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When Markets Make Agroecologies: Empirical Evidence from Downstream and Upstream Markets in Argentina, Brazil and France¹

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ABSTRACT

Markets for agroecological food and inputs are actively shaping ecological forms of agriculture. The processes that set up these two sets of markets, both upstream and downstream of farms, have an impact on agricultural systems and practices. To defend this thesis, we introduce results from ongoing studies over the past fifteen years of different forms of agroecology in France, Argentina, and Brazil. Without intending to be exhaustive, our examples focus on the effects of certification systems, marketing infrastructures, and companies' strategies. The article also demonstrates the role of the State in the political construction of these markets and, therefore, in the shaping of agroecologies.

KEYWORDS: Agroecology, Markets, Foodstuffs, Inputs, Farms JEL CODES: O30, O13, Q13

Since the early 2010s, agroecology has come to be known – particularly in international organizations such as the FAO - as the name for a set of innovative agricultural practices capable of constituting a sustainable alternative to the dominant agricultural model (HLPE, 2019; Loconto, Fouilleux, 2019; Bicksler et al., 2023). The term brings together relatively heterogeneous innovations, but the common denominator is inspired by the principles of ecology and to mobilize the biological processes at work in agroecosystems (see Barrios et al., 2020). Organic farming, as it has been formalized in public or private standards, is in this respect a relatively well-known form of agroecology. Forms of agroecology that are less formally framed, but are linked to relatively stabilized bodies of principles and knowledge, such as "biodynamic", "permaculture" or "peasant agroecology", are also maintained or developed. Agroecology can also be a term claimed by groups of farmers seeking to maintain the life and fertility of the soil ("conservation agriculture", "no-till farming") or to reduce the use of chemical pesticides in favor of biological products ("biological control", biofertilizers, "bioinputs"). Finally, Agroecology can sometimes refer to an overarching political program, independent of whether or not farmers use the term to describe their practices (Derbez, 2022).

The different forms of agroecology do not aim to achieve the same level of transformation of agricultural practices, but they all share the difficulty of scaling-up because of the constraints of the conventional agri-food system. This point has been particularly addressed by research on sociotechnical lockins (IPES-Food, 2018; De Schutter, 2017). Within this literature, emphasis has been placed on the constraints linked to market relations upstream and downstream of farms. Upstream there are agricultural supply firms. Because of the kinds of inputs and equipment they provide, and through the advice that they deliver to farmers, these firms mainly support the conventional agricultural model (Vanloqueren, Baret, 2008). Downstream, it is difficult to reconcile agroecological modes of production with wholesalers' and retailers' demand for cheap and homogeneous agricultural products (Boulestreau et al., 2021). Other requirements related to agri-food processing, such as those concerning the protein level in flour for industrial bread-making, also limit the range of possibilities for farmers (Wiskerke, 2003). Similarly, it is difficult for farmers to increase crop rotations (with the benefits of increased soil fertility and pest control that this would allow) if their cooperatives do not have the necessary infrastructure (sorting and storage facilities) to market the products that come from this diversification (Magrini et al., 2016). From this perspective, researchers have argued that the agroecological transition requires "coupled innovations" affecting the differrent components of agrifood systems, including upstream and downstream markets (Meynard et al., 2017; Magrini, 2023; Chiffoleau et al., 2021).

We agree with these arguments, but would like to take the reasoning one step further. Once new markets have been established with the aim of promoting a transition toward agroecology, it is also necessary to understand the impacts of these markets on agroecological practices. The argument that we advance in this paper is that the development of markets for agroecological food and inputs shapes different ecological agricultures. The processes that constitute these two sets of markets, upstream and downstream of farms, have an impact on farming systems and agricultural practices. They facilitate some production practices and impede others, they encourage certain forms of innovation in agricultural practices and hinder others. This argument is well captured by the following phrase: "When markets make agroecologies." This phrase should not be understood as a form of economic determinism. whereby it is only the market that "makes" agroecologies. However, given that most literature on agroecology has not systematically demonstrated the role that markets play in shaping agroecological production systems - or even stated that markets are antagonistic to agroecology - we suggest that the evolutionary paths of agroecology also depends on how both input (upstream) and output (downstream) markets are structured.

