



## Institutionalization and legislation of organic production in Brazil, and how new regulations are impacting farmers

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**ABSTRACT:** Regulation and certification in organic production systems are needed to guarantee the quality of organic products around the world. This study aims to understand the new provisions established by the most recent technical regulation for organic production systems, Ordinance 52/2021, and to assess the main implications of the new regulation for farmers. Starting from 1994, the debate for regulating organic agriculture in Brazil was officially recognized in May 1999. Still, only in 2003, when Law 10,831 was instituted, the country reached an effective milestone on organic production, both internally and externally. Since the regulation, the legislation has undergone many modifications, constantly reviewing and adjusting. The current study examined the institutionalization of organic production in Brazil and how the current regulations can be used as a reference for those interested in this sector. The recent update of Organic legislation had a direct impact on farmers because, among other points, it restricted the use of cultivation on the ground and the use of conventional seedlings and seeds. A case study on the production of strawberries and edible mushrooms in an organic system is presented and discussed. Also, we discussed how the next legislation updates can incorporate scientific and technical information to improve agroecosystem sustainability and the quality of organic products.

**Keywords:** organic certification; organic farming; agroecology; organic products; organic strawberry.

## Institucionalização e legislação de produtos orgânicos no Brasil e como a nova portaria está impactando os agricultores

**RESUMO:** Regulamentação e certificação da produção orgânica são necessárias para garantir a qualidade dos produtos orgânicos em todo o mundo. Este estudo tem como objetivo entender a mais recente regulamentação técnica para sistemas de produção orgânica, Portaria 52/2021, e avaliar as principais implicações da nova regulamentação para os agricultores. A partir de 1994, inicia-se o debate para regulamentação da agricultura orgânica no Brasil, sendo oficialmente reconhecido em 1999. Somente em 2003, quando a Lei 10.831 foi instituída, o país atingiu um marco efetivo na produção orgânica. Desde a regulamentação, a legislação passou por muitas modificações, constantemente revisando e ajustando. O presente estudo analisou a institucionalização da produção orgânica no Brasil e o que as regulamentações atuais podem ser usadas como referência para os interessados neste setor. A recente atualização da legislação orgânica impactou diretamente os agricultores porque, entre outros pontos, restringiu o uso do cultivo fora do solo e o uso de mudas e sementes convencionais. Estudos de caso são apresentados e discutidos. Além disso, discutimos como as próximas atualizações da legislação podem incorporar informações científicas e técnicas para melhorar a sustentabilidade do agroecossistema e a qualidade dos produtos orgânicos.

**Palavras-chave:** certificação de produtos orgânicos; agricultura orgânica; agroecologia; produção orgânica; morango orgânico.

### 1. INTRODUCTION

Organic farming is a working model that aims to achieve economic, environmental, and social sustainability in agroecological production systems, which is gaining increased ground both on the consumer table and in production areas (CIDÓN et al., 2021; NIKOL and JANSEN, 2021). In 2022, it is reported that global organic

production occupies an area of 96 million hectares; the number of producers is approximately 4.5 million, and the global financial figures generated from the organic chain are more than 145 billion dollars (WILLER et al., 2024).

Organic regulation and certification systems encounter several difficulties, mainly regarding the very definition of the organic system, making equivalence between countries

difficult, among other difficulties (PEKDEMIR, 2018). In Brazil, discussions about the organic movement began in the late 1970s through local initiatives that sought an alternative form of agriculture compared to that normally used by farmers. It expanded very slowly between 1973 and 1995, and its regulation began in 1999, with Normative Instruction (NI) n° 007, May 17<sup>th</sup>, 1999 (BRASIL, 1999). Since the subject of organic farming encompasses various particularities (SCHWARZ et al., 2022; OLOWE et al., 2022), Brazilian legislation is constantly being reformulated, seeking to adapt to new contexts and realities, and there are still sectors that require regulation, such as the production of organic cosmetics.

This situation represents a challenge for professionals and students in the field, especially for producers, who need to adjust to the continuous changes in the legislation that sometimes lack technical support, making it difficult to know which regulations are in use and what content they cover.

This study aims to understand the new provisions established by the most recent technical regulation for organic production systems, by the Ministry of Agriculture, Livestock and Food Supply (MAPA) Ordinance number 52 of March 15<sup>th</sup>, 2021 (BRASIL, 2021), and to assess the main implications of the new regulations. It is also sought to provide an overview of organic farming in Brazil since access to good quality information in the dynamic field of organic farming serves as a tool for more in-depth evaluation, influencing stakeholders throughout the value chain.

## 2. INSTITUTIONALIZATION AND HISTORY OF BRAZILIAN ORGANIC LEGISLATION

Certification of organic compliance is an essential element in the production and commercial process, as it gives consumers and growers greater credibility and fairness to the practices and principles employed in organic production (THORSØE, 2015; KONONETS et al., 2023). The institutionalization of organic farming in the world began in 1972, with the creation of IFOAM (International Federation of Organic Agriculture Movements) and the publication of its first regulations in 1978. IFOAM standards served as a parameter for the marketing of organic products worldwide until the 1990s and for implementing different local standards and technical regulations in various countries (FONSECA et al., 2009).

In Brazil, debates on organic farming began in the late 1970s through local initiatives that opposed traditional agriculture and sought alternative production models. However, it developed slowly until 1995. In the 1990s, with the first United Nations Conference on Environment and Development, held in Rio de Janeiro in 92 - ECO 92, the debate on sustainability advanced, positively influencing the production and consumption of organic food in Brazil. However, there was no Brazilian legislation for the sector then, and the certifiers defined their own rules (LOURENÇO et al., 2017).

