, 2020). Its conceptualization presents a wide range of definitions in the literature, depending on the prism that is being evidenced. Prisms range from organizational approaches to those aimed at the market.

According to Roure and Keely (1990), a startup is a nascent, technology-based firm that has as a foundation for its strategic planning technological advantages over its competitors. Corroborating this idea, Bacher and Guild (1996) affirm that startups can be conceptualized as companies that commercialize technologies, highly innovative, with the objective of achieving competitive advantage.

According to Ries (2011), the startup can be understood as the agglutination of organizations created to develop new

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products or services in the face of uncertain environments. For Blank and Dorf (2012), a startup is a transitive organization whose objective is to define a business model that has scalability and continuity. According to Nardes and Miranda (2014), startups are new ventures with a business model yet to be validated, which is located in a market with many hidden variables.

Like the startup concept, the demarcation of the development stages of this type of company does not have an academic consensus. The conceptual indicators of each stage and their names are subjective (Silva et al, 2016), and the choice for one demarcation or another depends on the need for each actor involved in the innovation ecosystem (Gonzaga et al., 2020), whose roles will be addressed in topic 2.4.

For Oleksandr et al. (2018), the life cycle of a startup consists of six stages (seed, startup, early-stage, early growth, expansion, mezzanine, and exit), which are marked by the investment risks at each moment. Nikiforova (2018) determines four stages in the development of a startup (concept, testing, working out, and launch), which vary according to the level of implementation of marketing activities.

In turn, Sebrae (2020b), according to one of its initiatives to encourage innovative entrepreneurship, subdivides the life cycle of a startup into four stages (curiosity, ideation, operation, and traction), each demarcated by the degree of maturity of the business model.

The development cycle of a startup can also be defined by the combination of Lean Startup and Design Science methodologies. In this model, a startup goes through the following steps: ideation, prototyping, pivoting/testing, and scalability (Furr and Dyer, 2014).

Agtechs

The agricultural sector's need for more technological services or products resulted in the creation of startups focused on agribusiness. These organizations were called Agtechs or agritechs.

According to Krishnan et al. (2020), Agtechs have the potential to transform the importance of each pillar of production factors (labor, capital, and land), bringing changes in productivity and agricultural production. Mashelkar (2018), in turn, believes that Agtechs can increase the efficiency of agribusiness supply chains, reducing storage losses, implementing customized agricultural mechanization, and allowing connectivity in the agricultural market. For Sharma and Mathur (2019), Agtechs are pioneering and emerging companies in agribusiness that strive to modify the traditional forms of agricultural systems, inserting them in a technological environment. Dutia (2014), on the other hand, believes that these companies have as a driver of the business model the gain in productivity with the reduction of socio-environmental costs.

Conceptually, Agtechs can then be referred to as nascent companies that aim, with the aid of incremental or radical innovations, to develop all the links involved in the production and delivery of an agricultural product, from its planting to arrival at the final consumer (Mikhailov et al., 2018), and which can therefore act at various stages of the chain.

Dias et al., (2019), in their work on the mapping of the main Brazilian Agtechs, in partnership with the Brazilian Agricultural Research Corporation (Embrapa), SP Ventures, and Homo Ludens, identified that 18% of Brazilian Agtechs provided services for the first link of the agribusiness chain ("before the farm"), 35%, for the second link ("inside the farm") and 47%, for the "after farm" link.

In general, Brazilian Agtechs have trained entrepreneurs, disruptive ideas, and potential economic impact (Dias et al., 2019). However, the majority of partners have little (30%), medium (17%), or intermediate (24%) experience as an entrepreneur (Mondin and Tomé, 2018).

ST&I policies for startups

According to Müller and Rammer (2012), since 1979, it has been shown that the majority of new jobs are created in small and medium-sized companies, which is why several countries have started to focus their policies on supporting and promoting startups. This strategy was also driven by the experience of Silicon Valley, where the high level of activity of these innovative companies goes hand in hand with economic progress. Initiatives in this direction have been observed in the United States, Israel, Chile, Colombia, South Korea, Singapore, India, the European Union, Hungary, Ireland, Lithuania, Austria, Portugal, among others (Roncaratti, 2017).

Several Latin American countries have programs for startups. In Brazil, a new Legal Framework of ST&I and for innovation support was developed, embodied in the so-called Law of Innovation and Law of Good, and the recent Code of Science and Technology (Salerno, 2017).

The Ministry of Science, Technology, Innovation and Communications (MCTIC) is the main driver of policies with a specific focus on encouraging startups, with an increasing number of programs offered through partnerships, such as Centelha, Nexos, Startup Brasil, Inovativa Brazil, among others (Startup Point, 2020). It is worth mentioning the initiatives of the Brazilian Micro and Small Business Support Service (Sebrae), specific for support Agtechs, in some states of the country, such as StartupRS Agritech, in the Rio Grande do Sul (StartupRS, 2020).

It is also expected the approval of the Legal Framework for Startups (Proposal for Complementary Law Project PL146/2019), which includes measures to facilitate the creation of technology companies, give investors more legal certainty, create new remuneration models and hire people, as well as institute the "simplified corporation" corporate model, to bring competitiveness gains to Brazilian startups.

Also noteworthy is the creation, in 2019, of the National Committee of Initiatives to Support Startups, with the representation of ten bodies and entities, to articulate the various actions of the Executive Branch aimed at these companies. Also noteworthy is the creation, in 2019, of the National Committee of Initiatives to Support Startups, with the representation of ten bodies and entities, to articulate the various actions of the Executive Branch aimed at these companies.

Innovation ecosystems

The term innovation ecosystem has been gaining more and more space in the literature on strategy, innovation, and entrepreneurship, having been used in different ways and meanings, sometimes in the same context of the business ecosystem and entrepreneurial ecosystem. However, according to Gomes et al., (2018), the business or entrepreneur ecosystem would be more related to capturing value, while the concept of innovation ecosystem proposes the co-creation

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of value. These scholars also identified that the concept of the innovation ecosystem is often used in a sense close to the idea of a "national innovation system", proposed by the so-called neo-Schumpeterians or evolutionary economists, such as Lundvall, Nelson, Freeman, and several others (Gomes et al., (2018)).