In this article, our objective is to bring out generic processes, observable in very diverse contexts. We will thus rely on the results of a series of qualitative case studies that we carried out in France, Argentina, and Brazil since the beginning of the 2010s. These results have mostly been published in a dozen previous articles that we quote throughout the article. The specific contribution of this article is to identify general processes across our cases that help to understand how markets make agroecologies. In addition, where relevant, the article also provides updated information on the processes described in previous articles. In Appendix 1, we present the cases studies and the methodologies of the main articles cited. These studies relate to very different forms of agroecology, like those we mentioned at the beginning of the introduction, and deal with cases of very heterogeneous scales of action, ranging from national public policies to local interactions between agri-food system actors. In the article, we do not go into indepth detail of the contexts, actors, or dynamics observed in each of the cases studied. Instead, we seek to identify common trends, actors and dynamics across the cases so to identify points of comparison and generalizable conclusions. The same applies to the methodological details of our studies that we briefly present in Appendix 1 and in more detail in each of the quoted publications.

Our conceptual framework is inspired by actor-network theory (Latour, 2005) and its developments in economic sociology (Callon, 2021). Thus, we take seriously the idea of agri-food systems or networks, by emphasizing the extent to which all of their agronomic, social, and economic components are co-determined in action (Busch, Juska, 1997; Lockie, Kitto, 2000). From this perspective, it becomes relevant to analyze, among other relationships, the impact of market organization on the ways in which agroecological production is organized. The notion of "market mediation", developed in economic sociology, emphasizes that the human (regulators, distributors, certifiers...) and non-human (standards, infrastructures, packaging, retail spaces...) intermediaries between sellers and buyers do not link a pre-existing supply and demand, but rather constitute and co-determine them in a single process of mediation (Cochoy, Dubuisson-Quellier, 2013; Kjellberg, Helgesson, 2007; for a review see Le Velly, 2021). In the cases presented here, we identify two market mediations in action: the first constitutes the inputs market by influencing the production and consumption of inputs; the second constitutes the food market by influencing the production and consumption of food. The farm, as a user of inputs and as a producer of food products, is thus influenced by these mediations, both upstream and downstream.

The article proceeds as follows. The first part discusses how shaping markets for agri-food products has implications for the forms of agrocecology that are developed. The second part analyzes how the shaping of upstream markets for agroecological inputs also influences agricultural practices and systems.

When the Shaping of Product Markets Makes Agroecologies

The organization of markets for organic products offers a first point of entry to our topic. We begin by reviewing the academic debates on the conventionalization of organic agriculture, highlighting the role of certification infrastructures (first section). We then describe counter-movements to this trend in France, Argentina and Brazil, with farmers and consumers creating alternative markets, based on a combination of participatory certification and short food chains (second section), and other actors trying to influence the organization of long chains through specific socio-technical devices (third section).

The Critique of Organic Certification in the Conventionalization Debates

Organic farming is one of the families usually recognized as belonging to agroecology. But within this organic familiy, there are also different lineages, referring to the history of the different groups that have developed it since the 1960s (for France, see Poméon *et al.*, 2018). In this history, the choices regarding the organization of markets have been decisive.

Since the 1980s, the dominant model for marketing organic products has been based on what we have called the tripartite standardization regime (TSR) (Loconto, Busch, 2010). This regime is founded on the construction of layered markets for products, standards, certifications and accreditations (Fouilleux, Loconto, 2017). In practice, the TSR requires that independent third parties carry out audits of farms and of certification bodies in order to ensure that the farmers are practicing the type of agriculture detailed in the standard and to ensure that the auditors are competent to carry out audits of the farmers' practices (Loconto, 2017). The way that the actors of the TSR carry out their work is based on an assumption of scientific objectivity (Ransom et al., 2017), which should build trust between multiple and distant operators and is a key driver of organic market growth (Dufeu, Le Velly, 2016). However, it is also a vector of modification of production. This may seem obvious: it is their raison d'être to frame agricultural practices. But this statement is less banal than it seems when one critically examines the whole system effects of the TSR. Research on the conventionalization of organic farming has begun to demonstrate these effects.

