

AgroEcological Transitions

Changes and Breakthroughs in the Making

Edited by Boelie Elzen, Anna Maria Augustyn,

Marc Barbier and Barbara van Mierlo



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Conclusion: a Curiosity Cabinet of Agro-Ecological Transition Studies

Marc Barbier¹, Boelie Elzen², Barbara van Mierlo³ and Anna Maria Augustyn⁴

1 Introduction

The final chapter in this volume teases out some general lessons. It summarises the main findings of each of the preceding chapters and ends with a number of general reflections on the study of agroecological transitions-in-the-making. Each of the preceding chapters describes practical experiences in stimulating transitions towards sustainable agri-food systems. Many of these studies draw upon the agroecological agenda, meaning the bio-politics of access to resources that define the people in their humanity with a sense of distributive justice. Most studies in this volume focus on how to sustain a biological and biophysical capability, says a living soil, to generate bio-resources as a surplus for animal, vegetal and human systemic relations. A limitation, that needs to be acknowledged, is that the majority of the chapters concern countries of industrialised agriculture, although there are some noticeable exceptions. Despite this limitation, however, these studies do provide a far more 'integral' analysis of sustainable agri-food systems than in a wide variety of other studies and do provide a good stepping-stone to tackle the enormous sustainability challenge that lies ahead.

The form taken by agroecological agenda in the cases analysed is largely inspired by the organic farming movement but cannot be reduced to it. Many relevant initiatives explore other sociotechnical promises that are based on value systems which are more or less shared with the agroecological agenda. This agroecological turn is not only paved with good intentions but also with many traps stemming from the inner tensions. Paradoxes emerge when practices confront diverging values in transition processes. But this turn cannot avoid facing the incumbent system of norms, actors, routines and lock-in of agri-food-chains. Therefore, studying transition-in-the-making in this context needs to liaise with the stream of research that studies sociotechnical regimes and that sheds the light on multi-actor networking and learning loops in fostering agroecological transitions. This concluding chapter thus also provides input for a research agenda on agroecological transitions-in-the-making.

2 A Curiosity Cabinet displaying three strands of Transition Studies

Seeking to draw general lessons from the preceding chapters constitutes a challenge, since these chapters have varying epistemological and theoretical backgrounds. Yet, they do represent the state-of-the-art of research on sustainability transitions in agro-food systems. Drawing general lessons from what at first sight seems a very heterogeneous collection, we have divided up the collection into three parts corresponding with the three analytical strands as explained in the introduction to this volume. To acknowledge this

¹ INRA, UR1326 Laboratoire Interdisciplinaire Sciences Innovations et Sociétés (LISIS), Champs-sur-Marne, France.

Email: marc.barbier@grignon.inra.fr

² Applied Arable and Vegetable Research, WUR, the Netherlands. Email: boelie.elzen@wur.nl

³ Knowledge, Technology and Innovation Group, Wageningen University, Netherlands. Email: barbara.vanmierlo@wur.nl

⁴ Groupe de Bruges, the Netherlands. Email: annamaria.augustyn@yahoo.com

heterogeneity, we use the term 'Curiosity Cabinet' for the collection as a whole. The three analytical strands are (1) learning in niches, (2) niche-regime interactions, and (3) regime transformations.

The three analytical strands represent three different *foci* in how researchers are currently tackling the issues of agroecological transitions, while they are situating their own analysis in rather specific *loci* of human action where actors are engaged in transformational change processes. This emphasis on field work certainly reflects a value that the authors of this volume share with many social scientists, including giving a reflexive account of engagement with the situations analysed and an openness towards transdisciplinary research. As a result, several of the authors address questions like: how to foster learning in niches? How do niches link up to regimes to start a change process? How to stimulate this with methods like co-design or action research? How does this lead to a transformation of the regime (massive uptake of novelties) and how to accelerate this?

Below, we seek to develop (tentative) answers to such questions by revisiting all the chapters of this volume. We are doing so under three headings that reflect the three analytical strands indicated above. In this synthesis of the chapters, we hope readers will find some echoes of their personal or collective interests thanks to our 'guided visit' through the Curiosity Cabinet.

2.1 Learning in Niches: Nursing the seeds of transition

In transition studies, niche projects are often considered the "seeds of transition" (Wiskerke and Van der Ploeg 2004) that, following an evolutionary process, could induce further regime transformations. Experiential knowledge, ex-post analysis and giving feedback are then important to help participants and scholars to learn about how innovations or changes can transform views on their institutional and biophysical environments. Six chapters focus on these issues from two different angles: (1) agricultural production *per se* and (2) agricultural production in its wider societal embedding.

2.1.1 Exploring path-breaking agricultural innovations

Three chapters take specific problems of the incumbent regime as a starting point to develop and/or explore new forms of agriculture that might solve these problems. They provide insights in transitions in-the-making and the collective design of possible transition pathways by analysing how certain actors try to realise purposeful changes by experimenting with breakthrough alternatives to the dominant agro-food regime. In one case, the strategy for change is rooted in reflexive processes of niche actors that interact with regime actors to explore possible pathways for change, based on anchoring and a permanent negotiation of ambitions. In another case, changes are promoted by niche initiatives that operate independently from the mainstream agricultural knowledge system. Yet, this chapter also describes that niche and regime developments do influence one another. The third case describes how changes may also occur in paradoxical situations where sustainability goals are pursued by both consumers and producers, but where inertia and prevailing power relationships create barriers for the regime change. Despite this lock-in, a combination of co-construction and advocacy strategies may induce changes towards a more sustainable system. Below we take a closer look at these three chapters.