For Russell and Smorodinskaya (2018), business networks with greater complexity in the patterns of interaction can generate greater synergy in the innovation. Thus, innovation ecosystems are generated by networks that have moved from cooperation to collaboration between agents. Innovation ecosystems that enable continuous innovation, such as innovation clusters, have a more complex triple-helix collaboration pattern. A continuous realignment of synergistic relationships between people, knowledge, and resources is necessary for the vitality of the ecosystem. And the ability to respond to internal changes and external forces makes co-creation a vital force in a dynamic ecosystem of innovation.

The Massachusetts Institute of Technology (MIT) proposes the concept of "innovation-oriented entrepreneurship" as a system in which a given array of actors leads to comparative advantage and impact (with different degrees) on an ecosystem (Sebrae, 2020a).

In this context, for startups to thrive, it is necessary that multiple actors in the entrepreneurial ecosystem shape institutions and provide resources, whatever they are (Van Weele et al., 2018, as cited in Sebrae, 2020a, p. 11): a) Talents - individuals with high human capital, who act as founders or professionals in startups; b) Domestic and foreign markets - consumers and companies that act as customers; c) Financial capital - provided by private investors or public development agencies, making it possible to obtain resources for the formation and growth of startups; d) Support - support to startups regarding specialized knowledge, through mentors, lawyers, accountants, consultants, incubators and accelerators; e) Universities - responsible for providing human capital (professors and consultants) for start-up companies, for technological opportunities and for promoting a culture of innovation and entrepreneurship; f) Physical infrastructure - office space, telecommunications facilities and transportation infrastructure.

The elements that make up an innovation ecosystem are shown in Figure 1.

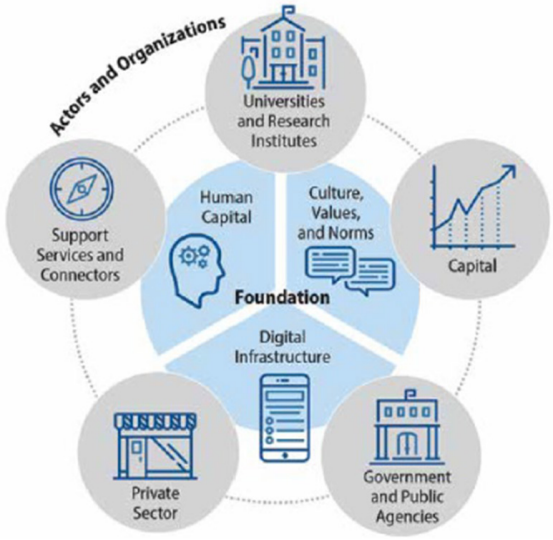

Fig. 01
Components of an innovation ecosystem
Source: Lawrence, Hogan e Brown (2019, apud Sebrae, 2020a, p. 13).

Ecosystem actors have different roles, decision-making logic, and behaviors, which strongly affects the growth and decline of the ecosystem (Tsujimotoa et al., 2018). Dedehayir et al. (2018) identified eleven different roles of these actors and grouped them into four key roles, placing them even in a temporal dimension throughout the development of the ecosystem, but especially at the stage of its birth. They are leadership roles (leader and dominator); direct roles of value creation (supplier, assembler, supplier of complementarities, user); support roles for value creation (specialist and champion), and ecosystem entrepreneurship roles (entrepreneur, sponsor, regulator). This characterization demonstrates that each actor exerts a certain type of influence in the innovation environment. And the intelligent development of an innovation ecosystem is based precisely on a deep understanding of the dynamics of the agents, relationships, forces, and results among/within the cultural, political, economic, and social subsystems (Grumadaite and Jucevicius, 2014).

As relevant as the connection of ecosystem actors in formal and informal networks is the existence of an institutional environment that favors the development of startups (Stam, 2015, as cited in Sebrae, 2020a, p. 13), with the creation, by governments, of regulations to stimulate new companies, such as subsidies or incentives to support Research and Development (R&D) collaboration between startups and universities. In parallel, the culture of the ecosystem should encourage entrepreneurship as a career, making risk-taking socially accepted and celebrating the success of local startups (Sebrae, 2020a).

The works of Spinosa et al. (2015), and Russell and Smorodinskaya (2018) present recommendations for the success or survival of innovation ecosystems. The most recent one brings practical approaches to the "orchestration" of these ecosystems, among which we highlight: increasing the number of nodes in the network, promote feedback mechanisms, quickly remove communication gaps, cultivating a shared vision of interdependencies, and collective resources. And the first affirms the importance of policies converging urban planning and the culture of innovation (knowledge-based cities). Therefore, the next topic will address national and international Science, Technology, and Innovation (ST&I) policies for nascent companies.

METHODOLOGY

For the development of this study, a qualitative research methodology was used to gather information from the actors/influencers of the Espírito Santo innovation ecosystem and on the entrepreneurs of the main Agtechs in the state. The research was conducted in Vitória, Espírito Santo (ES), but reached residents of other municipalities in the state.

In qualitative research, the researcher seeks to know opinions and attitudes to describe situations. The questions to be investigated are not established through the operationalization of variables, but they are previously formulated to study complex phenomena in a natural context (Meirinhos and Osório, 2010).

The final purpose of the paper followed Yin (2005) guidelines for testing the initial hypothesis. The initial hypothesis (H1) tested was: if, on the one hand, it is evident that there is a demand for Agtechs in the state of ES, on the other, the environment may not be the most favorable or fail to provide adequate or sufficient stimuli. To investigate this issue, the main incentives obtained by Agtechs in the Espírito Santo innovation ecosystem were recorded, as well as the challenges they face to reach the scalability phase.

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As a primary source of data, two different questionnaires were used, following the guidelines of Gray (2012), one addressed to the main influencers of the entrepreneurial ecosystem of Espírito Santo, and the other addressed to some Agtechs established in this state. As it involves interaction with people, the study was submitted to the Ethics Committee for Research with Human Beings at the University of Vila Velha (CEP-UVV) and registered at Plataforma Brasil under the number CAAE 18263619.0.0000.5064, being approved.