Studies in agronomy and in sociology have showed that the standards of organic agriculture are relatively weak compared to the founding principles

affirmed by the International Federation of Organic Agriculture Movements (Seufert et al., 2017; Dufeu et al., 2020). For instance, when reading the first Californian organic standards, Julie Guthman highlighted the lack of consideration within the standards for the social rights of farm workers or the presence of inputs with controversial health or environmental impacts (Guthman, 1998). This narrowing of requirements may result from the difficulty of maintaining the complexity of certain agroecological principles when writing precise rules that must be controlled in an 'objective' manner (Seppänen, Helenius, 2004). It may also result from pressure from conventional agriculture to impose flexible criteria to stimulate farm conversion in order to meet market demands (Guthman, 2004; Niederle, Radomsky, 2017). The content of the standards must be understood as the result of a political struggle, where opposing actors are defending unequally demanding conceptions of organic farming. However, in this struggle, the less demanding actors tend to prevail, especially in a context of international harmonization and competition with other sustainability standards (Fouilleux, Loconto, 2017).

Second, the TSR has also been criticized because of the barriers to entry that it does or does not generate. On the one hand, it favors the entry of actors practicing industrial organic agriculture, as the standards allow for a conversion by simple substitution of inputs, which is *a priori* easier than a full material and cognitive reconfiguration of agricultural systems (Rosset, Altieri, 1997). On the other hand, the complexity and costs of certification are obstacles for economically marginalized producers, as standardization can favor the most robust organizations (Gómez Tovar *et al.*, 2005). These critiques echo the thesis of this article: the intermediaries that make markets for agroecological products, such as standards, are far from being mere trade facilitators. They affect agricultural activities; they enable and encourage some forms of agroecological production practices, and make others less likely.

The Promotion of Alternative Certification and Short Food Chains

This analysis of the trends in how organic agriculture has evolved over time is not restricted to the academic sphere. In the three countries we surveyed, there is a well-established critique brought to the fore by promoters of organic farming or of agroecology, which has led to other forms of market shaping.

In France, the criticisms have emerged in a context of very strong growth in both the production and consumption of organic. Between 2010 and 2020

the area of cultivated land was multiplied by 3.5 and the organic consumption had quadrupled. This situation is marked also by the entry of new actors (recently converted farmers, conventional agri-food industries, networks of large supermarkets) and by a growing movement in the public sphere that denounces the excesses of industrial organic farming. Nature & Progrès (N&P), a pioneering organic association in France, has used the current context to reaffirm its criticism of the organic label and TSR (Niederle et al., 2020; Poméon et al., 2018). N&P positions itself as a promoter of a return to the agroecological principles of organic, from which certified organic agriculture would have strayed (Lamine et al., 2019). According to this network, organic farming should remain in a logic of peasant agroecology, involving only small farms and refusing to participate in mass markets. N&P also promotes its participatory guarantee system (PGS) as an alternative to the TSR (Loconto, Hatanaka, 2018). PGS is a system of audit that relies upon farmers' knowledges to conduct peer reviews of farms. Farmers in a PGS typically work in groups of 10-30 farmers to check up on each others' practices in a continuous process. Many PGS include consumers, researchers, technicians and other citizens in the peer review process.

However, the case of N&P can also be interpreted as a relative failure given the small number of French organic farmers involved in this movement: roughly one thousand, compared to the 50 000 certified organic farmers in France in 2022. Compared to the Ecovida movement in southern Brazil, N&P has also failed to influence the regulatory framework (Niederle *et al.*, 2020). In particular, even though it refers to an organic standard that is stricter than the European Union (EU) regulation, N&P's PGS does not enable its producers to use the EU label or the word organic.

The Ecovida network was established in 1998 through a collaboration of local, alternative agriculture organizations active since the 1980s (Lamine *et al.*, 2019). In March 2023, it certified 5580 family farms (from a total of 24 759 in the whole country) that are distributed in 300 local groups, themselves grouped into about 30 *núcleos* (nuclei). The creation of Ecovida was directly motivated by the first Brazilian organic agriculture regulation, at a time when the state was encouraging third-party certification with an eye toward developing export markets (Niederle *et al.*, 2023). Ecovida members saw this institutionalization of the TSR as the promotion of a narrow definition of organic agriculture, centered on a logic of banning certain inputs and mainly developing the market. Moreover, for them, this regulation was drafted to promote the interests of large capitalist farms and buyers from industrialized countries. In view of its financial costs and the administrative complexity, Ecovida concluded that the third-party certified TSR was

unsuitable for family farms, which are consequently excluded from the organic farming market.