In this context, international pressure erupted in 1994, especially from the European community and non-governmental organizations (NGOs), to define standards for producing and marketing organic products in Brazil. This pressure led to the creation of Ordinance MA (Ministry of Agriculture, after changed to MAPA) n° 178 of August 1994. This ordinance created the Special Commission to propose certification standards for organic products, with the participation of the executive branches and civil society to

discuss the guidelines for organic farming (FONTENELE and DAVID, 2004).

Later that year, MA Order n° 190 of September 1994 established the National Organic Products Committee, tasked with determining the strategies for certifying organic products. Following this decision, MA Order n° 192 of April 1995 stipulated the members who would make up the National Organic Products Committee. After much debate, Normative Instruction (NI) n° 007 was promulgated on May 17<sup>th</sup>, 1999, which began to regulate the production, classification, processing, distribution, identification, and certification of organic products and production. This was the beginning of regulating organic farming in Brazil (FONTENELE and DAVID, 2004). Four years later, through Normative Instruction n° 007/99, and after being discussed in the National Congress since 1996, the Law n° 10,831, known as the "Organic Law", was approved on December 23<sup>rd</sup>, 2003 (FONSECA et al., 2009). This law establishes the rules for the production and marketing of organic products and presents the concepts of organic production, including different types of alternative systems - natural, biodynamic, permaculture, regenerative, ecological, biological, and agroecological, among others (BRASIL, 2003; LIMA et al., 2020).

Law n° 10,831 is the only organic farming law, and it was decided to organize Brazilian regulations based on a general, intelligible law and to detail it in decrees and normative instructions, which are easier to amend. On April 15<sup>th</sup>, 2004, the Sectorial Assembly of the Organic Agriculture Production Chain (CSAO) was set up and officially sanctioned through Ordinance n° 36 of January, 2006. The assembly participated in various segments of the Brazilian organic movement, comprising government and civil society members. The discussions, drafting, approval, and regulation of Law 10,831/2003 occurred through this assembly. In 2008, the CSAO was renamed the Technical Assembly for Organic Agriculture (CTAO), maintaining the same regulations and legislative frameworks (FONSECA et al., 2009).

After being processed by the Civilian House and all the ministries involved (MAPA, Ministry of Agrarian Development and Family Farming (MDA), Ministry of the Environment (MMA), Ministry of Health (MS), and Ministry of Development, Industry, Commerce and Services (MDIC)) and after the CSAO assent, decree n° 6.323 was published on December 27<sup>th</sup>, 2007 (BRASIL, 2007).

This decree regulates Law 10,831, presenting itself as a more detailed regulatory instrument, addressing concepts, guidelines, and general provisions about organic farming, dealing with issues such as production, marketing, permitted inputs, quality information (identification, labeling, advertising, and publicity), labor relations in organic farming, control mechanisms, conversion, parallel production, responsibility of the parties involved, inspection, inspection documents, administrative penalties, conformity assessment bodies, the Brazilian conformity assessment system (SisOrg), among others. Law n° 10,831 of 2003 and its regulation by Decree n° 6,323 of 2007 made the certification of organic products in Brazil compulsory and n° longer voluntary, bringing significant changes for producers (BRASIL, 2007). The deadline for producers to comply was the end of 2008. Still, it was extended to the end of 2010 by Decree n° 7.048 of December 23<sup>rd</sup>, 2009, so as not to affect them since the aim of the legislation was to develop the sector, bringing

greater reliability and competitiveness to the national and international markets (ALVES et al., 2012).

In 2008, after public consultations, the first Normative Instructions were published, based on Law 10,831/2003 and its regulation by Decree n° 6,323 of 2007: Normative Instruction n° 54, of October 22<sup>nd</sup>, 2008, defined the structure, composition, and attributions of the Organic Production Commissions, both at national (CNPORG - National Organic Production Commission) and in the states levels (CPOrgs - State Organic Production Commissions). The commissions were established to contribute to fundamental actions for the development of organic production, with the essence of integration between the various agents of the organic production network in the public and private sectors and the effective involvement of society in the planning and democratic management of public policies (BRASIL, 2008).

Normative Instruction n° 64 of December 18<sup>th</sup>, 2008, revoked NI n° 007/99 and established the Technical Regulations for organic animal and plant production systems and the lists of substances and practices permitted for use in Organic Production Systems. Normative Instruction n° 64 was later replaced by Normative Instruction n° 46 of October 6<sup>th</sup>, 2011 (with the text later amended by Normative Instruction n° 17 of June 18<sup>th</sup>, 2014, and Normative Instruction n° 35 of September 8<sup>th</sup>, 2017). For 10 years, Normative Instruction n° 46 was one of the main pieces of legislation on organic production in Brazil until the publication of Ordinance n° 52/2021 revoked Normative Instruction n° 46, which will be discussed later (BRASIL, 2011).

Three more Normative Instructions were published on May 28<sup>th</sup>, 2009:

*NI n° 17, jointly issued by the Ministry of Agriculture, Livestock and Food Supply and the Ministry of the Environment (MMA), approves the technical standards for obtaining organic products from organic sustainable extractivists; NI n° 18, jointly issued by the Ministry of Health (MS) and the MAPA, sets out the technical regulations for processing, storing, and transporting organic products, as well as the products allowed for sanitizing facilities and equipment, the food additives and adjuvants allowed and the cleaning and disinfecting products that come into contact with organic food, and was later updated by NI n° 24 of June 1, 2011; and NI n° 19, which approves the organic quality control and information mechanisms and the official MAPA forms (BRASIL, 2009a; BRASIL, 2009b; BRASIL, 2009c).*

NI n° 19 is truly relevant when it comes to the certification process. It established quality control and information mechanisms for organic production for legal entities and individuals, allowing for three forms of conformity assessment: certification by audit, the Social Control Organization (OCS), and the Participatory Guarantee System (SPG). Certification by audit is conducted by institutions under public or private law registered with MAPA, responsible for verifying the conformity of production processes based on organic production regulations.

