

() Graduação (x) Pós-Graduação

**INNOVATION ADOPTION IN THE AGRI-FOOD SYSTEM:
a systematic literature review**

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RESUMO

The agri-food system is responsible for boosting the gross domestic product (GDP) of several countries, creating jobs, and feeding populations around the world. Several technologies have been developed by and for the agri-food system to remain competitive in an unstable and dynamic scenario. Innovation and its adoption process are complex constructs, approached from different perspectives. Therefore, the objective of this study was to identify, through a systematic review, the main innovations that are being adopted in the agri-food system, to clarify the paths and areas of research that organizations operating in the agri-food system should consider in order to remain competitive. The results showed that innovations are mainly related to the adoption of information and communication technologies (ICTs), the adoption of innovations in packaging, conservation methods, the use of nanotechnology and 3D printers. It was also found that the studies highlight the importance of networking and collaboration for innovation adoption processes to occur, and that innovations capable of promoting alternatives to sustainability challenges are currently considered the most attractive and a great opportunity for the agri-food system. Thematic gaps were identified, as alternative proteins adoption by agri-food system organizations and innovation possibilities for agri-food SMEs, directing to future research about this topics.

Palavras-chave: Innovation Adoption; Agri-food System; Sustainable Innovations.

1 INTRODUÇÃO

Despite the opportunities for competitive advantage and growth that the innovation adoption can generate for the agri-food system, the organizations that make it up still face many constraints. Agri-food is characterized as a traditional industry, with low research intensity and insufficient incentives for innovation, which makes the sector considered technologically backward compared to other industries. Most products remain on the market for a long period and new products are mostly extensions of older ones, the result of incremental innovation. Research and development (R&D) therefore has a specific character in the sector, and although many institutions and researchers are interested in discussing the topic, there is still much to be explored (ABAG, 2020; Batterink et al., 2010; Ettlíe, 1983b; González-Moreno, Triguero & Sáez-Martínez, 2019; Kastelli et al., 2016; Pavitt, 1984).

Therefore, the main objective of this study is to identify, through a systematic literature review, the main innovations that are adopted in the agri-food system. As for the specific objectives, it is expected: to clarify which paths and areas of research should be considered by organizations operating in the system as a possibility of obtaining competitive advantage; gather contemporary innovations in the agri-food system; to collect different perspectives on studies related to the innovation adoption theory in the agri-food system. It is expected that the results will be fruitful from a theoretical point of view, contributing to the strengthening of studies related to the theory of innovation adoption and bringing together different perspectives on the subject. As a practical contribution, it is expected to present contemporary innovations to industries and other actors involved in the agri-food system.

2 DISCUSSÃO E ANÁLISE DOS DADOS

Challenges and opportunities in the agri-food system

Fifteen articles in the sample address challenges and opportunities in the agri-food system, indicating the relevance of the topic in the agri-food system literature. The main challenges are related to climate change, pressures on the global food supply, demands for sustainability, traceability, and transparency, rising food prices and the spread of food-borne

diseases. Growing concern about these issues has led to a new food equation in which the agri-food system is a fundamental part, as gas emissions from the agri-food system exceed the targets set by the Paris Agreement, which aims to reduce global warming and greenhouse gas emissions (Bryant & Van der Weele, 2021; González-Moreno et al., 2019; Morgan & Sonnino, 2010; Sonnino & Griggs-Trevarthen, 2013).

Innovation in networks

Ten articles in the sample address the importance of networking for innovation adoption processes. It can be affirmed that firms in the agri-food system with networking capabilities have a greater capacity for innovation than others. Policy makers in the European Union encourage inter-organizational cooperation as a strategy to generate innovation in their economies. Innovative organizations have incorporated external perspectives and ideas into their R&D processes, and it has been found that for many companies it is not feasible to rely solely on innovations generated by internal activities. In many of them, there is a low capacity to invest in R&D and to face the risks that this investment would entail, which means that R&D activities, when present, are informal. Technology transfer mechanisms allow technological advances in other sectors to be adapted and used by organizations in the agri-food system, generating a series of benefits related to the innovation adoption. In addition, the exchange of experiences, the interaction between companies, the creation of inter-organizational networks and the maintenance of networks are ways of overcoming the challenges faced by organizations (Batterink et al., 2010; Bottani et al., 2014; Cox et al., 2002; Flipse & Van der Sanden, et al., 2013; Kastelli et al., 2016; Trott & Simms, 2017).

Innovations and technologies in the agri-food system

The sample includes nine articles that address specific innovations and technologies developed in the agri-food system. These are related to the adoption of ICT (Kabbiri et al., 2017; O'Connor & Kelly, 2017), innovations in food packaging (Matin et al., 2012; Trott & Simms, 2017), nanotechnology (Flipse & Van der Sanden, et al., 2013; Matin et al., 2012), food created by 3D printing (Lee et al., 2021) and new methods of food preservation (Mitsuda, 1999).

Adoption of sustainable innovations

Four articles in the sample deal with the adoption of sustainable innovations. The presence of this topic may be related to the fact that the agri-food system has a close relationship with the primary sector and is highly dependent on natural resources. The use of these resources by organizations and agricultural practices can be sustainable or indiscriminate, and given that the planet's environmental limits have already been exceeded or are in a critical situation due to factors such as biodiversity loss and climate change, indiscriminate use has been shown to be a practice present in the agri-food system (González-Moreno et al., 2019; Stål, Bonnedahl, & Eriksson, 2013).

3 CONCLUSÕES

The innovation adoption has been studied by different researchers at distinct levels of analysis. From this study, it was possible to review the literature on the adoption of innovations in the agri-food system, to synthesize the knowledge on this topic and to identify biases and knowledge gaps in the existing literature, as suggested by the literature (Rowe, 2014). The objective of identifying the main innovations adopted in the agri-food system was achieved, indicating which pathways and areas of research should be considered by organizations as a possibility to gain competitive advantage.

Innovations and technologies are related to the use of ICTs in the management, production, processing, distribution and services involved in the agri-food system, enabling innovations in packaging, preservation methods and the use of nanotechnology and 3D printers for food design and printing. It should be noted that innovations that promote alternatives to sustainability challenges are considered the currently most attractive and are responsible for a global rush of investors in the agtech and foodtech sectors. The adoption of sustainable innovations is an opportunity for the agri-food system, given the close relationship with the primary sector and the high dependence on natural resource. Sustainable innovations allow, among other things, food production with less water and fertilizer use, as well as low emissions of pollutants.

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