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Deposited in *Repositório ISCTE-IUL*:

2019-01-10

Deposited version:

Post-print

Peer-review status of attached file:

Peer-reviewed

Citation for published item:

Salavisa, I. & Ferreira, M. de F. (2018). Sustainable food systems: how important are bottom-up innovative experiments?. In Carlos Costa, Manuel Au-Yong-Oliveira, Marlene Paula Castro Amorim (Ed.), 13th European Conference on Innovation and Entrepreneurship, ECIE 2018. (pp. 700-708). Aveiro: Academic Conferences and Publishing International Limited.

Further information on publisher's website:

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Sustainable Food Systems: How Important are Bottom-Up Innovative Experiments?

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Abstract: The paper aims to analyse sustainable innovations in food production, commercialization and consumption, notably in the form of new production practices, new means of commercialization and new patterns of consumer behaviour. The main goal is to determine the importance of these recent experiments in the shift towards a more sustainable sociotechnical food system in Portugal, in a comparative perspective. In fact, there have been social, technological and organizational innovations in the food system in Portugal: novel forms of organic food production; new specialized retail chains; the transformation of food departments in large stores; and the creation of short food supply chains. These experiments – innovations deployed in “niches”, or protected spaces -, may become more widely adopted depending on their degree of compatibility with the dominant regime or, conversely, their ability to substitute the dominant regime (Ingram et al, 2015). Tensions at the mainstream regime (Smith, 2016) or pressures exerted by the landscape (Geels, 2004) may boost the diffusion of these innovations, favouring a complex transition process. When developing initiatives to achieve a sustainable food system, the role played by institutions (local and national authorities and legal framework) is crucial, as is the involvement of a wide range of actors (e.g., farmers, food processing companies, retailers and consumers). New social practices are crucial to this shift, due to centrality of consumers in this shift (Spaargaren, 2011). Policies may support or hinder the emergence and deployment of experiments in the form of new products, processes, business models and practices. The theoretical framework draws on niche strategic management (Smith, 2006), sustainable transitions multilevel approach (Geels, 2004) and social practices approach (Spaargaren, 2011). The paper aims to contribute to the literature by making a critical assessment of the impact of these experiments on the transition in the food system in Portugal, taking into account successful cases reported in the literature. It also aims to contribute to policy formulation regarding a sustainable food system.

Keywords: sustainability transitions, food system transition, social innovation, innovation in food production and retail, sustainable food policies.

1. Introduction

The need to move to a decarbonized economy within a relatively short period is one of the major issues facing society today. Making such a commitment implies dramatic shifts in the workings of the economy and the way we live. This means

that large sociotechnical systems have to change in order to meet very demanding sustainability goals.

Large sociotechnical systems perform the major social functions, which include the production, distribution and application/use of energy, transportation, communication, housing and nutrition. Although energy and transportation are perhaps the focus of most attention, the food sociotechnical system has already originated a substantial body of research. In fact, as this system is the most directly linked with nature, it is acknowledged as being responsible for soil and water degradation and the decline of biodiversity through the continuing spread of cultivated land and livestock.

This paper aims to contribute to the study of the food system transition in Portugal. It analyses innovative cases taking place in food production and commercialization in Portugal. To conduct this study, we draw on the niche strategic management approach (Smith, 2006), the multilevel perspective (Geels, 2004) and the social practices approach (Spaargaren, 2011).

The paper is structured as follows. In section 2, we introduce the theoretical framework. In section 3, we address the specificity of the food system transition to sustainability. In section 4, we analyse the evolution of the Common Agricultural Policy and its contribution to transition. In section 5, we present some successful innovative cases in developed countries. In section 6, we analyse the Portuguese case. Finally, we discuss the results and draw some preliminary conclusions.

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2. Theoretical background

Transitions, defined as regime shifts, are complex processes socially, economically and in policy terms and their study has given rise to a new research field: transition studies (Markard, Raven and Truffer, 2012).

In the transition process, large sociotechnical systems undergo major shifts. The socio-technical system (STS) is defined as a set of linkages between elements required to perform societal functions such as energy, transport, communications or nutrition. Its resources are knowledge, capital, labour, natural resources and

the assignment of meaning. STS comprises production, dissemination and the use sub-functions (Geels, 2004).

Socio-technical systems are the result of human activity. The human actors, producers and users are integrated into social groups, who share roles, responsibilities, norms and perceptions. Many specialized social groups are linked to resources and sub-functions of the socio-technical system, acting within the limits and rules established by regulators, despite their relative autonomy and internal coordination. (Geels, 2004).