Brazil has been an important driving force in the search for options for the auditing system, given that auditing is the costliest of the organic conformity assessment mechanisms and is far from the reality of the small producer. The other categories in the country resulted from pressure from social movements and producer associations, who opposed certification by auditing (BRITO et al., 2023).

On the other categories of conformity assessment in Brazil:

*The SPG is a participatory form of conformity assessment with the same recognition as an audit and comprises two groups: the members of the systems and the Participatory Conformity Assessment Bodies (OPACs). The OPAC is responsible for assuming the formal relationship with the MAPA, launching and updating the data of the production unit members of the SPG. The members of the systems can be made up of individuals and/or companies, which are divided into two categories: suppliers and collaborators. Suppliers comprise farming families, processors, distributors, marketers, transporters, and stores. The collaborators are consumers, technicians, public or private organizations, and NGO partners (BRITO et al., 2023).*

The third form is the Social Control Organizations (OCS), which, unlike the SPG and the audit, does not offer producers the use of the SisOrg seal. As a result, producers participating in this modality must market their produce only through direct sales. Only family producers can participate in the OCS, which, like the SPG, is characterized by the Social Control and Solidarity Responsibility that the system provides. The OCS can be formed by a group, association, cooperative, or consortium of family producers, with or without legal personality, but the OCS must be registered with the MAPA (BRITO et al., 2023).

Brazil was the first country to regulate the Participatory Guarantee System (SPG), serving as a world reference in this conformity assessment system (HIRATA et al., 2019). In addition, NI n° 19 established guidelines for the National Register of Organic Producers (CNPO), the certificate of conformity, and defined the use of the SisOrg Seal (Brazilian Organic Conformity Assessment System) for certified products.

Also, in 2009, on July 23<sup>rd</sup>, Decree n° 6.913 was instituted, which deals with phytosanitary products approved for use in organic farming, and on November 5<sup>th</sup>, NI n° 50 was published, establishing the single official seal of the Brazilian Organic Conformity Assessment System (SisOrg), determining the requirements for its use on organic products. NI n° 50 was later replaced by NI n° 18 of June 20<sup>th</sup>, 2014 (BRASIL, 2019d; BRASIL, 2014a).



Figure 1. Official seal of the Brazilian Organic Conformity Assessment System ("Selo SisOrg"). Above, the organic seal used for audit certification; below, the organic seal used for the participatory system.

Figura 1. Selo oficial do Sistema Brasileiro de Avaliação da Conformidade Orgânica ("Selo SisOrg"). Acima, o selo orgânico utilizado para a certificação de auditoria; abaixo, o selo orgânico utilizado para o sistema participativo.

Translation: "Produto orgânico": Organic Product; "Certificação por auditoria": Certification by Audit; "Sistema participativo": Participatory Guarantee System. Source: Adapted from (BRASIL, 2014a).

Seven other Normative Instructions were published in 2011. NI n° 1, of May 24<sup>th</sup>, 2011, jointly issued by SDA/SDC/ANVISA/IBAMA, establishes the procedures



for registering phytosanitary products approved for use in organic farming; NI n° 23, of June 1st, 2011, which establishes the Technical Regulation for Organic Textile Products De-rived from Cotton; Joint NI n° 24, of June 1st, 2011, which adds food additives and technology aids permitted in the processing of organic plant and animal products; NI n° 02, of June 2nd, 2011, jointly issued by SDA/SDC, which establishes the reference specifications for phytosanitary products approved for use in organic farming; Inter-ministerial NI n° 28, of June 8th, 2011, which establishes Technical Standards for Organic Aquaculture Production Systems; NI n° 37, of August 2nd, 2011, which established the Technical Regulation for the production of Edible Mushrooms in Organic Production Systems; and NI n° 38 of August 2nd, 2011, which establishes the Technical Regulation for the Production of Seeds and Seedlings in Organic Production Systems (BRASIL, 2011a; BRASIL, 2011b; BRASIL, 2011c; BRASIL, 2011d; BRASIL, 2011e; BRASIL, 2011f; BRASIL, 2011g).

In 2012, through Decree n° 7,794/2012, the federal government instituted the National Policy for Agroecology and Organic Production (PNAPO), aimed at allocating public funds to advance and foster agroecological transition and organic and ecologically based production (BRASIL, 2012).

The main instrument of the National Agroecology Policy (PNAPO) was the National Plan for Agroecology and Organic Production (PLANAPO), whose management bodies were the National Commission for Agroecology and Organic Production (CNAPO), made up of government representatives and civil society organizations, and the Interministerial Assembly for Agroecology and Organic Production (CIAPO), made up solely of government members to integrate and coordinate intra-governmental actions.

The first phase of PLANAPO, called “Brasil Agroecológico” (Agroecological Brazil), covered the period from 2013 to 2015 and represented a major step forward from the perspective of organizing actions in this area, promoting coordination between the public and private agents involved, expanding the intentions of government managers, which helped to incorporate the issue into methods for structuring and implementing public policies (SAMBUICH et al., 2017).

