



Transitions in agriculture: Three frameworks highlighting coexistence between a new agroecological configuration and an old, organic and conventional configuration of vegetable production in Wallonia (Belgium)



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ABSTRACT

The contribution of the multi-level perspective (MLP) to study transition dynamics is widely recognized. MLP involves examining interactions between three socio-technical levels: niche, regime and landscape. Empirical analysis of niche-regime interactions when applying this framework to agricultural transitions to sustainability remains challenging, however. The diversity of historical farming systems within a region can make niches and regimes highly heterogeneous. In addition, agricultural transitions to sustainability may be driven as much by technological changes as by institutional features, including normative rules and cultural cognitive rules that are less adequately addressed by MLP. To tackle these two challenges, we combined MLP with two additional frameworks to describe transition processes: the comparative agriculture framework, drawn from agro-economic, geographic and historical analyses of agricultural crises, and the justification of practices framework, drawn from pragmatic sociology. In this paper, we apply these three frameworks to the fresh vegetable production sector in Wallonia (Belgium) and discuss visions of transition through the lens of the agroecological paradigm. This leads us to predict a situation of coexistence between two socio-technical configurations of production: an old, organic and conventional configuration reoriented toward more commercial autonomy for the producers, and a new configuration oriented toward agroecology. The study contributes to a major debate discussing the extent to which the agroecological paradigm is being co-opted by the regime or remains faithful to its original principles and opens up perspectives for public policy development in the context of increasing governmental attention to the agroecological paradigm.

1. Introduction

The *multi-level perspective* (MLP) is now recognized as a major theoretical framework for understanding the dynamics of transition (e.g. Geels et al., 2016; Geels and Schot, 2007; Markard et al., 2012; Sutherland et al., 2015; van den Bergh et al., 2011). It consists of a powerful tool to examine transition pathways of socio-technical systems by distinguishing three socio-technical levels facing different degrees of pressure to change and by analyzing their interactions. These levels are the *regime* (the mainstream socio-technical function at any given time), the *niche* (protected spaces from which innovations that deviate from the regime emerge) and the *landscape* (macro context of the system consisting of deep social structure). The regime comprises a set of technologies, actors' networks and institutions, all of which co-evolve with each other. Internal complexity and tensions within this set of

elements have been recognized and theoretically developed (Geels, 2002; Geels et al., 2016). Nevertheless, dealing with this complexity when empirically analyzing niche-regime interactions remains difficult (Elzen et al., 2012b; Ingram et al., 2015; Rosenbloom et al., 2016; Smith, 2007). In addition, the literature on agricultural transitions to sustainability or agroecology demonstrates that such transitions involve multidimensional changes (e.g. cognitive, normative, political, cultural, market, technical) and processes occurring at diverse spatial and organizational scales (Côte et al., 2019; Duru et al., 2015; Gaitán-Cremaschi et al., 2019; HLPE, 2019; Ollivier et al., 2018). This poses two key challenges for studies of agricultural transitions to sustainability. First, the variation of farming systems due to economic, political, social, ecological and climatic factors, even within a single region, makes current agricultural regimes and niches highly heterogeneous (Darnhofer et al., 2015; Elzen et al., 2012a; Hervieu and Pursegile,

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2013; Mazoyer and Roudart, 2006; Plumecocq et al., 2018; Slee and Pinto-Correia, 2015). As a result, the processes by which niches and regimes interact are highly complex (Darnhofer et al., 2015; Ingram et al., 2015). Second, the social and political determinants of transitions to sustainability must be considered. Transitions to sustainability in agriculture involve struggles between different visions of sustainability (Bui et al., 2016; Elzen et al., 2017, 2012a; Lamine et al., 2015; Vanloqueren and Baret, 2009) and in some cases may not even be primarily driven by technology (Darnhofer, 2015; Woodhill, 2009). Consequently, norms and values that steer actors' actions must be carefully examined to describe transition pathways, including their political dimension. However, normative and cognitive rules have not been extensively addressed by the MLP (Darnhofer, 2015; Elzen et al., 2004; Geels et al., 2016; Holtz et al., 2008; Smith, 2007).

The aim of the present paper is twofold. First, it is to demonstrate the possibility of combining different theoretical frameworks to describe and interpret transition in agriculture at the production level. Second, it is to contribute to the debates on agroecological transitions by showing an original example of coexistence between socio-technical configurations of production. To overcome the theoretical limitations noted above, we combine the MLP with two additional theoretical frameworks: *comparative agriculture* (Cochet, 2015) and the *justification of practices* (Dumont, 2017; Dumont et al., 2016). The former allows us to take into account historical diversity in agricultural production within our analyses of transition dynamics. *Comparative agriculture* is a school of thought within agricultural development studies that sits at the crossroads of agronomy, geography, economy and history. The *justification of practices* framework helps us to reveal the values and shared belief systems that guide production actors. This framework is drawn from French pragmatic sociology (Boltanski and Thévenot, 2006, 1991), a precursor to institutional theory (Thornton and Ocasio, 2008), both of which have been mobilized to better conceptualize the role of agency and normative rules on MLP transition pathways (Fuenfschilling and Truffer, 2014; Lamine et al., 2015; Smink et al., 2015). The *justification of practices* has been developed specifically in order to study the on-the-ground implementation of agricultural paradigms by producers.

We apply these three theoretical frameworks to the realities of the fresh vegetable production sector in Wallonia (Belgium) and discuss visions of transition (i.e., actors' ideals for how agriculture should be in the future) through the lens of the agroecological paradigm. Agroecology is an alternative way of producing based on ecological and socioeconomic principles (Migliorini and Wezel, 2017). In addition, we situate our results with regard to the territorial agrifood system (Lamine et al., 2012), which includes retailers, governmental authorities, technical advisors, consumers, etc. Wallonia features a wide range of social and technical production systems: from new entrants to agriculture who are engaged in market gardening on small plots of land and sell their produce through short supply chains, to farmers with long-established agricultural backgrounds who grow vegetables as field crops and sell via produce auctions. The territorial agrifood system of this study area is engaged in a transition process often referred to in the literature as 'transitions-in-the-making' (Elzen et al., 2011). These are not past transitions that have already been achieved, nor are they nascent innovations that have not yet engaged with the regime. They are in-between situations, in which contrasting potential future pathways are being discussed with a view to managing them. The case study developed in the present paper comes from a PhD thesis (Dumont, 2017). A first paper was published on this case (Dumont and Baret, 2017). It focuses on the working conditions of producers and their farmworkers. The present paper, on the same case, develops the analysis of transition processes.

Examining norms and values that steer actors' actions and the diversity of historical farming systems in the region leads us to predict new transition dynamics involving the coexistence of two socio-technical configurations of production: an old (organic and conventional) configuration reoriented toward more commercial autonomy for the

producers, and a new configuration oriented toward agroecology. Although these two configurations of production would coexist, they support radically different visions of sustainability. These results suggest new possibilities for the understanding and management of agroecological transitions.