The interviews were conducted electronically, in order to contemplate the largest number of actors possible and to explore different visions regarding the concept of the innovation ecosystem. The data were examined qualitatively, using the technique of content analysis (Bardin, 2008).

Regarding the ecosystem, one of the focuses of the work was focused on the entities and other actors involved in the Capixaba Mobilization for Innovation (MCI). Created in August 2018, at the initiative of the Federation of Industries of Espírito Santo (Findes), MCI brings together: companies (ArcelorMittal, Vale, Fibria); entities in the state's productive sector; the Findes System - Social Service of Industry (Sesi), the National Service of Industrial Learning (Senai), and the Euvaldo Lodi Institute (IEL); the academy - the Federal Institute of Education, Science and Technology of Espírito Santo (Ifes), the Federal University of Espírito Santo (Ufes), and the Vila Velha University (UVV); and the State Government, besides other related public and private organizations. MCI proposes to organize the state's ecosystem, articulating and aligning interests, directing, and driving the various existing innovation actions, with a view to making the innovative business environment increasingly stronger and more structured (Findes, 2019).

Besides representatives working at MCI, representatives of other entities related to agribusiness and who are not part of that forum, such as the State Secretariat of Agriculture, Supply, Aquaculture, and Fisheries (Seag), the Capixaba Institute for Research, Technical Assistance, and Rural Extension (Incaper), the National Rural Learning Service (Senar), the Ministry of Agriculture, Livestock and Food Supply (Mapa), the Federation of Agriculture of the State of Espírito Santo (Faes), and also investors responded to the survey. In all, there were 27 interviews with these actors and influencers of the ecosystem, which constituted Group 1.

Agtechs were identified through surveys carried out with entities that operate in the innovation movements, such as incubators, institutions that support innovation, and other forms of research. In all, seven agtech entrepreneurs responded to the survey, constituting Group 2. Adding the two groups, there are a total of 34 respondents.

RESULTS AND DISCUSSION

The results presented below are separated according to the audience interviewed, considering the approach to two groups with different questionnaires.

Group 1
Actors/influencers of the innovation ecosystem of the Espírito Santo

The first group characterized here is made up of the influencers of the innovation ecosystem of the Espírito Santo. The research sought to capture the perceptions of actors with different roles to obtain a representative and balanced result. The questionnaire was divided into four blocks.

The first block featured the characterization of the actors involved in the innovation ecosystem. Most are over 50 years old (40.7%), are male (77.8%) and belong to the sectors: academia (32.1%); services (25%); government (21.4%); agribusiness (21.4%); non-profit institutions (17.9%); and industry (14.8%). The last question admitted more than one alternative. This descriptive profile has similarities with the characterization of influencers referred to in the executive report of the Global Entrepreneurship Monitor project, for Brazil, in 2019 (GEM, 2019), which demonstrates that the actors involved in this research represent part of the Brazilian reality.

The second block addressed the characterization of the ecosystem, concerning its strengths and weaknesses, according to the view of the actors themselves. The collection of this information allows the characterization of the Espírito Santo ecosystem and can contribute to a better understanding of the challenges to be overcome in this context. The absolute frequency and the percentage of weaknesses or deficiencies listed by the actors participating in the innovation ecosystem of the Espírito Santo are shown in Table 1. More than one option was possible as an answer.

Regarding the weaknesses, 92.6% of the interviewees identified that the "Lack of interconnection between the actors" constitutes the main deficiency of the local ecosystem, followed by the "Lack of structured information/communication", pointed out by 50% of the respondents. This situation leads to the development of practical actions, since, according to Andion et al. (2020), Bittencourt and Figueiró (2019), and Gomes et al. (2018), having an innovation ecosystem with interconnection, interrelation and communicability is essential for creating value for all actors involved in the ecosystem, as well as for making this ecosystem more mature and efficient.

Deficiencies/weaknesses	F	%
Lack of interconnection between the actors (entities, people, companies)	26	92
Lack of structured information/communication	14	50
Lack of an integrated solution offering	12	42,9
Absence of a common platform	12	42,9
Lack of a higher impact state innovation program	11	39,3
Leadership is not aggregating/does not converge interests in a balanced way	10	35,7
Lack of engagement of representations	9	32,1
Low interaction	9	32,1
Lack of human capital	7	25
Imbalance in representations	6	21,4
Others	5	17,9

Tab. 01
Deficiencies/weaknesses of the innovation ecosystem of the Espírito Santo
Source: Research data (2020).

Regarding the strengths, Table 2 presents a summary of the riteria raised by the actors involved in the research.

The "Availability of human capital" was the main strength in the opinion of the interviewees, with 60.7% of the responses. The second most mentioned alternative was "There are relevant partners acting together" (57.1%), and in third place, the "Availability of financial resources" (53.6%) stood out. Such characteristics are essential because, according to Heaton et al. (2019), human capital and partnerships are some of the main

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components to support an innovation ecosystem, since it is through them that there are advantages created competitive (Oksanen and Hautamäki, 2015) arising from the plurality of ideas (Estrin, 2009).

Strengths	F	%
There is defined leadership	3	10,7
The actors have well-defined roles, with coordinated interactions	0	0
There are relevant partners acting together	16	57,1
There are strategic alliances even from different segments	10	35,7
There is real collaboration for the creation of value (co-creation of value)	5	17,9
There are strong links among the actors, for the collective evolution	7	25
There is a balance between the actors	0	0
Availability of human capital	17	60,7
Availability of financial resources	15	53,6
Engagement among entities and stakeholders	2	7,1
Others	0	0

Tab. 02
Strengths of the innovation ecosystem of the Espírito Santo
Source: Research data (2020).

The third block raised the threats and opportunities for the innovation ecosystem of the Espírito Santo. The questions accepted more than one alternative. The main threats mentioned are shown in Table 4.

From the threats, the "Evasion of talent (startups and potential startups/Agtechs) to other more structured poles" was the item most cited by respondents, with 92% of responses, followed by the "Absence of structuring and integrating state public policies", cited by 60%.

By retaining talent in a region, the innovation ecosystem enables the technologies developed to be the driving forces for technological and economic growth in that location (Russel and Smorodinskaya, 2018; Fernández-Fernández et al., 2015). Consequently, talent evasion is a risk to the efficiency of the ecosystem.