In 2015, given the provisions of Decree n° 7,794 of August 20th, 2012, Normative Instruction n° 13 of May 28th, 2015, was published, establishing the structure, composition, and duties of the Thematic Subcommittee on Organic Production, and the structure, composition and duties of the Organic Production Commissions in the Federation Units (CPOrg-UF), and the guidelines for drawing up their respective internal regulations (BRASIL, 2015).

In 2016, through the Interministerial Ordinance MDA/SEGOV/PR n° 1 of May 3rd, 2016, the second phase of PLANAPO (2016 - 2019) was launched, which followed the same basis of broad civil society participation as the first cycle. However, since 2016, the issue has weakened, and a third cycle of the program has not followed. In addition to the regulations already mentioned, MAPA issued three important Technical Notes (TN), one in 2014 and two in 2018. The TN COAGRE (COAGRE = Agroecology coordination) n° 40, of August 6th, 2014, deals with provisional procedures for the registration and labeling of organic products; TN n° 1/2018, which provides for the use

of various terms for the marketing of organic products; and TN n° 2/2018, which provides for the addition of water and salt in the formulations of organic products or products with organic ingredients (BRASIL, 2014b; BRASIL, 2018a; BRASIL, 2018b).

### 3. MAIN POINTS ON ORDINANCE N° 52/2021, THE NEW GUIDELINE FOR ORGANIC PRODUCTION IN BRAZIL

In 2021, MAPA published Ordinance n° 52 of March 15<sup>th</sup>, 2021. Ordinance n° 52 revoked Normative Instruction n° 46 of October 6<sup>th</sup>, 2011, establishing the new technical regulations for organic animal and plant production systems and the lists of permitted substances and practices (BRASIL, 2021). The new Ordinance also revoked Normative Instructions n° 37 and n° 38 of August 2nd, 2011, which now govern mushroom, organic seeds and seedlings production. Ordinance n° 52 was initially due to come into force on April 1<sup>st</sup>, 2021, but Circular Letter n° 2/2021 - MAPA set a deadline of March 15<sup>th</sup>, 2022, for producers to comply with the new regulations. It presents clearer language, meeting a demand from producers and technicians who were asking for a contemporary and easy-to-understand text. The new regulation also adds substances and practices to the "Positive Lists", expanding the technological options available to producers and the industry.

The update also includes new rules for the production of seedlings and seeds; mushroom production; animal production, with emphasis on animal welfare; plant production; and an increase in the characterization of the organic production unit; the inclusion or alteration of items to be included in the Organic Management Plan; greater rigidity concerning the source of contaminants, with emphasis on Genetically Modified Organisms (GMOs); inclusion of criteria for migratory beekeeping and meliponiculture; among others.

Among the new rules established by Ordinance n° 52, we can consider that the most impactful and with the greatest implications were those concerning the use of seeds and seedlings in plant production. Seedling and seed production are highly specialized and fundamental practices for obtaining good yields, for which many producers currently do not have sufficient and appropriate foundations or knowledge to promote the production of quality seeds and seedlings.

Even with the subsequent update by Ordinance n° 404 of February 22<sup>nd</sup> (BRASIL, 2022a), which stipulated a deadline of five years for vegetable seedlings obtained from seeds to come from organic production systems, this reality still seems a long way off. There are very few organic seedling producers, and to date, there is no sign of the availability of organic seeds and seedlings for the list of species announced by MAPA. Figure 2 shows, utilizing an infographic, the main changes that Ordinance n° 52 of March 15, 2021, established.

Following the publication of Ordinance n° 52, two more Technical Notes (TN) were published rectifying some of the issues in Ordinance n° 52: Technical Note n° 1/2022 and Technical Note n° 2/2022, which deal respectively with mushroom production and production in pots and elevated structures (BRASIL, 2022b; BRASIL, 2022c). In addition to the Technical Notes, Ordinance n° 404 of February 22<sup>nd</sup>, 2022, was promulgated by the MAPA, amending Art. 103 § 2° of Ordinance n° 52, which deals with the use of organic seeds and seedlings.

It is important to note that not all organic production systems are covered by the Ordinance. For example, it does not deal with Aquaculture Production, Extractivism, and

Processed Foods, for which the previous specific Normative Instructions continue to apply. Chart 1 shows the main organic production legislation in force in Brazil.