Supported by agrarian and ecological social movements, Ecovida was able to persuade the Brazilian government to formally recognize this variety of forms of organic guarantee systems (Niederle *et al.*, 2020). The election of President Lula in 2003, who was strongly supported by these movements, opened the door for this recognition. Nowadays, in Brazil, 11 034 farmers use third-party audit while 8785 are integrated in PGS.

The existence of these guarantee systems was fundamental to structure different markets. In general, while third-party certification was required by processing industries, exporters, and large retailers, participatory certification systems enabled the creation of alternative food networks, principally through the creation of farmers' markets and public procurement programs. In addition, by constituting these different markets, such sociotechnical devices produced direct effects on agricultural practices, notably due to the way in which, by making access to such markets feasible, PGS encouraged a more diversified and small-scale farming, while third-party certification continually pushed for standardization and scaling-up (which, in turn, implies increased use of external bioinputs).

In Argentina, by virtue of a limited capacity for mobilization, social movements have been unable to avoid being excluded from organic agriculture brought about through the institutionalization of the third-party TSR (Patrouilleau et al., 2017). They have failed to consolidate PGS, which exist informally and only in local, short food chains. As a result, agroecology has recently been incorporated into the discourse of peasant movements as an element of resistance to the exclusionary processes brought about by largescale organic production. Organizations such as the National Movement of Peasants and Indigenous Peoples (MNCI) and the national section of the Latin American and Caribbean Agroecological Movement (MAELA) stand out in this process. However, they do not have a strong mobilization capacity to change the institutional framework. Universities and research centers of the National Institute of Agricultural Research (INTA) have also opened up space for the development of agroecology, but they bring an essentially technical perspective (Goulet, 2019). Ultimately, in Argentina, the institutionalization of alternative certification systems for organic agriculture, and consequently the inclusion of family farmers remains blocked. So do the agricultural practices they carry.

Long Chains That Face the Risks of Conventionalization of Organic Agriculture

In France, it is not only at the margins of the profession where questions are being raised about the risks of conventionalization of organic agriculture. The Fédération nationale de l'agriculture biologique (FNAB), the main network of organic farmers in the country, has repeatedly pointed to the risks of what it calls the "change of scale" of organic farming (Chance et al., 2018). While not opposing the growth of the market and the arrival of new entries, the FNAB has taken on the mission of raising the alert to the risks of conventionalization and promoting a model for the organization of organic farming in long chains that are consistent with organic values. To this end, it has developed a discourse that takes into account the pitfalls that are to be feared or that can already be observed (e.g. very large laying hen farms), reaffirmed its project (drafting of the "Charter of the values of the FNAB and its network") and described the economic model that it wishes to promote in this context of change of scale. The FNAB is therefore less interested in creating alternative markets than in educating mainstream operators. Through the publication of brochures and practical guides, the organization of professional conferences or the signing of agreements (for example with catering companies), the FNAB seeks to promote certain practices that are as much economic as agronomic. In particular, it has emphasized the benefits of establishing multi-year planning and contracts enabling the sales of all crops grown in rotations (Chance et al., 2023). Moreover, the FNAB created an additional certification, in addition to the EU label. In 2020, it developed its own label "Bio-Français-Équitable" (Organic-French-Fair) and tested it with the largest retailor of frozen foods in France (Picard).

Organic farmers organizations are also acting on a regional scale to support their vision of organic farming. This is notably the case of Bio Loire Océan (BLO), an association of 70 market gardeners and arboriculturists located in the Pays de la Loire region (Bréchet, Dufeu, 2019; Schieb-Bienfait *et al.*, 2020). The changes in regulatory requirements and the current development of industrial organic production methods do not correspond to their vision of organic. Having experienced complicated commercial relations with a largescale retailer, the members are also very vigilant about the risks of pressure on prices. To cope with this, they have set up original rules and mechanisms that give life to their specific organic farming project (Dufeu *et al.*, 2020). These rules were written progressively so that in 2015 they arrived at a technical standard that allowed the use of third-party certification. This document sets out principles that go beyond those of the public regulations, both on agronomic aspects (*e.g.* refusal of deep ploughing, sterile male plant seeds) and on socio-economic aspects (*e.g.* good working conditions for farm workers, development of sales in short circuits). These specifications must first be seen as a way for BLO producers to define what they consider organic farming to be, and then to act collectively to implement this value. Second the standard is a market-building device: the specifications are a guarantee for BLO's clients, primarily the Biocoop network of organic shops, whom are also seeking ways to push beyond the minimum requirements of the EU label.