The actors reproduce and transform the system under the aegis of rules and institutions, and in an environment populated by technologies materialized in goods and infrastructures of various types. This context influences the perceptions of the actors. Therefore, the technological regime is now a broad concept because it encompasses the productive practices and technologies, the characteristics of the products, the skills, the ways of dealing with goods and people and of defining the problems, all this embedded in institutions and infrastructures (Rip and Kemp, 1998, apud Geels, 2004).

The actors' role is a major theoretical issue. Spaargaren (2011) has criticized the STS approach (systemic approach) on the grounds of its implicit 'determinism', due to the central role of technological innovation, infrastructures and products, and implying the neglect of the actors. He has also rejected the individualist approaches, whereby individuals are 'left alone' at the core of the decisional process (Figure 1). Conversely, he proposed an approach based on social practices, which are at the junction of structure and agency.

Individualist Paradigm (social psychology/economics)	Systemic Paradigm (socio-technical systems)
Individuals and their attitudes are key units of analysis and policy	Producers/states and the
Behavioural change of individuals is decisive for environmental change	Technological innovation
Individual choices are the key intervention targets (micro level)	Socio-technical systems a
End-users/consumers determine the fate of green products and ideas	Technologies and market
Key policy instruments and approaches: social (soft) instruments (persuasion through information provision)	Key policy instruments are provided by market actors

Figure 1: Individualist versus systemic approaches Source: Spaargaren, 2011.

Smith (2006) and others (Kemp, Schot and Hoogma, 1998) see transitions arising from the interaction and co- evolution between innovations occurring in niches and the mainstream sociotechnical system. Geels (2004, 2010) and others (Smith, Voß and Grin, 2010) see transitions as multi-level dynamics, involving niches, dominant socio-technical regimes and the exogenous landscape. In both approaches different forces are involved - technological, economic (market), social, and institutional. In both, radical innovations play a major role and are mostly generated in niches (Kemp, Schot and Hoogma 1998; Hendry, Harbrone and Brown 2007; Schot and Geels, 2007; Lovell, 2007). Path dependency and lock-in in the installed regimes hinder this change. The sources of path dependency include cognitive frameworks, routines, habits, and attitudes; technical artefacts and dedicated infrastructures; incumbent practices enjoying economies of scale and network externalities; institutions and policies which evolved in parallel with the dominant regime (Smith, 2006).

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2017, p

73). Its intrinsic features explain its specificity, namely:

The intimate connection between food consumption and lifestyles. The nature of radical innovations fostering sustainability. These are mostly social, cultural and organizational innovations; however, technological innovations have been important in the modernization of agricultural practices. Examples include irrigation systems, mechanization and motorization, chemical fertilizers and pesticides, and the creation of genetically modified organisms. Disruptive technological innovation is occurring at the regime level, and is expected to continue to do so in the future. The multiplicity and diversity of producers. The integration of agriculture products within an entire and globalized food supply chain, which mediates the relationships between farmers and final consumers. In many subsectors, the great relevance of food processing companies, importers and retailers who have similar or even greater power than farmers.

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In the paper, we adopt a sociotechnical systems approach but also resort to the concept of social practices, to study the food system transition.

The food system is a broad system defined by “the activities, infrastructure, and people involved in feeding the global population (eg. the growing, processing, distribution, consumption, and disposal of goods)” (Popkin,

Since consumers perform a major and transformational role in the the food system transition, they deserve attention and appropriate analytical tools. The diversity of experiments consumers carry out constitutes the basis for the proposal of a specific taxonomy, which is one of the contributions of this research. An analysis is also made of the link between policy and bottom-up forms of governance arising from social experiments and social innovation.

3. Foodsystemtransition

3.1 Food system evolution

Modern agriculture and agro-industries have been as much the outcome as the condition of the modernization model of food production since WW II (Grin, 2012); this has been driven by targets to increase productivity and improve efficiency that have resulted in the intensive use of pesticides, fertilizers, energy and water.

The modernization of agriculture practices coincided with the emergence of a mass consumption model characterized by the rationalization of commercial circuits (with the generalization of packaging, labelling, and branding), the increasing supply of conserved, deep-frozen and convenience food, and growing concern about hygiene and safety. New outlets were created – most notably supermarkets and mega-markets -, that offered a diversified and vast array of products, much of which was sourced from distant locations (Grin, 2012). In fact, the liberalization of the markets provided access to a much larger assortment of food.