The paper begins with a presentation of the three frameworks and a working definition of agroecology (Section 2). We then detail our four methodological steps and comment on the coherence of our approach (Section 3). Next, we describe the Wallonian vegetable production sector and its embeddedness within the territorial agrifood system, and consider the main characteristics of its evolution over the past 40 years (Section 4). Our analysis leads us to discuss a future coexistence between two agricultural configurations and to draw perspectives for public policy formation for the management of agricultural transitions towards sustainability (Section 5). We conclude on the relevance of our joint mobilization of the three theoretical frameworks and open perspectives (Section 6).

2. Three complementary theoretical frameworks and the paradigm of agroecology

To describe and interpret transitions in agriculture we draw on three theoretical frameworks: the MLP, *comparative agriculture* and the *justification of practices*. These three frameworks are based on different epistemological assumptions regarding the relationship between agency and structure. We propose to mobilize them using a heuristic approach that will guide us towards achieving our goals, rather than as a basis from which to determine our assumptions. We also seek to make use of them in a way that is compatible with Weberian sociology. From this perspective, interviewed actors are always considered to be reflexive actors, capable of partially understanding the situations they experience, the actions they take and their thinking (Kaesler, 1996). In addition, we mobilize the three frameworks at different levels of analysis (Fig. 1), with each framework highlighting blind spots in the others and bringing a new depth to our understanding of transition. Below, we present each framework in line with our heuristic use of that framework. In the next section, we highlight how we adapted the three frameworks to align with Weberian assumptions and further detail our methodology.

2.1. The multi-level perspective

The MLP is inspired primarily by Giddens' structuring theory, evolutionary economics and innovation studies (e.g. Geels, 2011, 2002). Actors are considered as embedded in social structures that simultaneously enable and limit their actions and innovations. The focus of analysis is on the socio-technical system, a concept that may be applied at different scales: from large domains of activity such as the energy sector (e.g. Raven, 2004) to smaller domains such as territorial agrifood systems (e.g. Bui et al., 2016). The system is studied by distinguishing three socio-technical levels facing different degrees of pressure to change: the *landscape*, the *socio-technical regime* and the *niche*. Landscapes are the most stable, as actors have little or no direct influence over them, while niches are very unstable. In between these two extremes, regimes are relatively stable; 'path dependence' and 'lock-in' situations inhibit major changes at this level (Geels, 2011; Unruh, 2000; Vanloqueren and Baret, 2009). Transitions occur through the interactions between niche, regime and landscape, either as a result of a crisis or due to long-term developments in which the landscape exerts pressure on the regime and on niche-innovations, creating windows of opportunity for change. The socio-technical system considered for this article is the vegetable agrifood system of Wallonia; our findings pertain primarily to the vegetable production level within this system.

The MLP focuses on the interdependencies between the principal elements of the socio-technical system and allows us to consider both past and potential future socio-technical pathways (Geels, 2011; Genus

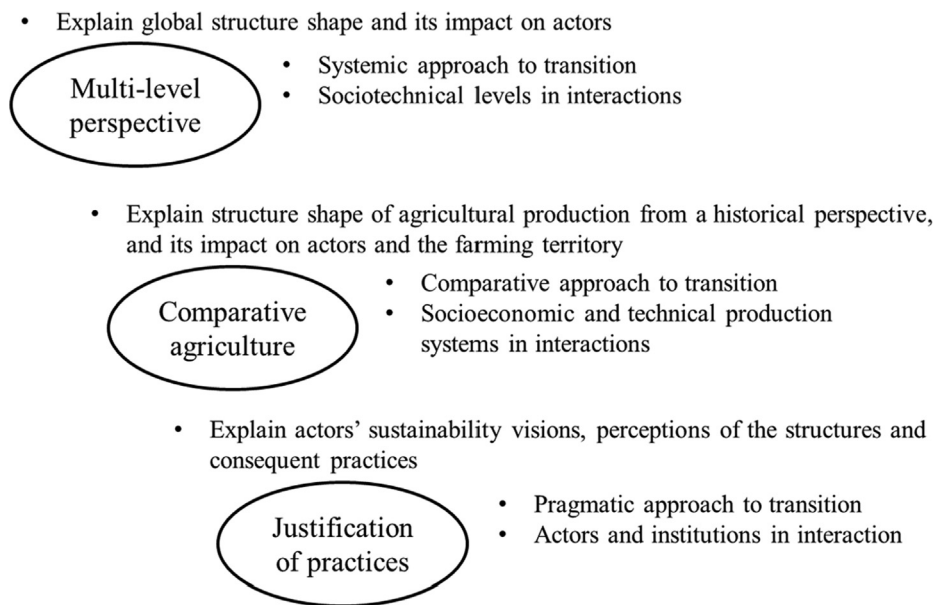


Fig. 1. The three heuristic frameworks and how they may be used to analyze a situation of agricultural transition.

and Coles, 2008). In situations characterized by significant internal tensions and differences among niches and regimes, however, MLP is difficult to implement and can fail to adequately describe transition processes (Darnhofer et al., 2015; Ingram et al., 2015). In addition, the MLP is easier to mobilize when transitions are driven primarily by technology, since it does not have much tools to highlight the values and norms that guide actors' actions (e.g. Hölscher et al., 2018; Longhurst, 2015; Murphy, 2015). These drawbacks led us to complement the MLP with two additional analytical frameworks: *comparative agriculture* and the *justification of practices*.

2.2. Comparative agriculture

When considering agricultural systems, it can be challenging to account for the diversity of farming systems existing within a region and the effect this diversity can have on transition pathways (Darnhofer et al., 2015). Agronomists have developed several ways to determine the diversity of farming systems: through criteria chosen *a priori*; based on criteria derived from producers' goals; or, as *comparative agriculture* suggests, through historical differentiation (Cochet, 2015). Because mainstream socio-technical functions are a product of history, we find the last approach most helpful.

Comparative agriculture emerged from the pioneering post-World War Two work of René Dumont (Dumont, 1962, 1954; Lacoste et al., 2016), who sought to develop a multidisciplinary and global approach to the study of agriculture (Cochet, 2015). We mobilized the *comparative agriculture* school of thought to identify socioeconomic and technical production systems (hereafter, *production systems*). Production systems make up historically constituted and geographically localized types of agriculture (Mazoyer and Roudart, 2006). They are identified by an examination of their geographical and historical differentiation, paying close attention to the modes of exploitation of agro-ecosystems, and the social relations of production and trade which describe the conditions of cooperation or competition between the various actors of an agrarian system (Cochet, 2012). Classifications are based on each production system's own coherence and productive logic, understood through interviews with old experts and producers who have personally witnessed changes in a region's agriculture. They usually involve different patterns of resource use (in terms of surface area, level of mechanization or labor force), crops grown, livestock kept, and socioeconomic characteristics. The study of the historical development of a

given production system allows the researcher to identify interactions and co-evolutionary processes between production systems, food system actors, markets, and economic and political institutions (Mazoyer and Roudart, 2006).