Threats	F	%
Evasion of talent (startups and potential startups/Agtechs) to other more structured poles	23	92
Absence of structuring and integrating state public policies	15	60
Absence of national public policies with state impact	9	36
The national and international financial crisis	7	28
Others	5	20

Tab. 03
Threats to the innovation ecosystem of the Espírito Santo
Source: Research data (2020).

Regarding a public policies, Brazilian productivity has not evolved since the late 1970s, despite recent efforts to implement a set of relatively broad innovation policies (Negri et al., 2020) and compatible with developed countries. Such a finding leads one to believe that such policies should be rethought to contribute effectively to the country's economic and social development (Cassiolato and Lastres, 2020). It is also necessary to investigate the effectiveness of state policies existing in the Espírito Santo and the knowledge that entrepreneurs and companies have about these policies.

Table 4, in turn, presents the main opportunities for the state's innovation ecosystem.

The "Strategic location in the center of the Southeast region" was chosen by 81.5% of the respondents as an opportunity factor, followed by the option "Becoming a relevant state for the country, concerning the business environment", which represented 74.1% of responses. According to Rosenkopf and Almeida (2003), the geographical proximity between strategic regions increases the probability that a given company will use the stock of knowledge of another company present, thus creating a win-win relationship. The result of this question also demonstrates alignment with one of the strategic objectives of the Capixaba Mobilization for Innovation (MCI), which is to position Espírito Santo among the five most innovative states in the country (MCI, 2020).

Opportunities	F	%
Strategic location in the center of the Southeast region	22	81,5
Becoming a relevant state for the country concerning the business environment	20	74,1
Learning from global and national best practices	12	44,4
Others	3	11,1

Tab. 04
Opportunities for the innovation ecosystem of the Espírito Santo
Source: Research data (2020).

Still, in this third block, three alternatives were presented, aiming to identify the one that best characterizes the state's innovation ecosystem. The alternative chosen by the majority (61.5%) was, "Each entity has its projects and methodologies to foster innovation, without articulation with the others". Considering the short time of structuring the MCI, it is natural that this perception still prevails; however, deserving attention, as the articulation is related to the success of the ecosystem. After all, according to the theoretical framework of this study, business networks with a higher degree of interaction promote greater synergy in innovation, and innovation ecosystems are constituted precisely when these networks evolve to the pattern of collaboration among agents (Russel and Smorodinskaya, 2018).

Regarding the main forms of promotion that the ecosystem of the Espírito Santo provides, 18 different entities were spontaneously mentioned, being the Brazilian Micro and Small Business Support Service (Sebrae) and the Espírito Santo Research and Innovation Support Foundation (Fapes), the most cited entities (11 times). The memory of this type of organism as the main agent for fostering innovation is routine in Brazil since these entities are the first to invest in nascent businesses (Carvalho et al., 2016).

The fourth block aimed to investigate the relationship between the innovation ecosystem of the Espírito Santo and the state Agtechs.

The main spontaneous responses about the challenges faced by the Espírito Santo Agtechs, in the view of the actors involved in the state's entrepreneurial ecosystem, were basically about the internal characteristics of the Agtechs and characteristics external to them.

As for external factors, the lack of a mature innovative environment, capable of meeting all the needs of entrepreneurs, stands out. The interviewee [E3] identified the "lack of a defined and consolidated ecosystem". For [E20], "there is an absence of a converging space for innovative solutions for agribusiness". [E6] believes "that the lack of incentive hinders more because we lose

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a lot concerning competing states and countries". [E26] states that "there is a need for coordination between sectors of the ecosystem and coordinated actions to grow with differentiated/innovative products". For [E7], the state environment needs to "foster the creation of more Agtechs". In turn, [E12] mentions the "lack of integration for joint solutions and government incentive".

As for internal particularities, the main challenge is to understand the business model and the pain of customers correctly. According to [E1], Agtechs need to have "knowledge of agribusiness problems", and this is only achieved, according to [E24], by reducing the "distance from the productive sector", which Agtechs currently have. According to [E4], there is a great challenge to "access the customers' pains and glimpse the existing market opportunity".

As for the opportunities for Agtechs, in spontaneous responses, the demand for innovation in the field and the importance of agribusiness for the state are highlighted. Regarding the demand for innovation in the field, [E13] says that "the rural development of Espírito Santo and the technological demands for solutions in the sector" are prosperous paths for the Espírito Santo Agtechs. This idea is shared by more respondents; [E24] says that the demand for innovation will attract "good production and traceability practices", and [E20] informs that this demand will create a "highly diversified production base". Considering the importance of this sector for the state, [E7] believes that "the Espírito Santo's vocation for agribusiness enables many solutions to be created by Agtechs". In favor of this argument are also: [E8], when he says that "the state is strong in agriculture"; [E6], when it considers that "the Espirito Santo and Vitória are perfect test fields, especially in agribusiness, as we have different climates and vegetations, cultures"; and [E4], when it points to the "high concentration of farmers and ranchers generating demand".

Finally, 64.3% of the respondents agree, and 35.7% partially agree that the Espírito Santo should become an inducing pole for Agtechs, which shows that there is a favorable perception, among the interviewees, about the promotion of these startups.

Group 2
Entrepreneurs from Agtechs of the Espírito Santo

The second group surveyed was made up of entrepreneurs from startups operating in the agribusiness chain, the Agtechs, with a universe of 7 respondents. The questionnaire assigned to this group had four blocks.

The first block presented the characterization of the partner/representative of agtech. Most are between 31 and 40 years old (57.1%), male (85.7%), and live in the Greater Vitória Metropolitan Region. Differently from what was identified about the characterization of the actors influencing the ecosystem, the interviewed entrepreneurs of Agtechs differ from the entrepreneurs described in some researched scientific publications. According to the Global Entrepreneurship Monitor (GEM, 2019), there is a tie concerning the number of male and female entrepreneurs, and most entrepreneurs (27.5%) are over 45 years old. According to a study that outlined the profile of the Brazilian startup (Brazilian Startups Association [ABStartups], 2018), 74% of startups have a team with most men, the same percentage found in the 2nd Agtech Startups Brasil Census (Mondin and Tomé, 2018).