This consumption model developed at a time of changing lifestyles (Grin, 2012), which involved:

- € the mass entry of women in the labour market with the correlative simplification and rationalization of domestic tasks;
- € the standardization and certification of food products;
- € the emergence and spread of supermarkets and mega-markets;

- € the deployment of innovative conservation techniques and devices;
- € changes in dietary norms, with the increase in consumption of processed and ultra-processed food (Popkin, 2017) ;
- € the diffusion of fridges and freezers in the households. In advanced European countries, these transformations rapidly took hold following WWII – in large part due to the adoption of the American lifestyle -, and government policies contributed greatly to the speed of these changes. In food production, the Common Agricultural Policy, launched in 1962, both steered and reflected the major shifts in agriculture. It is therefore no surprise that consumers' growing concerns about food security and ethics are echoed in the revised versions of the CAP, namely for the current 2014-2020 period. The

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question to be addressed here is whether the scope and speed of change are sufficient. Transition to sustainability is also necessary in this domain.

3.2 The emergence of alternative forms of food provision

Cristóvão and Tibério (2009) propose a categorization of alternative forms of food provision. It addresses different dimensions: i) consumption of locally produced food; ii) establishing direct relations between producers and consumers; iii) revitalization of distribution, transformation and production structures; iv) network building between producers, local governments, entrepreneurs and other leaders; v) promoting the local economy and rural development.

The above authors note that these movements emerged in Japan and the United States in the mid-20th century and extended to countries in Southern Europe, among others. They point out a need to clarify the multiplicity of concepts (e.g., 'foodshed', 'civic agriculture', 'alternative supply chains', 'localized agri-food system' - in Tibério and Baptista, 2013) related with the alternatives found in agri-food system. A systematization carried out within the 'Strategy for the valorization of local farm production' (Order no 4680/2012, 3 April) had already clarified the concepts of 'local agri-food system' and 'agri-food short chains'.

A local agri-food system is a set of interconnected activities where production, transformation, distribution and consumption of food products aim to foster the

sustainable use of territorial, environmental, economic, social and nutritional resources. The agri-short supply chain is defined as the commercial form that takes place through direct (producer-consumer) or indirect supply with no more than one intermediary. It is associated with both geographic and relational proximity between producers and consumers. (MAMAOT, 2013).

In terms of food system transition, a closer relationship between producers and consumers is important for several reasons:

- € it allows consumers to take informed decisions;
- € it may help producers to retain a larger share of the value created;
- € it may therefore improve their income and the viability of their businesses;
- € more traditional productive forms may remain cost effective and viable;
- € land preservation is improved;
- € the environmental impacts of transportation and distribution are reduced. In some countries, “buying local” campaigns have been made; this includes promoting seasonal products as an alternative to buying goods imported from afar and the implicit negative impact of transportation. Other studies point out the emergence of ‘alternative food networks’ (Roep and Wiskerke, 2012; Bui et al, 2016), which represent entirely new forms of provision, and begin with modest experiments in production, retail and consumption. These new practices take place in niches, or protected places. While new practices in production and retail seem to be main driver, the consumers’ role is very relevant here. Health concerns may become a lever of change, together with increasing awareness of and commitment to sustainability on condition that ‘natural’ food becomes more affordable and available. Bui et al (2016) describe the case of local and fresh food procurement for school canteens led by a parents’ association in Drôme Valley, France. The purpose was to provide pupils with seasonal and quality food. Another case presented by the authors is the creation of a community-support agriculture box-scheme by a group of city-dwellers from a peri-urban area of Paris. Their aim was the preservation of a farmland area threatened by urbanization (Bui et al, 2016). In both cases, local authorities joined or supported the initiative at a later stage. Different forms of government action are therefore crucial: examples of measures taken include the setting and implementation of

safety norms in production, transportation and commercialization; the implementation of informative labels and the provision of information to enhance transparency; the granting of pecuniary incentives to support sustainable practices by farmers. The complexity, multifaceted and slow nature of transition in the food system is explained by a number of factors; for example, the diversity of actors and the powerful interests at stake, and the historic persistence of nutritional habits.