2.3. Justification of practices and the definition of agroecology

Both the MLP and *comparative agriculture* frameworks highlight the complexity of systems. Both have also tended to emphasize structure rather than agency (Cochet and Gasselin, 2007; Diaz et al., 2013; Geels and Schot, 2007; Rosenbloom et al., 2016; Shove and Walker, 2007; Smith et al., 2010). The *justification of practices* framework, by contrast, enables us to understand the motivations underlying producers' practices and how they attempt to negotiate the transition horizon. It has been developed by Dumont (2017) in order to study the on-the-ground implementation of agricultural paradigms such as agroecology. Before explaining the *justification of practices* framework, we turn to the definition of agroecology.

2.3.1. What is agroecology? The importance of including socioeconomic dimensions

The word 'agroecology' refers to an alternative way of conceiving and managing farms and food systems based on ecological and agronomic principles, which recognizes experiential, indigenous as well as scientific knowledge (e.g. Altieri, 1995; Migliorini and Wezel, 2017; Montenegro de Wit and Iles, 2016). Yet, it exists different definitions in the scientific literature (e.g. Elzen et al., 2017; Ollivier and Bellon, 2013; Wezel et al., 2009). To study this paradigm, we adopt an *a priori* definition, considering agroecology as having two sets of dimensions, socioeconomic and ecological. By including the socioeconomic dimension in our definition, we emphasize the vision of agroecology as a political critique of the productivist system, rather than as simply a set of technical practices. This vision is in line with that of agroecology's founders (Altieri, 2002; Conway, 1987; Tripp, 2008).

For the socioeconomic dimension, we analyzed eleven of the thirteen 'ideal' agroecological socioeconomic principles identified by Dumont et al. (2016) after an extensive literature review: environmental equity; financial independence; market access and autonomy; sustainability and adaptability; social equity; partnership between producers and consumers; geographic proximity; rural development and the preservation of the rural fabric; shared organization; diversity

and exchange of knowledge and joint implementation of the various principles in practice.¹ Notice that the financial independence and autonomy principles refer to interactions between agroecological and non-agroecological actors, while the other principles concern interactions between actors of the agroecological local food system. For the ecological dimension, we used the European organic regulation as a benchmark. All the producers who were identified as following the socioeconomic principles of agroecology were working in highly diversified farms, relying on the recycling of nutrients rather than the use of inputs (Dumont, 2017). These practices are in accordance with the agroecological principles as defined by the founders of agroecology (Altieri, 1995).

In our working definition of agroecology, we consider it as a horizon, never fully attainable, like other ideal paradigms, such as democracy. What interested us is to understand if the agroecological horizon makes sense for some practitioners and, if so, how it influences their practices and, as such, guides the transition process.

2.3.2. What is an ‘agroecological producer’? Or, the study of the justification of practices

The aim of the *justification of practices* is threefold. First, to identify which actors are oriented towards agroecology. Second, to understand why some actors follow this ideal. And, third, to analyze how the producers who try to follow the agroecological ideal implement its principles. The *justification of practices* brings together insights from two models: Boltanski and Thévenot’s “modèle des cités” (“polity model”) (Boltanski and Thévenot, 2006, 1991) from the French school of pragmatic sociology, and the “modèle de l’éthique du compromis” (“ethics of compromise”), drawn from the former by Nanteuil (2016).

The *justification of practices* framework suggests that we can consider a producer to be oriented towards agroecology when he or she fulfills two conditions. First, he or she implements a significant number of agroecological principles in his or her daily routines. The implementation of principles is evaluated through the justification of producers’ practices, in a context of controversy regarding agroecological principles, as is the case in Wallonia and presumably in many other world regions² (Dumont, 2017; Dumont et al., 2016). In other words, a producer applies an agroecological principle when his/her motivations and perceptions driving his/her practices are aligned with the principles of agroecology, even in a controversial environment. In a given context, the producers who apply the largest number of agroecological principles implement enough principles to be considered oriented towards agroecology (Dumont, 2017). In the Walloon region, vegetable producers oriented towards agroecology apply nine principles; the principles of *social equity* and *financial independence* were the less often applied (see Section 4). Second, the producer must base his or her decision on social justice objectives (following ethical criteria suggested by the polity model (Nanteuil, 2016)) when faced with an ethical dilemma regarding the implementation of agroecological principles (Dumont, 2017).³ These ethical dilemmas are situations in which

¹ We leave aside two of Dumont et al.’s principles because they could not be systematically evaluated in the context of our study. The first principle, related to limited profit distribution, was not analyzable as several producers can barely pay themselves. As such, it makes no sense to discuss profit allocation. The second principle, relating to democratic governance, was not used as a criteria to distinguish agroecological producers as several producers have no permanent workers.

² In Wallonia, producers are highly aware of existing societal expectations about social and ecological practices. When researchers ask questions about labor, marketing routes, local, organic production, and so on, the producers immediately justify themselves. They will explain, for instance, why they consider working with volunteers, underpaid labor, or on the contrary, workers on permanent contracts (practices which relate to the social equity principle of agroecology) to be justified.

³ Following Boltanski and Thevenot, this means evaluating if actors justify

producers who attempt to follow the agroecological ideal have to choose between different principles, and the practices underlying these principles, because they are conflicting and difficult to apply together in the current socioeconomic and political context (Dumont, 2017; Dumont et al., 2016). Decisions are considered to be based on social justice objectives when they are (1) justified by a plurality of axiological registers, including the pursuit of the general interest, and (2) hard to reverse because they are materialized in investments, contracts or strong partnerships. This second step allows us to identify those producers who adopt practices that have a social objective that is in line with the agroecological ideal, as opposed to those who pursue a few agroecological principles that match their personal interests.

3. Methodological approach

3.1. Coherence of the approach

The three theoretical frameworks come from different schools of thought and are based on different assumptions. The interviews were, however, conducted following Weberian assumptions. We now highlight how we adapted *justification of practices*, *comparative agriculture* and MLP to comprehensive Weberian assumptions. From the Weberian perspective, researchers explore sense and values, which are considered to be the basis on which actors orient their actions (Kaesler, 1996). A comprehensive approach starts from the actors’ subjective sense. It does not mean, however, that researchers should consider that individuals are fully able to understand the factors steering their actions. They also must deeply explore the contexts to interpret actors’ subjective sense (Kaesler, 1996).

The *justification of practices* is in keeping with a Weberian approach. But the pragmatic sociology emphasizes the actors’ freedom, particularly regarding their critical capacity. Actors’ judgments and actions are analyzed without any presumptions based on their level of power, gender, pathways, age or any other social categories. It is only the study of actors’ justifications when faced with controversies and dilemmas that allows us to judge the influence of social category on actors’ point of view (Dodier, 2003; Genard and Cantelli, 2008). During comprehensive interviews, we could identify controversies and dilemmas faced by producers. Through confronting concrete examples, producers were asked to justify their related practices. By analyzing their justifications of these dilemmas, we deviate from a comprehensive Weberian approach to pragmatic sociology, without reassessing assumptions of Weberian nor pragmatic sociology.