The second block aimed to characterize the interviewed Agtechs. Most companies have CNPJ (71.4%), following the same configuration of the national scenario, which shows 82% of formalization among Agtechs (Mondin and Tomé, 2018). As for size, they fall into the category of microenterprise, with revenues between R$ 81 thousand and R$ 360 thousand. Still, 43% have more than 3 years of existence, and 42.9% have between 3 and 5 people in the team. Regarding access to incentive programs, 85.7% are or have been assisted by the main innovation support programs or entities in the state (Tecnova, Fapes, Finep, Ifes Incubators, Sinapse da Inovação, Challenge Baanko, TecVitória, and Azys).

Regarding the reason why entrepreneurs decided to work in agribusiness, the spontaneous responses were about personal and/or market aspects. Among the personal aspects, [E2] mentions that "problems experienced personally" made him work in agribusiness, [E7] attributes the choice to his training ("I am trained in the agricultural area and seek to promote and value organic producers") and [E4] explains: "we are the children of rural producers and we know the true need of rural people and their difficulties". Considering the market aspects, [E3] justifies its choice to act in agribusiness due to the "market demand [...], mainly family agriculture", and [E6] says that in this area, "there is still little competition, many calls for innovation available, and the market is huge in Brazil and the world".

The third block aimed to gather information about the journey of startups, and the difficulties faced by them, in the view of agribusiness entrepreneurs.

The forms of support/incentives obtained by startups were raised, with "incubation" and "mentoring" being the most cited (71.4% of companies). Mention was also made of "technical guidance", "training/capacity building", and "participation in fairs", for 57.1%, and "investment", for 28.6%. It is essential to clarify that this question allowed them to point out more than one alternative. The responses indicate that startups are accessing the support instruments that the ecosystem has provided.

Regarding the difficulties encountered in each phase of their life cycle, 60% of the Agtechs faced difficulties in the "prototyping" stage; 30% in the "pivot" phase; 15% in "ideation"; and 15% in the "scale-up", with the question accepting the choice of more than one moment of difficulty. According to Dey et al. (2001), prototyping helps to understand that consumers value characteristics different from those initially designed, which, on the one hand, is essential, as it adapts the product to reality, but, on the other hand, causes the need to reinvent the product. This not only explains the identification of this phase by the entrepreneurs, like the one that presented more difficulties, but also seems to demonstrate that the studied Agtechs sought to adapt their products to the consumers' desires.

Table 5 presents the main difficulties/threats encountered by the Agtechs, according to the entrepreneurs interviewed. The choice of more than one option was also accepted on this question.

The statements "Difficulty in forming the team" and "Difficulty in receiving investment" were mentioned by 57.1% of the interviewees; and "Unfamiliarity of an organized script/step by step" by 42.9%. Regarding the difficulty of forming the team, Kaiser and Müller (2015) say that this can occur in startups due to the need that many founders have to seek people who share similar beliefs, renouncing the contradictory discussion. Regarding the difficulty of receiving investments, the study by Dias et al. (2019) demonstrates that the number and amount of contributions to these companies are still lower than those obtained by other categories of startups, such as financial solutions and mobility.

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Alternative	F	%
Difficulty in forming the team	4	57,1
Difficulty receiving investment	4	57,1
Unfamiliarity of an organized script/step by step	3	42,9
Difficulty in knowing the rural reality	2	28,6
Difficulty identifying sources of funding/investment	1	14,3
Lack of support to improve the idea	1	14,3
Difficulty in accessing the producers	1	14,3
Difficulty identifying support entities	0	0

Tab. 05
Difficulties/threats for the entrepreneurs of the studied Agtechs
Source: Research data (2020).

Considering the issue of difficulty in receiving investment, the research also revealed that only 28% of the studied Agtechs received financial support, obtained through calls for innovation, incubators, and angel investments. The percentage of projects that received investment is justified because, according to Buainain et al. (2017), startups find it difficult to obtain bank credit since they do not have assets that constitute real guarantees, besides the scarce or nonexistent financial history. The payment of interest and loan installments also represents an obstacle to the cash flow of these nascent companies, making venture capital an interesting option. In some cases, however, bank credit is still an advantageous option concerning venture capital, due to the maintenance of integrality in the founders' corporate participation, as well as the autonomy in the management of the business (Buainain et al., 2017).

Asked about what is missing for Espírito Santo to be a reference in supporting the development of Agtechs, 100% of respondents understand that the lack of "specific programs" is an important gap. Other gaps most cited were greater representativeness of the sector in the innovation ecosystem; greater knowledge of the sector by the leaders of the innovation ecosystem, and prioritization of the sector, considering its relevance. It is expected that, once they have specific programs, several other Agtechs can be promoted and developed, bringing the foreign exchange to the Espírito Santo and Brazil.

The fourth block of questions aimed to explore the perception of entrepreneurs and their relationship with the business environment.

The first question, that allowed the choice of more than one alternative, identified the challenges, according to the vision of the entrepreneurs themselves, that Agtechs face to deliver their value proposal to producers. Table 6 shows the frequency and percentage of each alternative.

The statement "Dissemination of the solution" was mentioned by 71.4% of the Agtechs, followed by "Lack of connectivity in the rural area" and "Conservatism of the producer (low adhesion to technology)" with 42.9% each. Regarding the "Dissemination of the solution", in the Brazilian innovation ecosystem, there is still room for improvement in practices related to the management of the dissemination of knowledge and the value proposals of nascent companies (Rocha et al., 2019). Regarding the "Lack of connectivity in the rural area" and the "Conservatism of the producer", Souza-Filho et al. (2011) believe that such facts occur because the process of adoption and diffusion of technology in the agricultural area it is still complex and inherently social, highly influenced by the characteristics of knowledge dispersing agents and knowledge capturing agents.

Alternative	F	%
Lack of connectivity in rural areas	3	42,9
Producer conservatism (low technology adherence)	3	42,9
Dissemination of the solution	5	71,4
Loyalty	0	0
Competition	0	0

Tab. 06
Challenges in delivering the value proposition to producers
Source: Research data (2020).