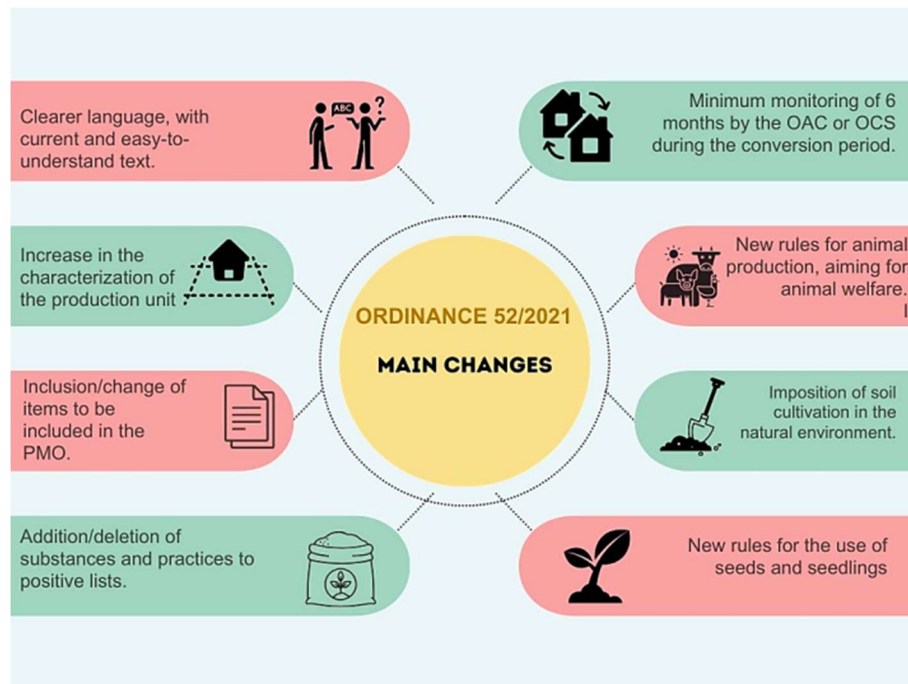


Figure 2. Main changes established by the Ministry of Agriculture, Livestock and Food Supply (MAPA) Ordinance nº 52/2021. PMO: Organic handling plan; OCS: Social Control Organizations; OAC: Conformity Assessment Bodies.

Figura 2. Principais alterações estabelecidas pela Portaria nº 52/2021 do Ministério da Agricultura, Pecuária e Abastecimento (MAPA). PMO: Plano de manejo orgânico; OCS: Órgãos de Controle Social; OAC: Organismos de Avaliação da Conformidade.

Chart 1. Compilation of the main organic production law, decree, normative instruction, and ordinance in force in Brazil in 2023.

Quadro 1. Compilação das principais leis, decretos, instruções normativas e portarias de produção orgânica vigentes no Brasil em 2023.

Legislation	Legislative provision
Law nº 10,831, of December 23, 2003.	Provides for organic farming and other measures.
Decree 6,323 of December 27, 2007.	Regulates Law nº 10,831 of 2003.
Joint Normative Instruction nº 17, of May 28, 2009.	Approves the technical standards for obtaining organic products from organic, sustainable extractives.
Joint Normative Instruction nº 18, of May 28, 2009.	Approves the technical regulations for the processing, storing, and transporting of organic products (amended by Interministerial Instruction nº 24/2011).
Normative Instruction nº 19 of May 28, 2009.	Approves organic quality control and information mechanisms.
Decree nº 6.913 of July 23, 2009.	Establishes differentiated registration for phytosanitary products approved for use in organic farming.
Normative Instruction nº 23, of June 1, 2011.	Establishes the Technical Regulation for Organic Textile Products Derived from Cotton.
Interministerial Normative Instruction nº 28, of June 8, 2011.	Establishes Technical Standards for Organic Aquaculture Production Systems.
Normative Instruction nº 18, of June 20, 2014.	Establishes the official seal of the Brazilian Organic Conformity Assessment System and sets out the requirements for its use.
Ordinance nº 52, of March 15, 2021.	Establishes the Technical Regulations for Organic Animal and Plant Production Systems and the lists of substances and practices permitted for use in Organic Production Systems.
Ordinance nº 404, of February 22, 2022.	Amends Art. 103 § 2º of Ordinance nº 52, which deals with using organic seeds and seedlings.

### 3.1. A case study for strawberry in organic system: how are the new rules affecting farmers?

In this section, we will discuss how Ordinance nº 52 is affecting the organic production of strawberry (*Fragaria × ananassa* Duch.). We used this crop as an example because of the greater impact of new rules on strawberry farmers. However, what is discussed here can be expanded to other cultivated plants to which the specific conditions are

applied. Strawberry production is characterized by a wide range of cultivation systems (Figure 3) (HERNÁNDEZ-MARTÍNEZ et al., 2023). Farmers can choose to grow strawberry plants on soil, in a hill system (Figure 3A) or out of the ground, with cultivation in soil-less media (substrate) (Figures 3B, C, and D).

Specifically, updating organic legislation is becoming a barrier to strawberry production in the ground in organic

systems, making cultivation challenging and frequently impractical (GRUNEVALD, 2022; de SÁ RESENDE et al., 2023). Discussion in farmer groups includes nutrition, how to obtain organic seedlings, and the new regulations for cultivation out of the ground, in substrate.

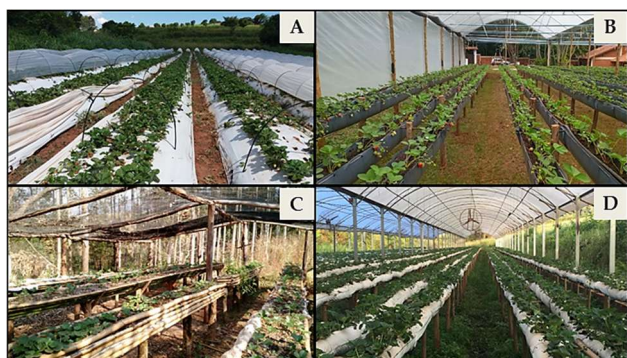


Figure 3. Strawberries are cultivated in different systems. A) Strawberry cultivation in hill system B) strawberry cultivation in substrate, with plastic to support the substrate; c) strawberry cultivation in substrate, with bamboo and plastic to support the substrate; d) strawberry cultivation in substrate, with substrate in plastic grow bags.

Figura 3. Morangos são cultivados em diferentes sistemas. A) cultivo de morango em canteiros sobre o solo. b) cultivo de morango em substrato, com plástico para suporte do substrato; c) cultivo de morango em substrato, com bambu e plástico para suporte do substrato; d) cultivo de morango em substrato, com substrato em sacos plásticos de cultivo (slabs).