The literature on *comparative agriculture* generally does not describe values steering actors’ actions. Yet, typologies based on comparative agriculture are often built on comprehensive interviews and, as such, do not contradict Weberian assumptions (Cochet, 2015). Eventually, the assumptions underlying MLP partially contradict a comprehensive Weberian approach. In particular, MLP sometimes uses an approach that considers actors to be wholly strategic (Geels and Schot, 2007). We did not follow these assumptions. Calculated strategic choices and the pursuit of economic interest were considered as possible motivations among others, following the Weberian approach.

3.2. Four methodological steps

We applied these three theoretical frameworks at the production level, which includes producers and their farmworkers, and then situated our results within the ‘territorial agrifood system’ (Lamine et al., 2012) which also includes retailers, governmental authorities, technical advisors, consumers, and other local actors and organizations involved in the agrifood system for fresh vegetables in Wallonia. This territorial

(footnote continued)

their choices on the behalf of a plurality of ‘polities,’ including the ‘civic polity’.

agrifood system features a wide range of production and marketing practices within an area of 16,844 km² that is spatially, politically and socioeconomically relatively homogenous (see Section 4).

The study followed four methodological steps. The first step involved characterizing the vegetable agrifood system of Wallonia (MLP) and identifying the different *production systems* present in the region (*comparative agriculture*). To complete this step, we conducted open-ended interviews with 15 actors, including local scientists, experts, advisors, and a few producers, in addition to reviewing the available literature and on-line information.

The second step involved describing the historical pathway of each production system (*comparative agriculture*), identifying actors with an agroecological orientation and then beginning to understand how producers implement this paradigm (*justification of practices*). These qualitative data were collected through comprehensive semi-structured interviews (Blanchet and Gotman, 2007; Kaufmann, 2011; Olivier de Sardan, 2008) with 41 producers (for more details on sample selection see Dumont (2017); Dumont and Baret (2017)).

For the third step we undertook a technical and economic appraisal of 34 out of the 41 producers we interviewed. This quantitative data enabled us to verify some qualitative information and revisit our understanding of the diversity of production systems (*comparative agriculture*).

The final step was undertaken to cross-check the information gathered by interviewing a diverse range of agrifood system actors. These included technical advisors, farm laborers, a regional agricultural subsidies advisor, an expert on farm accountancy, a local social secretariat, members of a collective buying group, union members, and others. We also examined how these agrifood system actors try to influence the practices of one or more groups of producers, and their stance on dilemmas faced by agroecological producers.

4. The regional context, historical pathways and current interactions

Our study of the historical differentiation of production in Wallonia, according to the *comparative agriculture* approach (Section 2.2), led us to identify four *technical orientations*⁴ existing within organic and conventional agriculture: market gardening on small areas (MGS); market gardening on medium areas (MGM); market gardening on large areas (MGL); and vegetable production in combination with field crops (VFC) (Table 1). Based on our study of the *producers' justifications of their practices* (Section 2.3), MGS and MGM organic producers were also considered to be agroecological in their orientation, while this was not the case for the MGL and VFC organic producers. This gave us a total of eight *production systems*:

- MGS and MGM systems that are organic and oriented toward agroecology (hereafter referred to as agroecological);
- MGL and VFC systems that are organic but not oriented towards agroecology (hereafter referred to as organic);
- and conventional MGS, MGM, MGL and VFC systems.

Below, we develop these results and analyze the diversity of Wallonian vegetable production systems using the *multi-level perspective* (Section 2.1). The *comparative agriculture* approach led us to distinguish two phases in a relatively recent history which help explain current production system diversity and transition processes. The first phase began in the 1970 s; the second began around the turn of the millennium and continues today.

Space constraints preclude our providing detailed accounts of the social and technical characteristics of each production system or the

implementation of agroecological principles within these systems. These details are not necessary to discussing the transition perspective. For a more exhaustive technical and agroecological analysis of the same case study and using these frameworks, see previous publications (Dumont, 2017; Dumont and Baret, 2017).

4.1. First phase

4.1.1. The parallel emergence of two diverging models

The Walloon region (which occupies the southern part of Belgium) has traditionally specialized in cereal and cattle farming, while the Flemish region (in the northern part) has specialized in vegetable and pig production. Most of the farms in Wallonia that specialized in market gardening in or before the 1970 s, which were no larger than a few hectares, no longer exist. The few vegetable farms that remain expanded and mechanized in the 1980 s, becoming the current MGL. Yet, most of the older farms currently involved in vegetable growing were started in the 1980 s (or their producers shifted to vegetable production then). Two parallel movements drove their creation.

Some producers inherited a conventional cereal or cattle farm and switched to or developed vegetable production in order to be more profitable. Their systems were conventional, large-scale and highly mechanized. They make up the MGL and VFC conventional systems. The main advice center, the CIM (Inter-Professional Market Gardening Center), plays a key role in supporting these systems. The Center was established in 1986 on the initiative of pioneer market gardeners (CIM, 2009) who wanted to develop vegetable production to supply supermarkets and capable of competing with Flemish production. Until the 2000 s, these farms sold their vegetables to supermarkets and at Flemish auctions. These producers, market organizations, and the advisory center remain the key actors in the socio-technical regime of fresh vegetable production in Wallonia.

On the other hand, there are farmers who came from non-farming families and established themselves in rural areas and in agriculture, looking for a better quality of life. They are part of a larger 'back to the countryside' movement that occurred in several western European countries (Laforge et al., 2017; Lamine et al., 2015; Pinto-Correia et al., 2015) at the *landscape* level (Smith et al., 2010). They were attracted to market gardening as it requires less investment and land than cereal or cattle farms. The producers of these farms are today the older farmers in the MGS and MGM agroecological systems, and some in the MGL organic system. Our interviews revealed that these producers implemented agroecological principles at this time. They chose small-scale diversified farming "to be less dependent on fossil fuels," chemical inputs, regular markets and mechanization and because "it made the human more central" in the farming system. They sold their products into short supply chains. These producers quickly constituted the majority of fresh vegetable growers (Fig. 2). Yet, they have always been a *niche*, according to the MLP definition, and have had problems ensuring their viability (Dumont, 2017; Dumont and Baret, 2017). Until 2014 there was no research and advice center to support them. Even today this group tends to be younger than producers in the other production systems (most of them are between 30 and 50 years old, compared to 40 to 60 years old in the other production systems) and are still new entrants in agriculture with less experience.

4.2. Second phase

4.2.1. Transformation of the production regime toward more commercial autonomy for producers

Between 1995 and 2000, an increasing number of the regime MGL producers started to develop short supply chains and numbers of VFC producers began to move into organic agriculture, following examples initially developed in the *niche*. This period corresponds with new pressures from the *landscape* on the agrifood system, which impacted several European countries (Allaire and Daviron, 2019; HLP, 2019).

⁴ A technical orientation brings together the farms sharing similar production area, level of mechanization and rotation system.

Table 1
Production system characteristics identified through *comparative agriculture* (data corresponding to the year 2013) (Dumont and Baret, 2017).