In Brazil, some recent trends inspire a less positive conclusion. The consistent growth in demand for organic food estimates by the Ministry of Agriculture point to a growth of 20% per year and the restriction in the supply of third-pary certified food led supermarkets and processing industries to incorporate participatory certification. The requirement that this type of certification be carried out by a formal association also contributed to this, so that, in the event of non-compliance, buyers can sue this association in court. This situation has resulted both in increased bureaucratic pressure on farmers, forced to fill in numerous audit forms, and in changes in quality standards. The incongruity between these new demands and the logic of qualification that presupposed the participatory certification is expressed in the speech of some leaders of the peasant agroecological movement as a kind of "colonization" of participatory certification by the rationale of auditing. The growing pressure of a techno-scientific logic is expressed, for example, in the bureaucratization of controls, in the standardization of information systems, in the creation of countless technical forms that need to be filled out, in the requirement to prove with invoices the acquisition of inputs and seeds. In the case of Ecovida, this even implied the creation, in 2018, of a computerized system for document management, which has resulted in pressure for farmers to standardize their agricultural practices - the lower the diversification of crop production on farms, the lower the number of forms to be filled in, for example.

The rules and mechanisms described in this section have different configurations, but they confirm the existence of close links between the shaping of market exchanges and the forms of farming practices and systems. The challenge for the actors is to act on the market rules and infrastructures in order to support an agricultural activity that conforms to their vision of organic agriculture or agroecology. The following sections will show that this is also true for upstream markets.

When the Shaping of Agri-Supply Markets Makes Agroecologies

The development of agroecology is often associated with the idea of reducing or removing certain inputs or practices that are harmful to the environment or to human health (Goulet, Vinck, 2012). This is the case, for example, with the reduction of pesticides, chemical fertilizers or tillage in crop production, as well as for the reduction of antibiotics in livestock production. To compensate for this reduced or prohibited use, advocates of agroecology recommend acting on certain balances: lengthening rotations or inserting legumes, adopting a global approach to herd health through the animals' diet and living conditions, etc. The argument is that by strengthening these so-called "natural" balances, by stimulating plant and animal defenses and by reducing their exposure to certain parasites, more robust organisms would require less use of external inputs. This balance approach is most often complemented by a second approach, which aims to use inputs that have no adverse environmental or health effects. Some of these inputs can in some cases be produced by the farmers themselves, in line with a vision of agroecology that defends the emancipation of farmers from suppliers and the commercial dependence they would generate. This approach, which has a strong political dimension, appeals to many actors close to alternative agriculture. It is embodied in numerous objects: seeds, machines or crop treatment products (Goulet, Hubert, 2020).

Nevertheless, the market for inputs or equipments that can support the development of agroecological practices is currently undergoing major developments, which we explore in the next sections. First, we show that both governments and companies are helping to build markets for these inputs. This generates innovations in agricultural practices beyond the first ring of pioneer farmers but also sets the scope of the possible agronomic options for farmers (first section). On a more micro scale, we explore the importance of the relationship that farmers have with the technical sales representatives of alternative input distributors. The advice that the latter couple with sales, as well as the user groups that they constitute, are essential vectors for changes in practices, and thus for the forms of agroecology that are developed (second section).

Bioinput Markets: Between Promoting Innovative Practices and Defining the Options Available

Our entry point is through the creation of markets for bioinputs. With this term, we mean first of all biological control products used in plant health (commonly referred to as biocontrol) or animal health. They can be based on macro-organisms (*e.g.* insects) or micro-organisms (*e.g.* microscopic fungi or bacteria capable of parasitizing crop pests or acting on the resistance of cultivated plants). We also include the biofertilizers used in plant production, either in the form of additives that valorize biomass, or in the form of bacterial inoculants that reinforce the plants' capacity to absorb nutrients like nitrogen or phosphorus. In the three countries of interest, public policies have encouraged the development of the market for such inputs, by influencing both supply and demand.