CONCLUSION

The research carried out provided an overview of the innovation ecosystem of the Espírito Santo and how this environment influences the emergence and development of Agtechs and pointed out opportunities for improvement. In a complementary way, the main challenges and bottlenecks faced by them, as well as suggestions/recommendations for stimulating these enterprises, were identified from the research with the Agtechs, given the relevance of agribusiness to the Espírito Santo and the potential for growth and technological development in this sector.

The innovation ecosystem of the Espírito Santo still presents a series of challenges so that it can fully fulfill the role of encouraging, in a structured way, startups called Agtechs, among which we highlight the absence of a common platform, the lack of interconnection between the actors, and the absence of structured information. However, the availability of human capital, financial resources, and the relevance of some partners are strengths that, in the long run, can overcome the deficiencies pointed out. Despite the organizational effort that has been undertaken in the context of the Capixaba Mobilization for Innovation (MCI) since 2018, it is necessary to consider the fact that innovation ecosystems are not built in a top-down manner but depend on the interrelationship and cooperation between the actors, the consolidation of a knowledge management base, the adequate urban structuring of the territories aimed at the culture of innovation, and investments.

The interviewed Agtechs entrepreneurs identified different market demands and opportunities and counted mainly on support, through incubation and mentoring, with greater difficulty in the prototyping stage, in identifying resource sources, and in team formation, which indicates the need to expand support and offer ecosystem solutions in this direction, as well as to facilitate access for investors. Besides the points mentioned above, the absence of specific programs for Agtechs, greater representation of the agricultural sector in the innovation ecosystem, and greater knowledge of the sector by the leaders of this ecosystem (two-way) are obstacles for Espírito Santo to be a reference on supporting Agtechs; Once these problems are solved, such companies would bring to the state greater gains in competitiveness, generation of jobs, and income.

At this moment when the innovation cluster that Espírito Santo intends to be designed/redesigns - the central objective of the Capixaba Mobilization for Innovation - the collaboration between the representations, other actors, and influencers of the agricultural sector is a preponderant factor to make possible the construction of a bold strategy for technological development along the entire agribusiness chain, without a sectorial and fragmented view. It is necessary that the main agents of this ecosystem make concrete efforts for the integration and complementarity of the initiatives of each institution, through collaborative methodologies that result in the proposition of convergent programs, with a focus on innovation.

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Given the findings of this article, we can suggest proposals for future studies. Due to the perception of a part of the interviewees on the topic, there is a need for research on the effectiveness of existing state policies and the knowledge that entrepreneurs and companies have about such policies. It will also be essential to examine whether information from the innovation ecosystem, aimed at startups, has had state capillarity since several Agtechs have emerged in the interior of the state. This type of study is relevant, as it will help to strengthen the state innovation cluster. As a field method, the in-depth interview linked to a verbal protocol of "Think Aloud" (Ericsson and Simon, 1993) is indicated. For the treatment of the results, the content analysis proposed by Bardin (2008) is suggested.

Conflit of interest statement

The authors declare that there is no conflict of interest and that there was no financial support for the development of the study.

Authors statement of individual contributions

Roles	Authors Contributions	
	Castro CB	Ramos PHB
Conceptualization	X	X
Methodology	X	X
Software	X	X
Validation	X	X
Formal analysis	X	X
Investigation	X	X
Resources	X	
Data Curation	X	X
Writing - Original Draft	X	X
Writing - Review & Editing	X	X
Visualization	X	X
Supervision		X
Project administration	X	X
Funding acquisition	X	

REFERENCES

ABStartups – Associação Brasileira de Startups (2018). Mapeamento Agtech – Investigação sobre o uso das tecnologias para o Agronegócio no Brasil. Retrieved from https://abstartups.com.br/mapeamento-Agtech/.

AgFunder – Agriculture and Agtech Investment Opportunities. (2019). AgFunder AgriFood Tech Investing Report – Year in Review 2018. Retrieved from https://research.AgFunder.com/2018/AgFunder-Agrifood-Tech-Investing-Report-2018.pdf.

AgFunder – Agriculture and Agtech Investment Opportunities. (2020). AgFunder AgriFood Tech Investing Report – Year in Review 2019. Retrieved from https://research.agfunder.com/2019/AgFunder-Agrifood-Tech-Investing-Report-2019.pdf.

Andion, C., Alperstedt, G. D., & Graeff, J. F. (2020). Ecossistema de inovação social, sustentabilidade e experimentação democrática: Um estudo em Florianópolis. Revista de Administração Pública, 54(1), 181-200. https://doi.org/10.1590/0034-761220180418.

Bacher, J. S., & Guild, P. D. (1996). Financing early stage technology-based companies: Investment criteria used by investors. Frontiers of Entrepreneurship Research – Proceeding of the 16th Annual Entrepreneurship Research Conference, Babson College, Wellesley, MA.

Bardin, L. (2008). Análise de conteúdo. Lisboa: Edições 70.

Bittencourt, B. A., & Figueiró, P. S. (2019). Inovation ecosystems articulation and share value creation. Cad. Ebape.BR, 17(4), 1002-1015. https://doi.org/10.1590/1679-395174403x.

Blank, S., & Dorf, B. (2012). The startup owner's manual: The step-by-step guides for building a great company. (Vol. 1). Pescadeiro, CA, USA: K&S Ranch Publishing Division.

Buainain, A. M., Lima Jr., I. S., & Corder S. (2017). Desafios do financiamento à inovação no Brasil. In Coutinho, D. R., Foss, M. C, & Mouallem, P. S. B. (Orgs.). Inovação no Brasil: Avanços e desafios jurídicos e institucionais (pp. 97-124). Retrieved from http://pdf.blucher.com.br.s3-sa-east-1.amazonaws.com/openaccess/9788580392821/completo.pdf.

Carvalho, L. M. C., Viana, A. B. N., & Mantovani, D. M. N. (2016). O papel da Fapesp no ecossistema empreendedor do estado de São Paulo. Racef – Revista de Administração, Contabilidade e Economia da Fundace, 7(1), 84-101. https://doi.org/10.13059/racef.v7i1.168.