Technical orientation	Main characteristics				
	Gross vegetable production area (hectares)	Full-time equivalent per hectare of vegetables	Level of mechanization [0–1] ^{*4}	Number of cultivated vegetables	Marketing routes ^{*5}
MGS ^{*6}	A ^{*1} : < 2.5 C ^{*2} : < 2.5	A: [1–2.5] C: [0.25–2.5]	A: 0 C: [0–0.125]	A: [25–45] C: [20–30]	A: Vegetable boxes sold to collective buying groups, producers' cooperative C: Small farm store
MGM	A: [2–10] C: [2–10]	A: [1.5–5] C: [0.5–2.5]	A: [0–0.125] C: [0–0.25]	A: [30–45] C: [40–50]	A: Farm store, local market C: Farm store, retailer
MGL	O ^{*3} : [12–38] C: [12–38]	O: [0.25–1] C: [0.25–1]	O: [0.30–0.5] C: [0.5–0.7]	O: [25–35] C: [3–13]	O: Farm store, wholesaler C: Supermarket, farm store
VFC	O: > 25 C: > 18	O: < 0.20 C: < 0.10	O: [0.5–1] C: [0.5–1]	O: [5–10] C: [2–8]	O: Supermarket, wholesaler C: Auction

^{*1}A = organic and agroecological producers; ^{*2}C = conventional producers; ^{*3}O = organic and non-agroecological producers; ^{*4}The level of mechanization represents the percentage of vegetable production (of four vegetables: carrots (without tops), green bush beans, lettuce and squash) for which planting and harvesting are mechanized. ^{*5}The indicated food chains are those through which at least 50% of the producers in the production system sell more than 20% of their vegetables. ^{*6}MGS = Market gardening on small areas, MGM = Market gardening on medium areas, MGL = Market gardening on large areas, VFC = Vegetable production in combination with field crops.

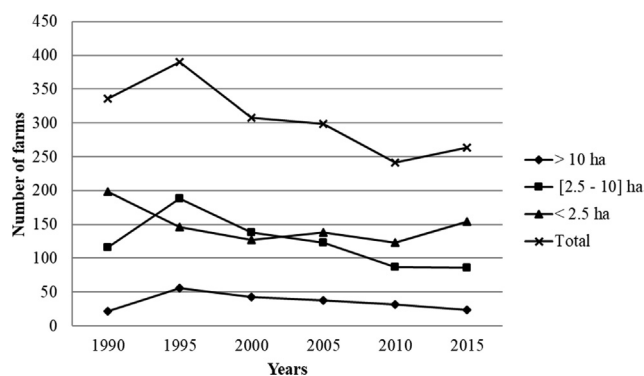


Fig. 2. Change in the number of vegetable farms in Wallonia, 1990–2015. Data provided by J.-M. Marsin from the Wallonian Public Service (personal communication, March 2017). The exact number of small farms in both organic and conventional agriculture is unknown, since market gardening is not a regulated profession. However, all the census organizations consider that MGS organic (and probably agroecological, according to our definition) farms are now largely dominant in terms of the number of producers.

They include increased competition among supermarkets (as it has been well documented in France (Daumas, 2006)), a stagnation and slight drop in producers' prices (SPF Economie, 2016) and the emergence of new food safety crises (especially the dioxin crisis in 1999 in Belgium). Since that time, the prices paid to producers have become more volatile (SPF Economie, 2016), administrative tasks more complex, food safety controls more restrictive, relationships with supermarkets more uncertain, and the public more critical of the social and environmental impacts of intensive agriculture.

The current MGS and MGM conventional farmers were born into agricultural families. Most of them started vegetable production on a portion of their parents' cereal or cattle farms from the 2000 s. While they often consider the MGL and VFC technical orientations as an ideal, they have developed their vegetable production systems on a small or medium areas and are supplying short food chains. These smaller systems are seen as a necessary risk-reduction strategy.

MGS conventional producer speaking about an MGL organic farm (translation from French): “I have a very good relationship with them. I worship these people (...) but I would not like to take over their farm. (...) They are up to their neck in shit because of debts.”

Since 2010, there have been some significant public policy and organizational changes. In 2012, a Wallonian minister initiated a strategic plan to develop organic agriculture and the following year Wallonia

established an advisory center for short food chains. In 2013, the main (and still the only) wholesaler in the region changed its name (to Interbio) and shifted to 100% organic product. In 2014, the main advice center in organic agriculture, Biowallonie, began to take an interest in market gardeners. Throughout this period the demand for local and organic products has been steadily increasing (Annet and Beaudelot, 2017).

Overall, farm shops have become the most common marketing routes for producers (Table 1) and around 50% of fresh-market vegetable producers have moved into organic agriculture, according to Biowallonie.⁵ These changes were prompted by producers searching for more commercial autonomy, a central tenet of agroecology (Nicholls and Altieri, 2012). However, this does not mean that regime producers have started to adopt all of agroecology's principles. Our study of the *justification of practices* found that agroecological practices and underlying principles not linked to autonomy are considered by regime producers as incompatible with the technical and economic characteristics of their farms (Dumont, 2017). For instance, they consider that their large farm implies repetitive and demanding physical work that makes it difficult to hire local people (a practice related to the *rural development* principle), who are unwilling to perform such work for the wages prevailing in the sector, and to offer good employment conditions (a practice related to the *social equity* principle). They also consider other practices of agroecological systems, such as direct selling, to be not possible given their technical and economic constraints.

VFC organic producer (translation from French): “Here, it is hundreds of tons [of vegetables] which are harvested every year. Each producer must develop marketing channels compatible with his own technical and economic features. Direct selling, etc., here, is in my opinion out of the realm of the possible”.

4.2.2. The rise of the MGM agroecological niche-innovation

In parallel with the reorientation of the production regime towards short food chains, there has also, since 2000, been a steady rise in the number of new entrants to agriculture taking up small-scale market gardening, generally following organic or related (agroecology, permaculture, biodynamic, etc.) practices and tapping into short food chains. While there is some debate among census organizations as to their exact numbers, all observers agree that these new producers are now numerically dominant in fresh vegetable production (Dumont, 2017). These producers come from diverse backgrounds, but most of

⁵ Data provided by A. Beaudelot from Biowallonie (personal communication, May 2017).

them chose market gardening looking for a new career in line with their ecological and social values. Like the MGS agroecological producers who entered the sector before 2000, most of these new entrants refer to agroecological principles (as we defined in Section 2.3) when justifying their practices (Dumont, 2017). All have developed practices to apply nine out of the 11 socioeconomic principles (*market access and autonomy; environmental equity; sustainability and adaptability; partnership between producers and consumers; geographic proximity; rural development and the preservation of the rural fabric; shared organization; diversity and exchange of knowledge and joint implementation of the various principles in practice*). The two final socioeconomic principles (*social equity and financial independence from non-agroecological actors*) were less systematically applied, as we will describe hereafter. Around the 2010 s, several of these producers began to organize themselves to facilitate agroecological development, for instance by creating marketing co-operatives and a widely used internet forum. In the years since, several institutional changes have emerged to further encourage this development. Biowallonie has been giving special attention to these new agroecological entrants and scientific research on the viability of MGS systems has increased (see for instance: Lemaître, 2016; UltraTree Project, 2016). Nevertheless, the socioeconomic situation of these agroecological farms is still far from ideal and many are struggling to survive. They work between 2000 and 3000 h a year for a pre-tax profit that is never higher (and is often lower) than €30,000/person/per year. These producers struggle to pay themselves and their workers, make investments, and secure the viability of their enterprises. There are several reasons for this, including high land prices, lack of access to Wallonian investment subsidies (which are not tailored to the multiple small investments usually made on agroecological farms), increased competition among vegetable box schemes (their main marketing route; see Table 1), lack of access to outside contractors (who are not interested in working on small farms although their services are useful for production tasks requiring heavy machinery), and the technical complexity of small market gardening, especially for new entrants to agriculture (Dumont, 2017; Dumont and Baret, 2017). Their economic situations are made even more complicated by the fact that these producers want to preserve a good balance between work life and family life (Dumont, 2017; Dumont and Baret, 2017).