To stimulate supply, states have set up mechanisms to promote interactions between public laboratories and private companies, such as with the creation of the Biocontrol Consortium in France in 2016 (Aulagnier, Goulet, 2017), the extension also in 2016 of the Fonrebio program in Argentina (Fondo de Regulación de Productos Biotecnológicos), or the creation in 2018 of a unit dedicated to bioinputs within the Brazilian research institute Embrapa's (Empresa Brasileira de Pesquisa Agropecuaria). Measures to reduce the cost of registering bioinputs relative to chemical inputs have also been implemented, as in Argentina, where the registration fee was reduced by twothirds. But more than reducing costs, it is above all in the simplification of registration and approval procedures that the States have promoted, since biological inputs do not present the same health and environmental risks as chemical inputs. The purpose has thus been to facilitate and accelerate the availability of these products in the domestic markets (Goulet, 2021).

On the demand side, governments are trying to put in place measures to promote the use of bioinputs by farmers. For example, the Argentine Ministry of Agriculture has developed in 2015 the Profobio program (Programa de Fomento al Uso de Bioinsumos Agropecuarios), which provides financial incentives, albeit on a very limited basis, for the acquisition and testing of biocontrol products. In France, there is no form of direct financial aid. Instead, the agricultural development apparatus and the Ecophyto program, through the Dephy farm network, have provided a means of raising farmers' awareness of the value of these products. In Brazil, under the left wing government of Dilma Roussef (2011-2016), a specific funding line for agroecology in the Pronaf (Programa Nacional de Fortalecimento da Agricultura Familiar) included support for the use of bioinputs, and the public rural extension agencies were responsible for disseminating them to farmers. And even though programmes and institutions dedicated to family farming and agroecology were dismantled under the Bolsonaro government (Niederle *et al.*, 2023), bioinputs remained a priority for public action, with the implementation of a National Bioinputs Program in 2019 (Vidal *et al.*, 2021). Through this dual action, the states are contributing to the organization of a market for bioinputs that links companies, distributors and farmers.

All these policies support the development of markets for bioinputs and help break the lock-ins linked to the use of chemical inputs. But, once this first observation has been made, we must also look at what form agroecology is thus supported. In France, the development of these markets goes hand in hand with a lack of development of on-farm production of inputs, even though this is often supported by the historical advocates of agroecology. The advocates' argument is twofold: not only do they defend the right of farmers to emancipate themselves from input sellers in order to produce their inputs at a lower cost, but they also denounce the industrial tendency to concentrate their research and development activities on only a few strains of microorganisms and fungi. In so doing, the activists argue, we ignore the potential of the immense biodiversity that exists. The abandonment of specific strains of microorganisms or substances by agroindustries also means that we miss out on the positive effects that these strains might have in certain ecosystems. In Brazil, under the Bolsonaro government, the opposite trend was temporarily supported. The Brazilian State has in fact encouraged the production of microorganisms by farmers, triggering the ire of companies in the sector fearing that their sales would be eroded, and that of microbiologists in the academic sector fearful of seeing the proliferation of bad practices of production of microorganisms, and with them pathogens released into the fields.

Public action is not in itself a sufficient force to build these new markets, and we must also understand the role of the agricultural input industry. In this regard, bioinputs represent a major technological promise, attracting the attention of traditional input industry players. In the three countries we studied, this sector has long been composed of small to medium-sized enterprises (SMEs); led particularly by entrepreneurs with rather close ties to academia. Over the last ten years, large agrochemical groups have invested in this sector, developing subsidiaries and internal departments, but also and above all by acquiring these SMEs. This has led to a consolidation in the bioinput sector and the development of large international alliances aimed at organizing and federating the industries. Thus, in 2016, the international alliance BioProtection Global was created, bringing together national associations of biocontrol industries (such as the Brazilian association ABCBio) and pre-existing international alliances. It is also through these upheavals that the boundary between the chemical and biological input industries has gradually been erased: thus in 2019, the Brazilian association of biological control producers (ABC Bio) merged with CropLife, the agrochemical and biotechnology industries association (Goulet, 2021). We can observe numerous acquisitions, investments, international coalitions. In the face of an increasingly promising demand, the bioinput industry and market are undergoing profound transformations that are contributing to the generalisation of agroecological practices beyond their first circles of users, and a transformation of the boundaries between agroecological and conventional agricultural spheres (Goulet, 2022).