The previous legislation did not provide guidelines for systems on the ground, using substrate. Then, farmers continued to cultivate with authorization from organizations that guarantee organic quality with a minimum of 30-50% of soil in the substrate composition, depending on the organization. The new regulations, however, still lack clarity and apply a subjective norm to this type of cultivation.

Ordinance n° 52's Article 97 mandates that soil must be used for plant production. However, Chapter II's second paragraph permits the use of pots, or similar, in certain exceptional circumstances where cultivation in a natural setting is not feasible. In this way, cultivation out of the ground is addressed, where it is determined that the substrate used to replace the soil must have physical characteristics and chemical and biological properties similar to soil in natural conditions. This includes raised beds or structures of a similar nature, provided that the substrate is made exclusively from materials authorized in the technical regulations. One of the main points of this Article is what do "exceptional circumstances" mean? There is no definition of what it is in the Ordinance n° 52. This renders comprehension arbitrary.

It is important to note that subjective points in the legislation are required for applying the law correctly and fairly, adapting the legal system to the specific reality of each farmer. Subjectivity is critical to avoid law for law's sake, which would complicate the process of ensuring organic quality even further. However, the current work raises the question of whether guidelines are required at some points to guide how the farmer and auditor should behave to ensure organic quality.

Another point that must be taken into account concerns plant nutrition. According to the fourth paragraph, article 97, of Ordinance n° 52, plant nutrition cannot be carried out exclusively through nutritional solutions, such as those used

in hydroponics and similar techniques, or exclusively by fertigation. It is therefore necessary to add different fertilizers, permitted by ordinance, when making the substrate and later, during the crop cycle, for fertilizers to be used in solid form.

According to Ordinance n° 52, the seedlings must originate from organic systems. However, producers or companies producing organic strawberry seedlings are, to our knowledge, non-existent or very limited, and cannot attend to the organic strawberry seedlings demand in Brazil. Furthermore, most of the cultivars currently in use are protected by patents, preventing farmers from producing their seedlings by stolons.

Another obstacle is that the seedlings have to go through a period of vernalization, which is the accumulation of hours of cold to induce plant stolon or flowering (OVIDEIO et al., 2020; GUEVARA-MATUS et al., 2023), and only large groups of seedling suppliers have the adequate structure to prepare these seedlings. Suppose the producer of organic seedlings needs to acquire vegetative propagation material from non-organic production systems. In that case, they must have  $\frac{3}{4}$  of their production period under organic management so that the seedlings produced can be considered organic. This makes the production of organic strawberries difficult, especially in strawberry production systems in soil beds in which plants are generally replaced annually.

### 3.2. A case study for edible mushroom in an organic system: the problem was readily solved

The production of organic edible mushrooms in Brazil is undergoing expansion, with cultivation from inoculated substrates being one of the primary methods employed (Figure 4). Ordinance n° 52 revoked the previous regulation that established the Technical Regulation for the production of edible mushrooms in organic production systems, introducing new guidelines.

Among the changes established by the Ordinance n° 52, the determination that at least 50 % of the materials composing the substrates must originate from organic production systems has generated the most significant repercussion. This is because a considerable portion of the substrates is based on materials with a high content of lignin, cellulose, and hemicellulose (such as dried grass, sugarcane bagasse, sawdust, various fruit residues, corncob, among others) (BAKTEMUR et al., 2022; LEONG et al., 2022; XU et al., 2023), bran or flours, manures, limestone, gypsum, and other nutrient sources, which can constitute up to 90 % of the substrate composition. However, for some of these materials, certified organic sources are not available, often rendering the production of organic mushrooms unfeasible.

With the publication of Ordinance n° 52, a series of inquiries from producers, conformity assessment bodies, and CPOrg-UF emerged, indicating the impossibility of complying with the sole paragraph of Article 125. These complaints sparked a significant movement among producers, resulting in the publication of Technical Note n° 1/2022/DIFIQ/CPOR/DTEC/SDA/MAPA, which disregarded the sole paragraph of Article 125, authorizing the use of other materials available in the market, preferably those treated with substances and products authorized by the Ordinance (BRASIL, 2022a).

In this case, there was a subsequent and rapid correction, updating the regulation, which reduced the negative



repercussions and economic losses to edible mushroom producers.

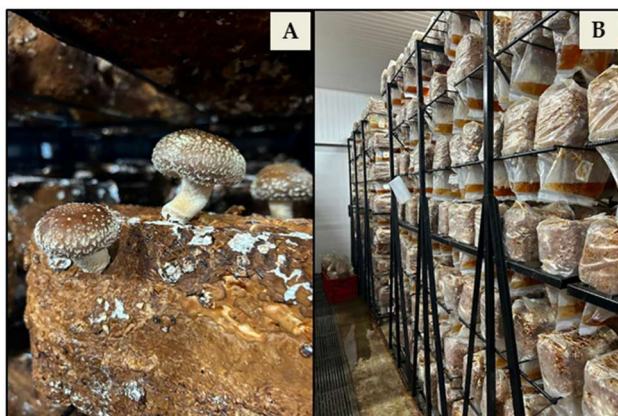


Figure 4. Edible mushroom production in an organic system. A) shiitake mushroom (*Lentinula edodes*); B) mushroom in substrate in a fruiting chamber.

Figura 4. Produção de cogumelos comestíveis em sistema orgânico. A) cogumelo Shiitake (*Lentinula edodes*); B) cogumelo em substrato em câmara de frutificação.