In this context, a few agroecological MGS producers have been switching to an MGM system (Fig. 3). This includes producers with

agricultural backgrounds who have inherited a cereal farm and want to produce vegetables according to the same ideals as the new entrants. These agroecological MGM producers want to create a more viable system for themselves and their workers. To do so, they have altered their technical and marketing systems, mainly by slightly increasing their production area and level of mechanization, hiring more workers, developing large farm stores and increasing winter crop production to maintain activity year-round (Table 1). In addition, they have reoriented their businesses: Most of the agroecological MGM producers generate between 50 and 85% of their turnover through ‘purchase-resale operations’. This involves buying large amounts of vegetables from organic wholesalers, mainly Interbio, and reselling them in their own farm store. The Interbio vegetables come from the region’s MGL and VFC producers or are imported from other countries. These purchase-resale activities are made possible by the Belgian tax regime, which regards them as producers even though this commercial activity may outweigh their productive activities. As a result, they can maintain a financially attractive tax status, which would not be the case in some other countries, such as France (Dumont, 2017).

These ‘purchase-resale operations’ allow agroecological MGM producers to enjoy relatively good working conditions. They also offer the best working conditions to their workers compared to the other production systems. On a per-farm basis, a majority of hours are completed by workers with fixed-term or permanent contracts. Permanent contracts, which account for 42% of completed hours, offer the highest level of social security and the highest salaries in the sector. In addition, MGM agroecological farmworkers benefit from diversified work tasks at the production level, including both production and sales activities. They also often participate in decision-making for task assignments. This situation is highly uncommon within the sector as a whole. In vegetable production, poor working conditions, precarious and low-paying seasonal contracts are the norm in Belgium as in other Western countries (e.g. Barndt, 2008; Gray, 2014; Guthman, 2004; Morice and Michalon, 2008; Sbicca, 2015; Shreck et al., 2006; Weiler et al., 2016). Because of this situation, MGM agroecological farms attract many workers who want to learn agroecological practices and have a meaningful job with acceptable work security and earnings ((Dumont, 2017; Dumont and Baret, 2017).

Nevertheless, our study of the justification of practices suggests that these purchase-resale operations represent a real ethical dilemma for

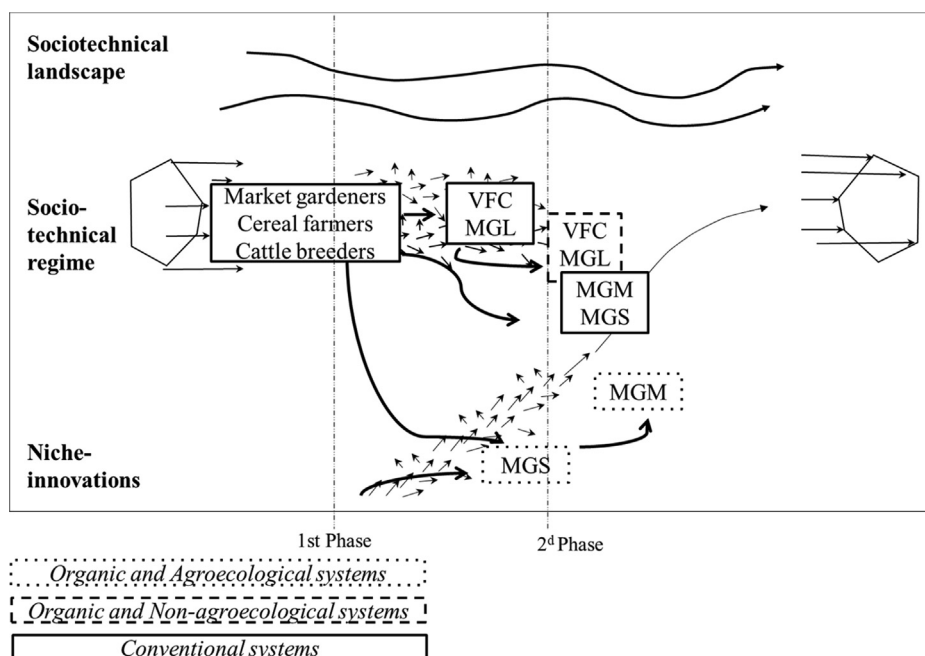


Fig. 3. The historical development of the Wallonian fresh vegetable production systems, situated within the levels of the MLP. The arrows represent the most common origin of each production system. MGS = Market gardening on small areas, MGM = Market gardening on medium areas, MGL = Market gardening on large areas, VFC = Vegetable production in combination with field crops. The representation of MLP is adapted from Geels and Schot (2007, p. 401)

agroecological producers. Paradoxically, MGM producers both depend on and sustain regime actors by buying large quantities of their vegetables, which is in conflict with the principle of *financial independence from non-agroecological actors*. For this reason, not all MGS producers wish to become MGM producers even if they would like to offer a better livelihood to their farmworkers, according to the *social equity* principle. Agroecological MGS producers refuse to support unsustainable practices. They want to teach consumers to pay the right price for sustainable agriculture and to support local and sustainable production only. As such, no agroecological producers can seek to put into practice all agroecological principles; instead, they must favor some principles at the expense of others. MGM producers favor the *social equity* principle of agroecology, providing better conditions for their farmworkers, while MGS producers favor *financial independence from non-agroecological actors*. Producers from both groups justify their choices partly in the name of the general interest.⁶ Neither group can be considered ‘less’ agroecological than the other according to the *justification of practices* (for more details see Dumont (2017)). Notice that while all of the MGM producers interviewed consider their purchase-resale activities as necessary to maintaining a livelihood, MGS producers are more divided. Most hold strong views on these activities and some have even adopted them, albeit in a more limited way than the MGM producers.

MGM agroecological producer (translation from French): “The crop, in accounting terms, is systematically in deficit! This was not the case when I was alone [i.e., when he was a MGS producer] (...) even if it needs to be put into perspective given the hourly pay was really ridiculous. The system is such that I do a lot of marketing, and the marketing pays for the crop. (...) I don’t want to work with short-term seasonal workers and pay people with a cut-rate salary. (...) We really have a differentiated quality (...) but society, nowadays, does not pay for that. Anyway, the price of our products does not pay for the quality of the produce, nor for the quality of life for the people, me or my workers”.