Cassiolato, J. E. & Lastres, H. M. M. (2017). Políticas de inovação e desenvolvimento. In Coutinho, D. R., Foss, M. C, & Mouallem, P. S. B. (Orgs.). Inovação no Brasil: Avanços e desafios jurídicos e institucionais (pp. 19-56). Retrieved from http://pdf.blucher.com.br.s3-sa-east-1.amazonaws.com/openaccess/9788580392821/completo.pdf.

Cepea – Centro de Estudos Avançados em Economia Aplicada. (2020). PIB do agronegócio brasileiro. Retrieved from https://www.cepea.esalq.usp.br/br/pib-do-agronegocio-brasileiro.aspx.

Dedehayir, O; Mäkinen, S.J.; & Ortt, J. R. (2018). Roles during innovation ecosystem genesis: A literature review. Technological Forecasting and Social Change, 136, 18-29. https://doi.org/10.1016/j.techfore.2016.11.028.

Dey, A. K., Abowd, G. D., & Salber, D. (2001). A conceptual framework and a toolkit for supporting the rapid prototyping of context-aware applications. Human-computer interaction, 16(2), 97-166. https://doi.org/10.1207/S15327051HCI16234_02.

Dias, C. N., Jardim, F., & Sakuda, L. O. (2019). Radar Agtech Brasil 2019: Mapeamento das startups do setor agro brasileiro. Retrieved from https://www.radarAgtech.com.br.

Dutia, S. G. (2014). Agtech: Challenges and opportunities for sustainable growth. Innovations, 9(1-2), 161-193. https://doi.org/10.1162/inov_a_00208.

Ericsson, K. A.; & Simon, H. A. (1993). Protocol analysis: Verbal reports as data (rev. ed.). Cambridge: MIT Press.

Estrin, J. (2009). Closing the innovation gap: Reigniting the spark of creativity in a global economy. New York: McGrew Hill.

Feld, B. (2020). Startup communities: Building an entrepreneurial ecosystem in your city (2nd ed.). Hoboken: Wiley.

Fernández-Fernández, M.T., Blanco-Jiménez, F. J., & Cuadrado-Roura, J. R. (2015). Business incubation: Innovative services in an entrepreneurship ecosystem. The Service Industries Journal, 35(14), 783-800. https://doi.org/10.1080/02642069.2015.1080243.

Findes – Federação das Indústrias do Espírito Santo. (2019). Mobilização Capixaba pela Inovação. Retrieved from https://findes.com.br/mobilizacao-capixaba-pela-inovacao/.

Furr, N., & Dyer, J. (2014). The innovator's method: Bringing the lean startup into your organization. Boston: Harvard Business School Publishing.

GEM – Global Entrepreneurship Monitor. (2019). Empreendedorismo no Brasil 2019 – Relatório Executivo. Retrieved from http://ibqp.org.br/PDF%20GEM/Relat%C3%B3rio%20Executivo%20Empreendedorismo%20no%20Brasil%202019.pdf.

Gomes, L. A. V., Facin, A. L. F., Salerno, M. S., & Ikenami, R. K. (2018). Unpacking the innovation ecosystem construct: Evolution, gaps and trends. Technological Forecasting and Social Charge, 136, 30-48. https://doi.org/10.1016/j.techfore.2016.11.009.

Gonzaga, B. S., Figueiredo, P. S., Souza, E. L. R. C. & Passos, F. U. (2020). Organizational learning capacity of startups in Northeast Brazil. Revista de Gestão, 27(3), 301-316. https://doi.org/10.1108/REGE-11-2019-0116.

Gray, D. E. (2012). Pesquisa no mundo real (2. ed.). Porto Alegre: Penso.

Grumadaite, K.; & Jucevicius, G. (2014). Smart development of innovation ecosystem. Procedia: Social and Behavioral Sciences, 156(26), 125-129. https://doi.org/10.1016/j.sbspro.2014.11.133.

Heaton, S., Siegel, D. S., & Teece, D. J. (2019). Universities and innovation ecosystems: a dynamic capabilities perspective. Industrial and Corporate Change, 28(4), 921-939. https://doi.org/10.1093/icc/dtz038.

IBGE – Instituto Brasileiro de Geografia e Estatística. (2019). Censo Agropecuário 2017: Resultados Preliminares. Retrieved from https://censos.ibge.gov.br/agro/2017/templates/censo_agro/resultadosagro/index.html.

Incaper – Instituto Capixaba de Pesquisa, Assistência Técnica e Extensão Rural. (2019). Boletim da Conjuntura Agropecuária Capixaba. Retrieved from https://biblioteca.incaper.es.gov.br/digital/bitstream/123456789/3394/1/Boletim-da-conjuntura-Agropecuaria-Ano-IV-n-16-Dezembro-de-2018.pdf>.

Kaiser, U., & Müller, B. (2015). Skill heterogeneity in startups and its development over time. Small Business Economics, 45, 787-804. https://doi.org/10.1007/s11187-015-9667-8.

Krishnan, A., Banga, K., & Mendez-Parra, M. (2020). Disruptive technologies in agricultural value chains: Insights from East Africa. Working Paper 576, EIF – Enhanced Integrated Framework. Retrieved from https://www.odi.org/sites/odi.org.uk/files/resource-documents/disruptive_agritech_-_5_mar_2020_-_final_draft.pdf.

https://doi.org/10.14211/regepe.v10i1.1767
ISSN: 2316-2058

Mashelkar, R. A. (2018). Exponential technology, Industry 4.0 and future of jobs in India. Review of Market Integration, 10(2), 138-157. https://doi.org/10.1177/0974929218774408.

MCI – Mobilização Capixaba pela Inovação (2020). Metas MCI 2020-2030. Retrieved from http://mcinovacao.com.br/.

Meirinhos, M., & Osório, A. (2010). O estudo de caso como estratégia de investigação em educação. Eduser: Revista de Educação, 2, 49-65.

Mikhailov, A., Reichert, F. M., & Pivoto, D. (2018). Innovation in agribusiness: The case of agricultural technology new ventures. Ifama 28th World Conference "Disruptive innovations: Better business, management, science and government", Buenos Aires.

Mondin, M; & Tomé, J. (2018). 2º Censo Agtech Startup Brasil. Retrieved from https://www.Agtechgarage.com/censo/.