### 3.3. Case study on the production of organic vegetable seedlings and seeds: possible barriers to the adoption of new organic farmers

The production of vegetable seedlings is a highly specialized and determining activity in vegetable production. To obtain seedlings with a high-quality standard, investments in structure and in-depth technical knowledge are needed. In Brazil, the production of certified organic seedlings is still incipient, being practiced by only 0.8% of organic producers.

In all technical regulations updates on plant production published since its beginning, Brazilian legislation on organic production attempted to establish the use of organic seeds and seedlings, maintaining the article “Seeds and seedlings must come from organic systems. However, given the low availability on the market, the difficulty of access, and the lack of technical knowledge of farmers to produce seedlings and seeds in organic systems, organic production standards authorize the use of non-certified seeds and seedlings when these certified materials are unavailable (BRASIL, 2011h; BRASIL, 2021).

In Ordinance 52, an attempt was made to promote progress on the topic, establishing a deadline of one year for the production of vegetable seedlings obtained from seeds in organic systems to be mandatory. Ordinance 404, published in February 2022, extended the period to 5 years, proposing the gradual adoption of the use of vegetable seedlings obtained from seeds, with an increase of 20% per year in mandatory use (BRASIL, 2022b).

For producing organic seedlings, only inputs and practices permitted in Ordinance 52 (positive lists) can be used. The most frequently used material in the world as a substrate in the production of seedlings is peat, a material that has restrictions on its use in organic production due to the environmental impacts of its extraction (TESTANI et al., 2017). The search for more ecologically friendly materials that can replace peat has also been the subject of work in the area of soilless culture. Some ways, such as the use of biochar, coconut fiber, composting, organic waste and wood fibers have been studied (ATZORI et al., 2021). However, in Brazil, a continental country that comprises five different biomes, the search for local solutions for the production of substrates

and biofertilizers that allow the production of quality vegetable seedlings still needs further study.

The availability of organic seeds for the production of certified vegetable seedlings is another existing bottleneck. As of NI 46, legislation provided that the Ministry of Agriculture would publish a list of organic seeds available in each region, as is already the case in countries such as France and England. This mechanism was not implemented until the present moment of this work, making access to certified seeds difficult for farmers and seedling producers.

After 20 years of the publication of Law No. 10,831, certified farmers represent less than 1% of the area and Brazilian farmers (LIMA et al., 2020). The number of producers appears to be insufficient to guarantee sufficient demand for organic seedlings to justify the investments of nurseries specialized in vegetable seedlings in the production of certified seedlings.

The benefits of adopting the use of organic vegetable seedlings, such as valuing local biodiversity and taking advantage of regional sources to manufacture substrates, are highly desirable. In any case, the requirement to use certified seedlings without there being public policies that (1) encourage the development of production technology locally adapted to the different realities existing in the countryside, (2) strengthen rural extension services and guarantee the sharing of knowledge already produced on the topic with farmers and seedling producers tends to create barriers for new farmers to join organic agriculture and make it difficult for farmers already certified to remain.

## 4. GENERAL CONSIDERATIONS, BOTTLENECKS AND SUGGESTIONS

Brazilian legislation on organic farming stands out for having been built collectively between government and society, taking into account the social, environmental, and cultural differences of the different regions of Brazil, making them less exclusive.

Since the beginning of the regulation of organic farming in the country, through Normative Instruction nº 007 of May 17<sup>th</sup>, 1999, Brazilian legislation in the sector has undergone several modifications and updates, with five of the most relevant periods standing out (2003, 2007, 2009, 2011, and 2021). Although there are still sectors of organic farming that require regulation, today, we have comprehensive legislation that guarantees the organic quality of products in production and marketing.

However, we cannot ignore that the continual changes to the rules are an obstacle for professionals, students, and especially producers interested in the subject, who constantly need to keep up to date and often find it difficult to know what legislation is in force. That is why it is important to have materials that help those interested in the subject. This highlights the importance of this study.

For the scenario proposed by the Regulations to become feasible, government incentives and support for the development, research, and extension institutes are needed. This could boost the number of seed and seedling producers and provide an adequate organic substrate for planting. In addition, the development of research to structure a scientific base, with minimum protocols for producing organic seedlings, considering the substrates used and the control of pests and diseases, to obtain better quality seedlings is needed. This is one of the main factors that few enterprises invest in organic seedlings/seeds, and the farmers have to use

materials of insufficient quality, usually lower than conventional ones.

As seen in the organic strawberry case study, the legislation update hindered the production on the ground by imposing that the cultivation of plants must be on soil. Before, each conformity assessment body had its recommendation of the percentage of soil in the substrate. Now, after the legislation update, some conformity assessment bodies are prohibiting new farmers from growing crops above ground (who were growing in a hill system before or who want to start a strawberry production).

In 2022, the Technical Note nº 2/2022/DIFIQ/CPOR/DTEC/SDA/MAPA, which reaffirms that “when it is not possible to cultivate on soil, the producers can use pots, or similar”, with supporting evidence of the impossibility of cultivation on soil (archived and available for possible verification) (BRASIL, 2022c). The government could be clearer, defining the parameters for “on-ground” production systems by publishing a comprehensive technical note. Discussions on this topic are being made by diverse actors, and there will be a solution as soon as possible.

As the regulation is being demanded, already certified producers will face difficulties, and a new obstacle will be created to make it difficult for new producers to achieve the organic standard. Caution is needed when determining an obligation on this scale.

Like other places in the world, such as the United States, the European Union, and Japan, where the mandatory use of organic seedlings and seeds did not come about by regulation but by adherence, the adoption of organic seeds and seedlings in Brazil should happen because of their benefits to the system as a whole, in an orderly and planned way, with the support of the government, and not just by legal injunction.