5. Discussion

5.1. Coexistence between agricultural configurations

Our results show that the agroecological MGM system, originally an agroecological niche-innovation, would become a new agricultural configuration of the regime, alongside the incumbent agricultural configuration made up of organic and conventional systems. Indeed, purchase-resale activities, together with a few technical adjustments such as a slightly larger land area and a higher level of mechanization (see previous section and Table 1), are allowing MGM agroecological producers to secure their own livelihoods and pay their farmworkers well. They are thereby overcoming the lack of socioeconomic viability that has been inherent in the agroecological niche and remains a central issue for the agroecological MGS system. At the same time, MGM agroecological producers are benefiting from increased demand for organic and local products and from recent organizational and institutional agrifood system developments to support organic agriculture and agroecology. Since the number of new entrants interested in agroecology is already high and continues to increase in the region, the MGM agroecological niche-innovation is expanding and would eventually become a dominant agricultural configuration. At the same time, however, the MGM agroecological niche-innovation is supporting the current regime by financing the regime actors in organic agriculture

through their purchase-resale activities. This would lead to a situation where the MGM system of the agroecological niche would become an agricultural configuration of the regime alongside the current configuration.

In addition, we observed that the agroecological MGM system is becoming part of the regime level while remaining faithful to the agroecological ideal. Following our ecological and socioeconomic definition of agroecology, both the MGS system, trapped at the niche level, and the MGM system, becoming part of the regime level, apply agroecological principles to the same degree. The technical changes operated by the MGM producers, such as a slight extension of the size of their farm (Table 1) do not affect their implementation of agroecological principles. Both types are organic, highly diversified farms, relying on the recycling of nutrients rather than the use of inputs and applying nine out of the 11 socioeconomic principles of agroecology. The two agroecological systems differ with regard to the two socioeconomic principles that are hardest to implement in the current context. MGM agroecological producers favor the *social equity* principle at the expense of the *financial independence* principle. Generally speaking, they accept financial dependence on non-agroecological wholesalers through purchase-resale activities, and consequently offer good employment conditions to their farmworkers. Thanks to these activities, they are becoming part of the regime level, while the agroecological MGS producers, who have made the opposite choice, are trapped at the niche level.

As a result, we are reaching a situation of coexistence between two agricultural configurations at the regime level: (1) an old configuration reoriented toward more commercial autonomy for producers and dominated by MGL and VFC organic and conventional systems; (2) a new configuration oriented toward agroecological principles and dominated by the MGM agroecological system (Fig. 4). Both agricultural configurations remain faithful to their agricultural ideals as highlighted by the *justification of practices*. More generally, the actors’ networks and rules, including cognitive rules (Geels, 2004), necessary to the regime’s reproduction and explaining lock-in situations, would differ for the two agricultural configurations. Non-agroecological regime producers innovate to improve their farms’ performance and their investment capacities. They are mainly motivated by the “technical challenges” encountered in their work and appreciate the need “to move things forward” (Dumont and Baret, 2017). Their production systems meet the expectations of supermarket consumers. Cheap food prices and pressure on the costs of production, especially labor costs, are one of the principal ‘rules’ that allow the current agricultural configuration of the regime to reproduce itself. This situation explains the prevalence of precarious, seasonal contracts for farmworkers and the use of foreign workers dependent on their home countries’ social security system rather than on Belgium’s relatively generous social security.

The producers in the agroecological configuration that is becoming a part of the regime level have a very different trajectory, innovate in different ways and have created practices that follow other pathways. Most of these producers do not come from agricultural backgrounds. They have taken on a farm looking for a new life in line with their social and ecological values. They innovate to improve their own well-being and that of their workers. They have high expectations in terms of work-family life balance. They are prepared to work fewer hours even if it means making less money and reducing their investment capacity. The agroecological MGM producers have developed some practices, such as purchase-resale activities, precisely to overcome the lock-in situation of precarious employment in vegetable production. One of the fundamental pre-conditions for the emergence and reproduction of this agroecological configuration is the continuation of the Belgian tax regime that makes these purchase-resale activities possible.

Both the new agroecological and the old organic and conventional configurations would include different key actors seeking to enforce the hegemony of the incumbent production regime or of a new

⁶ Using Boltanski and Thevenot’s framework, the justifications of MGM agroecological producers in favor of purchase/resale operations are based on the “industrial” and “civic” polities. For MGS agroecological producers, the justifications for not accepting these operations are based on the “domestic” and “civic” polities.

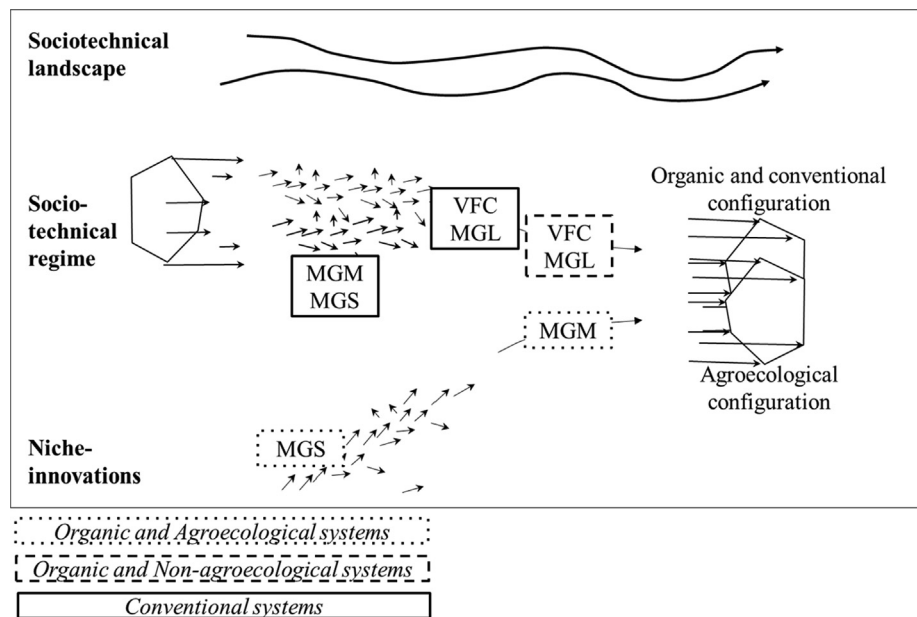


Fig. 4. Emergence of a new agroecological configuration alongside the old, organic and conventional configuration into the regime of the Wallonian fresh vegetable agrifood system.

agroecological regime. For instance, with regard to advisors, Biowallonie and the CIM both advise organic vegetable producers, but the former orients them towards agroecological principles while the latter seeks to reinforce the values and practices of the current regime. Biowallonie is mainly interested in new entrants to farming who are attracted to agroecology, and produces publications on permaculture, agroecology and other practices that are of little interest to actors who follow the script of the current regime. By contrast, CIM's main goal is to help producers supply the continuous flow of vegetable products needed by supermarkets.