However, this shift is taking place at the cost of a concentration of power within the hands of a small number of industrial groups (see Howard, 2016). This concentration risks reducing the diversity of technological options available to farmers. Once again, the shaping of markets makes some agro-ecologies more possible than others. The market, as it is constructed, orients the nature of the available technologies and associated practices. While the interest of the agro-industries is growing across all cropping systems, fruit and vegetable production is at the forefront. Greenhouse market gardening, in particular, has experienced considerable growth since the 1980s, mostly driven by Dutch companies (Bonnaud, Anzalone, 2021). In field crops or viticulture (Villemaine *et al.*, 2021), the development of biological inputs is growing far more slowly, especially concerning biological control.

The Sales and Advising Relationship between Farmers and Inputs Suppliers

Highlighting the role of the State and companies at national and international levels provides initial information about how the constitution of agroecological inputs market can transform agricultural practices. However, we hesitate to accept this exclusively macro vision of market shaping. In fact, it appears that the analysis of the market relations that link agri-supply sellers to farmers is essential for understanding the reasons for changes in practices. We explain this importance by mobilizing data collected in France from companies marketing bioinputs and seed drills that allow no-till planting, a farming practice that is part of the "conservation agriculture" family of agroecology.

We characterize the importance of the relationship with agro-supply distributors in two ways. First, in addition to the known sources of information, mobilized in particular by traditional innovation system actors such as

cooperatives or public advisory services, suppliers of alternative inputs and equipments play an essential role in the bifurcations that farmers can make in their technical choices. We have observed this, for example, around the abandonment of plowing, with vendors of direct seeders, bioinputs and soil analysis services playing a role as advisors and facilitators within communities of farmers (Goulet, 2013). Second, we highlight the place that advice activities occupies in the work performed by the technical sales staff of these distributors. This observation is not unique to alternative inputs: sale of chemical inputs is closely linked to the activity of technical advice and this has regularly been seen as a hindrance to an agroecological transition (Compagnone, Golé, 2011). Since their income depends on it, sales representatives will usually provide advice on how to use inputs and thus promote them, no matter how harmful they are. This empirical reality forces us to ask the question: Could this interdependence between sales and advice also be a lever for the adoption of more environmentally friendly practices when it comes to selling alternative inputs?

Two points suggest that the answer is yes. The first is that the use of these new inputs is based on rules of action or observation that break with those in force until now. Indeed, the infestation thresholds that trigger a treatment, the application methods of biological inputs, or the time steps that allow us to observe their effectiveness, are quite different from those related to the use of synthetic inputs. However, in the absence of public guidelines on these issues, it is very often the firms that produce and market these products that support farmers in their agronomic changes. The sale of inputs is therefore inseparable from the development of agroecological practices or at least for certain agroecological practices. The challenge of building customer loyalty leads these firms to discourage their customers from using competing products or solutions, which might be better for their agro-ecosystems. The second point is that farmers engaged in the development of such practices place at least as much importance on the advice delivered by technical sales staff as on the effectiveness of certain products (Le Velly, Goulet, 2015). What farmers seek in relationships with technical salespeople is not only the acquisition of effective and relevant products, but also the knowledge that they need to reorganize their cropping or breeding practices. As an extension of this relationship, groups of user-clients are also created to share practices, but also to share the convictions regarding the model of agriculture that should be promoted.

Conclusion

With the cases explored in this paper, we have offered several illustrations of how the shaping of markets for agroecological products and inputs affects farmers' practices. Far from operating solely on an economic level, far from having only a facilitating effect on exchanges, the market mediations that constitute these two markets allow and encourage certain forms of agroecological production and make others less possible. The trajectories of agroecological innovations are therefore largely conditioned by the upstream and downstream markets shaping processes. Through the explanation of the dynamics observed in Argentina, Brazil and France, we demonstrate the strength of market intermediaries such as certification infrastructures and product marketing channels, but also certification procedures and input distribution networks. Our analysis also highlighted the importance of States' actions in the shaping of markets and the controversies over the agroecologies to be practiced. We have ultimately shown that actors in the agroecological movements are well aware of these market issues and actively seek innovations in both certification and inputs markets as a means to advance their cause. They have made a space for debate around the desirable models of markets in the their political struggles over the desirable models of agriculture. Whether it is a question of allowing the integration of family farmers, defending a model of organic agriculture that is stricter than the one defined by the public standards, worrying about the reduction of technical choices or the dependence of farmers on input suppliers, they turn their criticism and their action towards the modalities of market shaping.