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To address the transition process, Roep and Wiskerke (2012) propose an approach based on three dimensions: governance, embedding and marketing. The coordination of activities deployed in the three areas is key to the success of emerging food supply alternatives. Each food network unfolds in a specific way. Using some main criteria (initiators, main objective, initial focus, and strategy adopted) the authors distinguish three main trajectories:

€Chain innovation – i.e. the construction of a new food supply chain, the main objective of which is to improve the farmers positioning;

€Chain differentiation – where new products are produced and commercialized within an existing chain;

€Territorial embedding – where a food supply chain is re-built to become a vehicle of regional development. The authors present telling examples of each trajectory. In the Netherlands, a small pork supply chain, De Hoeve, is a case of chain innovation. It has innovated in housing systems with less environmental impact and managed to put together an association of pig farmers, a meat wholesaler and a number of independent butchers under the same hallmark. In Switzerland, they describe the case of a new beef label (Naturabeef) that managed to become commercialized by one of the two big Swiss retailers (Coop) as an example of chain differentiation. As to territorial embedding, they present a German example associated with a specific region, Rhon. Rhongut became a brand of high-quality organic food (originally meat and bread). This brand was launched by the founder of a chain of specialized organic food stores and a dedicated organic packaging and trading company, both operating under the name Alnatura (Roep and Wiskerke, 2012). These successful cases date back to the 1980s or 1990s; they proved economically viable while offering high-quality products and meeting demanding environmental norms and animal

welfare concerns. These cases do not represent yet a substitute for more intense industrialization of agriculture, resorting to intensive use of technological and scientific breakthroughs ('The Economist', 11 June 2016). However, they constitute emergent forms of production, distribution and consumption (Ingram et al, 2015), which should be encouraged, not only to preserve diversity but also to keep options open to the future of human nutrition.

4. Policies

The role of policies is of the utmost importance here. In the EU particularly, the CAP's updates have reflected a new vision of the linkages between increased efficiency + market mechanisms + farmers' income support + rural development + sustainability. This is the first dimension to be explored herein. CAP should be considered in this reflection on transition. In fact, since its inception, CAP performs an important and decisive role in terms of farmers' decisions, land use, and, therefore, in food markets and consumption patterns. The Mac Sharry reform of 1992 constituted a turning point in CAP's greening and sustainability path with the introduction of agri-environmental measures. The deepening of CAP's sustainability concerns through a multidimensional approach have led to further developments and milestones, including the financial strengthening of Rural Development Policy and its constitution as the second pillar of the CAP Agenda 2000. Nowadays, the financial support of the Common Agricultural and Rural Policy comes from a single European Fund - The European Fund of Agriculture and Rural Development – and contains several measures focused on sustainability. It is necessary to investigate whether CAP's two pillars are environmentally and ecologically effective in terms of food production and consumption regarding nutrition and health. In fact, we are dealing with a sector- driven policy with established objectives in its two pillars, namely food supply and farmers' income support (pillar 1) and rural development (pillar 2), but without a clear and direct link with food security and safety in a broad sense, that is, the guarantee of food in quantitative and qualitative terms. According to Walls et al (2016), “[A]n important determinant of diet is food price and availability, which is directly influenced by agricultural policy. (Walls et al, 2016, p 12). As recognized by the “WHO's Global Strategy on Diet, Physical Activity and Health (2004) [...], it seems essential for agricultural policy to be designed with nutritional priorities” (James et al, 2006, apud Walls et al, 2016, p 12).

In addition to food security, the European Commission also presented climate change and balanced territorial development as main challenges for the 2014-2020 CAP. It responds to these challenges with concrete measures and financial support from European funds. In the case of food security, the measures are related to the support and stabilization of the farmers' income and improving farms' competitiveness, including the improvement of the producers' positioning in the food value chain. Climate change is addressed through sustainable production practices, and 'green growth' through innovation and the development of mitigation actions. The promotion of a more balanced territorial development involves the structural diversity of agricultural systems and improved living conditions in the case of small farms as well as the development of local markets.

The development of local markets has been integrated in the European Regulation No 1305/2013 (17 December) on rural development support from the Agricultural European Fund on Rural Development. This regulation presents some policy measures that introduce a more integrated approach (supply-side; demand- side), namely through the "promotion of food value chains related with the transformation and commercialization of farm products [...]" (Official Journal of the European Communities L347, p 500).

More specifically, it is possible to find measures associated with 'short circuits and local markets' and the 'promotion of local-quality products'. Therefore, CAP not only supports sustainable agriculture through agri- environmental measures, but it also addresses the food value chain through financial aid directed to short circuits.

In the Portuguese case, 'innovation and knowledge' are important drivers of change in Rural Development Policy (2014-2010) and correspond to central axes of financial support for farmers and other actors involved in the landscape of rural territories, namely research centres and rural development associations.