Müller, B; & Rammer, C. (2012). Start-up promotion instruments in OECD countries and their application in developing countries. ZEW Gutachten/Forschungsberichte, Deutsche Gesellschaft für Internationale Zusammenarbeit [GIZ] GmbH. Retrieved from https://www.econstor.eu/bitstream/10419/110561/1/718712390.pdf.

Nardes, F. B. S., & Miranda, R. C. R. (2014). Lean Startup e Canvas: Uma proposta de metodologia para startups. Revista Brasileira de Administração Científica, 5(3), 252-272. https://doi.org/0.6008/SPC2179-684X.2014.003.0015.

Negri, F., Rauen A. T., & Squeff, F. H. S. (2018). Ciência, inovação e produtividade: Por uma nova geração de políticas públicas. In Negri, J. A., Araújo, B. C., & Bacelette, R. (Orgs.). Desafios da nação: Artigos de apoio (Vol. 1, pp. 533-560). Retrieved from https://www.ipea.gov.br/portal/images/stories/PDFs/livros/livros/180413_desafios_da_nacao_artigos_vol1_cap11.pdf

Nikiforova, S. (2018). The study of the correspondence of marketing instruments to the stages of the start-up life cycle. Matec Web of Conferences, EDP Sciences, 239, 07004.

Oksanen, K., & Hautamäki, A. (2015). Sustainable innovation: A competitive advantage for innovation ecosystems. Technology Innovation Management Review, 5(10), 24-30. https://doi.org/10.22215/timreview/934.

Oleksandr, T., Ganna, V., & Tetiana, P. (2018). Dynamics of the influence of risk factors taking into account marketing of startups life stage. Modern Economics, 9, 113-123. https://doi.org/10.31521/modecon.V9(2018)-14.

Proposição de Projeto de Lei Complementar (PL146/2019). Retrieved from https://www.camara.leg.br/proposicoesWeb/fichadetramitacao?idProposicao=2205645.

Ries, E. (2011). The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses. New York: Crown.

Rocha, C. F. R., Mamédio, D. F., & Quandt, C. O. (2019). Startups and the innovation ecosystem in Industry 4.0. Technology Analysis & Strategic Management, 31(12), 1474-1487. https://doi.org/10.1080/09537325.2019.1628938.

Roncaratti, L. S. (2017). Incentivos a startups no Brasil: os casos do Startup Brasil, InovAtiva e InovApps. In: Cavalcante, P., Camões, M., Cunha, B., & Severo, W. (Orgs.). Inovação no setor público: Teoria, tendências e casos no Brasil (pp. 215-229). Retrieved from http://repositorio.ipea.gov.br/bitstream/11058/8800/1/Incentivos%20a%20Startups%20no%20Brasil.pdf.

Rosenkopf, L., & Almeida, P. (2003). Overcoming local search through alliances and mobility. Management Science, 49(6), 751-766. https://doi.org/10.1287/mnsc.49.6.751.16026.

Roure, J. B., & Keely, R. H. (1990). Predictor of success in new technology-based ventures. Journal of Business Venturing, 5(4), 201-220. https://doi.org/10.1016/0883-9026(90)90017-N.

Russell, M. G.; & Smorodinskaya, N. V. (2018). Leveraging complexity for ecosystemic innovation. Technological Forecasting & Social Change, 136, 114-131. https://doi.org/10.1016/j.techfore.2017.11.024.

Salerno, M. S. (2017). Políticas de inovação no Brasil: Desafios de formulação, financiamento e implantação. In Coutinho, D. R., Foss, M. C, & Mouallem, P. S. B. (Orgs.). Inovação no Brasil: Avanços e desafios jurídicos e institucionais (pp. 79-96). Retrieved from http://pdf.blucher.com.br.s3-sa-east-1.amazonaws.com/openaccess/9788580392821/completo.pdf.

Sharma, K., & Mathur, H. P. (2018). A step towards digital agronomy by startups. International Journal of Business Insights & Transformation, 12(1), 26-32.

Sebrae – Serviço Brasileiro de Apoio às Micro e Pequenas Empresas. (2020b). Sebrae like a boss. Retrieved from https://www.sebrae.com.br/sites/PortalSebrae/likeaboss.

Sebrae – Serviço Brasileiro de Apoio às Micro e Pequenas Empresas (2020a). Ecossistemas de empreendedorismo inovadores e inspiradores. Retrieved from https://d335luupugsy2.cloudfront.net/cms/files/52159/1591723666ECOSSISTEMAS_DE_ALTO_IMPACTO_Digital_3.pdf.

Sedes – Secretaria de Desenvolvimento. (2020). Setores de negócios: Agronegócios. Retrieved from https://sedes.es.gov.br/agronegocio.

Silva, M. R. M., Mendall, F. N., Bertolin, J. A., Stroher, A. D.; & Moura, J. M. P. (2016). Modelo para avaliação do nível de maturidade de startups (SMM). Anais da 26ª Conferência Anprotec, Fortaleza, CE, Brasil.

Souza-Filho, H. M., Buainain, A. M., Silveira, J. M. F. J., & Vinholis, M. M. B. (2011). Condicionantes da adoção de inovações tecnológicas na agricultura. Cadernos de Ciência & Tecnologia, 28(1), 223-255. https://doi.org/10.35977/0104-1096.cct2011.v28.12041.

Spinosa, L. M., Schlemm, M. M., & Reis, R. S. (2015). Brazilian innovation ecosystems in perspective: Some challenges for stakeholders. Revista Brasileira de Estratégia, 8(3), 386-400. https://doi.org/10.7213/rebrae.08.003.AO08.

Startup Point. Startup Point em números. Retrieved from https://www.gov.br/startuppoint/pt-br.

StartupRS. Programa StartupRS Agritech. Retrieved from http://startups.sebraers.com.br/startuprs-agritech/.

Tsujimotoa, M; Kajikawa, Y; Tomita, J; & Matsumoto, Y. (2018). A review of the ecosystem concept – Towards coherent ecosystem design. Technological Forecasting & Social Change, 136, 49-58. https://doi.org/10.1016/j.techfore.2017.06.032.

Yin, R. (2005). Estudo de caso: planejamento e métodos. Porto Alegre: Bookman.

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