Even after the Regulation update, some difficulties are still being encountered. Some points in the legislation could be less subjective, i.e., more detailed, based on technical aspects, so that quality assurance agents (auditors and inspectors) can have a solid basis in the legislation for their actions.

One example of subjectiveness is in Article 10, Chapter II of Ordinance nº 52, which states that farmers should mitigate the risks of contamination from neighboring areas. It is not detailed what an efficient method is to prevent these contaminations. This makes the auditor's or ethics committee's assessment subjective. In Brazil, the most common tactic used is the vegetative barrier. Depending on the development of the plants, vegetation density, number of planted rows, windbreak porosity, and other factors, this method is considered efficient in reducing the drift from one side to the other side of the vegetative barrier up to 90% (UCAR and HALL, 2001; FELSOT et al., 2010; LANGENBACH et al., 2022). Figure 5 illustrates the types of barriers that were used to mitigate contamination risks by different farmers. By common sense, Figure 5A would probably be considered a failed vegetative barrier. However, what about figures 5B, 5C, and 5D? Would these examples be sufficient to mitigate the spray drift from neighboring areas? The plastic barrier shown in Figure 5C has a few perforations. If neighboring farmers use synthetic insecticides, fungicides or herbicides, is that sufficient measure of spray drift mitigation? If the neighboring farmer is also organic, the risk is reduced. On the other hand, high-input synthetic crops as maize (*Zea mays* L.) or soybean

(*Glycine max* L. Merrill) in a neighborhood are a higher factor of risk.

The vegetative barrier may be used for biodiversity and conservation, biological control improvement (PRÉCIGOUT and ROBERT, 2022; BOINOT et al., 2023; FERRANTE et al., 2024). Then, the next organic legislation updates could encourage the use of vegetative barriers instead of non-natural barriers, which are usually used as an emergency tactic, but sometimes stay as a barrier for a long period.

The first step for the drift mitigation tactic with the vegetative barrier guideline could be the definition of barrier porosity. This is the main factor related to the vegetative barrier that influences the reduction of wind speed and also the pesticide carrier (UCAR and HALL, 2001). Non-porous windbreaks, such as the abovementioned plastic barriers, may increase the wind turbulence, drastically reducing the protection against drift (UCAR and HALL, 2001). In addition, farmers' (not only organic) awareness of the correct use of pesticides is needed. Factors that influence the pesticide spray drift are mode of application and formulation, droplet size, climatic conditions, and others (FELSOT et al., 2010). These factors are crucial for neighboring farmers to avoid the use of pesticides in adverse conditions.

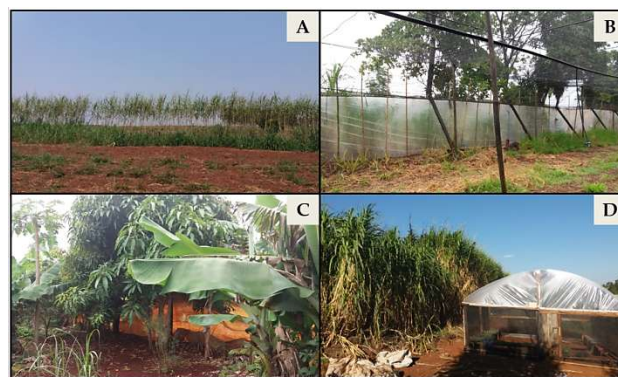


Figure 5. A) Vegetation barrier made up of Napier grass (*Pennisetum purpureum* Schum.) with an insufficient measure of pesticide drift mitigation. B) Barrier with transparent plastic, commonly used for emergency cases, when a vegetable barrier is insufficient; C) Barrier with ripped plastic; D) Well-established vegetation barrier with Napier grass.

Figure 5. A) Barreira vegetal feita de capim-napier (*Pennisetum purpureum* Schum.) com medida insuficiente de mitigação da deriva de pesticidas. B) Barreira com plástico transparente, comumente usada em casos de emergência, quando uma barreira vegetal é insuficiente; C) Barreira com plástico rasgado; D) Barreira vegetal bem estabelecida com capim-napier.

As discussed in the present work, the organic production legislation in Brazil is being continuously updated. Political policies should encourage/finance research on the topics that still have insufficient technical information, such as organic substrates, seedling productions, plant nutrition products, organic varieties that are adapted to the organic systems, etc. We understand that the process of research and construction of legislation is slow and should be implemented in a manner that farmers can adapt to legislation updates without losing the organic quality of the products guarantee.

For next legislation updates, harmonization of the organic legislation with other countries could be considered. This is important for improving the commercialization of organic products overseas. According to IFOAM, in 2022, 75 countries fully implemented regulations on organic



production (HYSA et al., 2023). An equivalence agreement is needed for commercialization between two countries with different legislative frameworks. There are similarities in regulatory structures and food production practices between Brazil, the USA and the European Union (ESTEVEZ et al., 2021), which can facilitate commerce among these groups. The most advanced agreement for organic certification harmonization is between Brazil and Chile. In 2018, the Ministry of Agriculture of these two countries issued a memorandum for understanding on similarities and analogies of organic production normative (LIMA et al., 2020). In the future, this can improve the organic products circulation between Brazil and Chile by mutual equivalence on organic legislation of these countries and also be the first of Brazil's other country accords.

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**Data availability:** Study data can be obtained by email from the corresponding author or the second author upon request. It is not available on the website as the research project is still under development.

**Conflict of interest:** The authors declare no conflict of interest. Supporting entities had no role in the study's design, data collection, analysis, interpretation, manuscript writing, or decision to publish the results.



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