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Appendix

Table 1 - Case studies and methodologies of the main research	
supporting the results presented in the article	

Source	Case studies	Form of agroecology	Methodologies
Chance <i>et al.</i> (2018)	France: actions carried out by the Federation Nationale de l'Agriculture Biologique (FNAB) with the aim of influencing the trajectory of the national organic sector in a context of strong growth	Organic agriculture	Qualitative analysis of about 50 documents, 13 semi-structured interviews with FNAB's staff, participant observation of a dozen of public events

Source	Case studies	Form of agroecology	Methodologies
Chance <i>et al.</i> (2023)	France: markets' shaping strategies of one farmers' cooperative (Norabio) and one vegetable trading company (Ferme de la motte)	Organic agriculture	Semi-structured interviews with 18 organic farmers, 9 employees of Norabio and Ferme de la Motte and 5 task officers from development bodies created to support organic farmers
Dufeu <i>et al.</i> (2020); Schieb- Bienfait <i>et al.</i> (2020)	France: rules and devices that an association of farmers (Bio Loire Océan) put into place to implement their vision of organic farming	Organic agriculture	Qualitative analysis of all Bio Loire Océan's archives, 12 semi-structured interviews with BLO's members, participant observation of 15 BLO's meetings
Fouilleux and Loconto (2017)	Global: institutionalization of the global organic agriculture market through standard- setting, certification, and accreditation activities	Organic agriculture	Qualitative analysis of a range of publicly available standards, documents and websites, 16 semi- structured interviews with actors in the global organic field, participant observation of 25 international conferences and of different specialized email lists
Goulet and Hubert (2020)	Argentina: building and setting up of publics policies and national programs to promote the use/production of biological inputs	Organic agriculture/ biological control/ conventional agriculture in transition	25 semi-structured interviews with public servants, scientists and entrepreneurs, ethnographic observation of 10 meetings organized by Ministry of Agriculture
Goulet (2021)	Argentina: building and setting up of publics policies and national programs to promote the use/production of biological inputs	Organic agriculture/ biological control/ conventional agriculture in transition	18 semi-structured interviews with public servants, scientists, industry representatives, NGOs, farmers, ethnographic observation of 5 meetings organized by the Ministry of Agriculture

Source	Case studies	Form of	Methodologies
		agroecology	
Lamine <i>et al.</i> (2019)	Brazil and France: institutionalization of agroecology as an official paradigm for national agricultural Policies	Various forms of agroecology	Qualitative analysis of documents, semi-structured interviews with key interlocutors, ethnographic observation of public events (conferences, meetings)
Le Velly and Goulet (2015)	France: marketing activities of a small agricultural supply company aimed at convincing farmers of the interest of using their alternative inputs (claiming to optimize the biological functions of soil, plants, and animals)	Conservation agriculture	26 semi-structured interviews with the company's staff and their customer farmers, 20 days of ethnographic observation of the technical sales representatives' work
Niederle and Radomsky (2017)	Brazil: the construction of standards for organic agriculture	Organic agriculture/peasant agroecology	Qualitative analysis of documents, interviews with key interlocutors
Niederle <i>et al.</i> (2020)	Brazil and France: comparison between the trajectories of institutionalization of two participatory guarantee systems (Nature & Progrès and Ecovida)	Organic agriculture/peasant agroecology	Qualitative analysis of documents (laws, decrees, normative instructions, codes of practice), interviews with about 40 actors (farmers, consumers, vendors, processors, policy makers), participatory observation during peasant movement meetings
Niederle <i>et al.</i> (2022)	Brazil: policy dismantling strategies put in place by the government and social movements' resistance strategies	Peasant agroecology/ conventional agriculture	Qualitative analysis of documents, 15 interviews and one focus group involving policymakers and street-level bureaucrats