To sum up, CAP must be considered in the debate regarding the food system transition in EU countries. This policy has become greener and more market-orientated in its first pillar, while enhancing the role and budget of rural development (second pillar), namely through measures focused on value chain and the promotion of local products and local markets. It envisages diversifying the rural economy and thus affecting food security in the broad sense (including nutrition and food quality).

5. The Portuguese case

While experiments are less frequent in Portugal than in other developed countries, traditional forms of food production and distribution managed to survive the modernization surge of the second half of the 20th century. A prime example is the fact that the first mega-markets only appeared in the 1980s. Despite the massive destruction they caused in many traditional retail branches, small food outlets still operate in villages, small towns and city neighbourhoods by drawing on proximity relationships. Short supply chains are therefore both old and new, and sometimes old and new at the same time. This is the case of the revitalization of traditional farm production by using the internet for commercialization.

The Portuguese Rural Network proposes the following typology of short supply chains:

1. Markets of producers: “market dedicated to food and agri-food producers which sell their own production; products with local certification”.
2. Markets of Bio producers: “market exclusively dedicated to agri and agri-food producers with certification in Bio Production; producers sell their own production; products with local certification”.
3. Markets of local products: local or regional markets with direct sale of a local product or various related products.
4. Collective supply point: organization of farmers and agro-industry supplying their own products.
5. Agri-Food baskets: direct and regular supply of local and seasonal agri-food products. The baskets are delivered to a predefined place (e.g., consumer home, enterprise, cooperatives and shops).

Examples of these experiments are found in Portugal. Bio producer markets have opened up in Lisbon municipalities: Príncipe Real and Campo Pequeno in the centre of Lisbon; and AGROBIO markets in cities such as Algés, Almada, Amadora, Carcavelos, Cascais, Loures and Oeiras.

There is a long history of local or regional markets that sell local products directly. Some current examples involve wine production: Festa das Vindimas (Vintage Fair), in Palmela, and Festa do Vinho e das Vindimas

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(Vintage and Wine Fair), in Loures. In other regions of the country, similar events take place annually and focus on their own regional products.

There are a number of successful cases of agri-food baskets. While the most outstanding is PROVE, the following should also be mentioned: Poiso da Abelha, Cabaz Horta Verde, Cabaz QPB, Marinhova (meat), Quinta do Arneiro, Cabaz da Semana BioSOLO, Cabaz Dona Horta, Cabaz Papafigos, Cabaz da Horta.

PROVE – Promover e Vender – aims to supply local products, improving proximity relations between producers and consumers, and establishing short chains of commercialization among small farmers and consumers using ICT. The experiment started in 2006 in the municipalities of Palmela and Sesimbra. It has spread very successfully across the country through Local Action Groups (GAL), producers, consumers, but also municipalities, farmers' associations and other local partners. The baskets contain only seasonal products produced locally with sustainable techniques and respecting good farming practice.

In addition to short circuits, specialized organic and quality food retailers developed mostly in the metropolitan areas of Lisbon and Oporto. This is the case of Brio supermarkets (later Go Natural). More recently, some big retail chains entered this market, by creating departments of organic food or even buying the bio retail shops themselves.

However, the new practices are still limited in scope. As mentioned above, unlike other countries, these practices have been unable to create their own national chains or to integrate significantly in big distribution channels.

6. Conclusions

This paper is a first attempt to address the transition of the food system in the Portuguese case. We present three dimensions of the research: 1) a draft of the conceptual framework, drawing mainly on the sustainability transitions literature, with the contributions of social practice theorists; 2) a preliminary assessment of the European agricultural policy with regard to the transition to sustainability; 3) the identification of existing bottom-up experiments in food production, retail and consumption in Portugal.

At this stage, only provisional conclusions are drawn, namely:

1. The experiments in short chains emerged at the same time as the start of

- organic food retail shops, which are now expanding, and the rise of a new generation of farmers devoted to high quality organic products.
2. Provided they are able to scale up and become more cost effective, bottom-up experiments may become the basis of alternative food networks.
 3. This option is not yet a substitute for the continuing industrialization of agriculture, resorting to technological and scientific breakthroughs.

Nevertheless, the new experiments constitute either a complementary or an emergent form of production, distribution and consumption that should be encouraged.

In order to improve our knowledge on the Portuguese case, we will conduct more in-depth case studies. Our aim is to contribute to the debate on the food system transition and to policy formulation.

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