5.2. The coexistence phenomenon and its public policy implications

These results show that a socio-technical configuration of the niche (in this case an agricultural production configuration) can become part of the regime while remaining faithful to its original ideals and at the same time not replacing the older socio-technical configuration. This leads to a coexistence situation between diverse socio-technical configurations of the regime, supporting different visions of sustainability and shaped by different institutions, rules, lock-in and path dependence. Nevertheless, this transformation is currently limited at the production regime (Fig. 4). The overwhelming number of vegetables eaten by Wallonian consumers are not agroecological in origin and this situation is not going to change any time soon. Through their purchase-resale activities, agroecological MGM producers offer large quantities of non-agroecological vegetables to their customers. This reality is not likely to change without a major reorientation towards agroecology not just in Wallonia but also in Flanders and other parts of Europe that supply the Wallonian market and agroecological MGM producers.

Regarding the MLP typology of transition pathways (Geels et al., 2016), the observed coexistence between two production configurations could lead to a *reconfiguration pathway*: where a new 'alliance' (here mainly materialized in the purchase-resale operations) between incumbent actors (producers in organic agriculture) and new entrants (producers in agroecology) is leading to a deep transformation of the architecture of the whole socio-technical system (the Wallonian fresh vegetable agrifood system). This will depend, however, on future public policy. In the current socioeconomic and political context, agroecological producers are unable to implement all agroecological principles: they have to prioritize some principles at the expense of others, and

consequently continue to offer large quantities of non-agroecological vegetables to their consumers (Section 4.2). At a minimum, public policies are needed to facilitate secure access to land and to develop suitable investment subsidies for agroecological systems. In addition, it would be helpful to encourage the exchange of knowledge and machinery among farms using different vegetable production systems, since agroecological producers are usually new entrants to agriculture and struggle to make use of outside contractors for production tasks requiring heavy machinery (Section 4.2). Public policies could also help prevent negative interactions that threaten to undermine the future agroecological configuration, such as increased competition among farm shops.

While the MLP typology does not preclude the possibility of coexistence phenomena, it does not detail them nor provide tools for observing them empirically, given that heterogeneity, tensions, and conflicts within the regime and niche levels are empirically hard to grasp (Berkhout et al., 2004; Genus and Coles, 2008; Shove and Walker, 2007; Smith et al., 2005) in (Fuenfschilling and Truffer, 2014)). However, understanding coexistence situations highlights new possibilities for scaling-up agroecology in Wallonia.

6. Conclusions and perspectives

6.1. A new epistemology to examine agricultural transitions to sustainability

To address the complexity of making an empirical study of agricultural transitions to sustainability, we suggested three theoretical frameworks developed with a heuristic intent and adapted to the assumptions of the Weberian comprehensive sociology. Taken together, the *multi-level perspective* (MLP), *comparative agriculture* and *justification of practices* approaches allowed us to analyze the dynamics of agricultural transition, while taking into account normative and cognitive rules and the diversity of historical farming systems. More precisely, *comparative agriculture* shed light on the diverse historical production systems that make up the agrifood system for fresh vegetable production in Wallonia, their interactions and co-evolutionary dynamics. It enabled us to understand how a production system of the agroecological niche began to interact with the regime by financing two organic production systems of the regime. Thanks to this interaction, the agroecological system is overcoming the lack of socioeconomic viability

that had previously been inherent to the niche.

By examining which values and motivations underlie actors' practices using the *justification of practices* framework, we identified two groups of agroecological market gardeners: the MGS and MGM systems. We were able to explain why we observe a plurality of implementations of the agroecological paradigm and why these agroecological systems have different perspectives for future development.

Finally, it is well-known that the MLP provides insights into the overall dynamics of transition and the resulting potential transition horizons. In our multi-framework approach, the MLP also allowed us to evaluate the impacts on transition dynamics of the interactions identified via the *comparative agriculture* and the *justification of practices* frameworks. For instance, we could see that by prioritizing their financial independence from non-agroecological actors, MGS producers are supporting a transition that would substitute the socio-technical regime of production. However, they are currently trapped at a niche level, primarily because their farms lack viability in the current political and socioeconomic context. By prioritizing social equity and depending on regime actors, the agroecological MGM producers are instead supporting a reconfiguration of the regime of production. This reconfiguration involves a coexistence situation between a new agroecological configuration and an old, organic and conventional configuration.

Combining these three theoretical frameworks opens up a new epistemological approach to studying transition. This epistemology consists of a combination of pragmatic, comparative and systemic approaches. It is pragmatic in the sense that by exploring the subjective sense and ideals that guide actors' actions, experiences and thinking, we come to understand the way(s) in which actors act to influence the transition horizon. It is comparative in the sense that the same framework is used to analyze the situation of the different systems belonging to the niche and the regime and to outline their interactions and perspectives. Finally, it is systemic in the sense that it aims to grasp the complexity of a system and its interactions, rather than focus on a few elements of the system.

6.2. Perspectives on the understanding and management of agroecological transitions

These three frameworks have led us to a new comprehension of coexistence phenomena between socio-technical configurations. We have seen that a plurality of socio-technical configurations, supported by different key actors pursuing different aims, and shaped by different rules, lock-in effects and path dependence, can potentially coexist in the current socioeconomic and political context. We have also observed that a socio-technical configuration of a niche can become part of the regime level while remaining faithful to the ideal of the niche. The agroecological system transitioning to the regime level applies agroecological principles to the same degree as the system trapped at the niche level. Both are organic, highly diversified farms, relying on the recycling of nutrients rather than the use of inputs, and manage to apply at least nine out of the 11 socioeconomic principles of agroecology in the current context. However, they do not favor the implementation of the same principles.

These findings open up new possibilities for the understanding and management of agroecological transitions. In recent years a growing number of politicians have advanced agroecology on the public policy agenda. For instance, the French minister of agriculture (2012–2017) made agroecology his primary target, while the Food and Agriculture Organization of the United Nations (FAO) is looking into policies to favor the implementation of agroecology. The extent to which the agroecological paradigm is being co-opted by the regime or remains faithful to its original principles constitutes a major debate (Cayre et al., 2018; Lamine et al., 2015; Levidow et al., 2014; Plumecocq et al., 2018; Rosset and Altieri, 2017). Our analytical framework and working definition of agroecology allow us to distinguish between these two

phenomena by highlighting which agroecological principles are being applied, by whom and on what basis, and in turn how this impacts farms' long-term viability. This approach thus provides a better understanding of the implications, at the regional level, of the political appropriation of agroecology, and helps point the way toward public policies to encourage implementation of all agroecological principles.

Author contributions

The present paper is based on a PhD thesis conducted by Antoinette M. Dumont. Conceptualization, analysis of the literature, methodology, data collection, analysis of the results, and writing of the paper are mainly from her. Philippe V. Baret, as PhD's mentor and specialist of multidisciplinary methodologies, and Pierre Gassel, as Jury member and specialist of the comparative agriculture, helped along all the steps.

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