Reflexivity and anchoring. The chapter by **Bart Bremmer** and **Bram Bos** provided an analysis of network building in the design of new animal husbandry systems (the RIO approach) in the Netherlands over the past 15 years. By documenting the vicissitudes of these new initiatives they shed light on three distinctive ways to support niche development, notably shielding, nurturing and empowerment. They argue that innovations, that are carried out by individual farmers, are not likely to result in niche development, as innovative farmers generally only aim for changes on their own farm, and do not seek to make others adopt these changes. In practice, in many of these initiatives, that were initially path breaking, farmers chose to decrease the level of ambition by adapting their choices to the existing environment that remained unaltered. In other examples, however, a wider network was involved in implementing new systems that resulted from the RIO projects and these altered the direction of regime developments to some extent, thereby providing more space and support for radically different innovations. The RIO approach and its

outcomes did result in path-breaking new husbandry systems which, however, (thus far) have only been realized on a small scale in local initiatives.

Boundary work and adaptive interactions. In their study, **Julie Ingram** and **Damian Maye** described an emerging group or 'sub-niche' that promotes and develops permaculture initiatives and analyse how this group interacts with the mainstream agricultural knowledge system (AKS). Going beyond identity claims and contentions, their analysis showed that a new knowledge system has emerged in this community to support learning independently from the existing AKS. They also showed that this learning process has cohered around the community's social system. Interestingly, rather than finding a dichotomy of the permaculture knowledge system challenging or invigorating the incumbent system, they identified a subtle set of overlapping processes that involve some contested diffusion of permaculture ideas into the AKS. There is a certain degree of co-learning, resulting in the emergence of fresh perspectives and opportunities for innovation. As a result, there is a clear influence from a niche with transformative ambitions on the regime. In this situation, intermediaries between the knowledge systems, rather than playing a purely functional role of communicating objective knowledge, engaged in a process to negotiate, interpret and represent different values, epistemologies and visions of the future. In the case of permaculture, these intermediary processes have been *ad hoc* and opportunistic and the relative merits of such emergent and adaptive interactions, compared to formalised approaches, need further attention in the context of sustainability transitions.

Strategizing transitions in a sociotechnical system. Recent developments have led to the emergence of new multi-actor 'transition arenas'. The chapter by **Claire Lamine** takes a paradox as a matter of enquiry: how to understand that societal pressures for sustainability have had virtually no impact on cultivar breeding in the French peach and apricot industry, although the quality of modern cultivars is often disappointing to both consumers and farmers? She shows that, despite inertia and prevailing power relationships, a combination of co-construction and advocacy strategies within three different kinds of arena (mainstream, alternative and transition arenas) might form a basis for a collective design of pathways towards sustainability. These emerging transition arenas stem from the alliances between a diversity of stakeholders who embody the different components of the socio-technical system (research, experimentation networks, breeders, economic stakeholders, policy makers, civil society), although they do not represent them in an official, mandatory way. This co-presence can provide a way to tackle (or to redefine) the interdependencies that tie them together.

2.1.2 Societal embedding of novel agricultural practices

The first three chapters discussed above all addressed niche developments in which agricultural production is the focus of attention. Three further chapters also dealt with the development of niches but in these, agricultural practices were analysed as part of a wider system. These chapters also consider agriculture's regional role with moral concerns about linking production to food provision in alternative food networks and intermediation support for sustainable development. They thus provide informed insights on transitions-in-the-making when the reconnection of production and consumption is grounded in a moral economy carried by communities and social movements. Although the focus is on niches, in which a collective exploration takes place at a rather small scale, this should not lead to viewing these practices solely as fancy subcultures of alternative food provision. While infrastructural barriers to sourcing food through sustainable regional food channels will not be overcome by individuals or small organizations alone, these initiatives do provide stepping stones to target political action strategies at multiple levels.

A culture of reconnection. From the point of view of transition dynamics, **Bálint Balázs**, **György Pataki** and **Orsolya Lazányi** described how farmers became the main actors in the protection and consolidation of an innovative reconnection of producers and consumers. 'Community Supported Agriculture' (CSA), that has developed outside the industrial regime of food provision, relies on the help of engaged consumers and an emerging CSA platform. CSA members put extra effort into bringing together and nurturing bonds of affinity with their customer base and, furthermore, educate them about sustainable diets. CSA appears as a specific form of the moral economy whereby farmers seek to create communities relying on external financial resources and reaching out to trust-based personal networks or ethical consumers. CSA can be

seen as a collective exploration to catalyse changes in a dominant agro-food system, reconnecting consumers with producers by fostering a collaborative culture of sharing, gifting, bartering and donating.

Small scale farming as alternative. Building on the concept of 'alternative food networks', **Boldizsár Megyesi** described different models-in-use of agri-food production in a Hungarian rural micro-region. He assessed various forms of knowledge (local/traditional, managerial and scientific knowledge) and types of farming (agricultural companies, medium-size farms, small-size farms and social farming). Exploring the factors and resources that determine farming technologies and specific practices that inspire different models of agri-food production, it appears that small scale farming is able to liaise with alternative food networks, while the other types of farming remain inside the incumbent agricultural regime. The latter abide by existing rural policies and subsidy arrangements and tend to minimize their attention for the societal or environmental consequences of their farming practices.

The transformative potential of alternative food movements. Compared to the two previous chapters, **Marcia Ostrom** went a step further by showing how niche level developments may start change processes at the regime level. She described a new dialogue on the meaning and politics of food that takes place at local, regional, but also national levels. New sets of meanings, ideas, and ideals have emerged and have been taken up and debated by the larger society. She concluded that the transformative potential of alternative food movement organizations depends on their ability to catalyse cultural shifts and evolutions in the values, ideals, and meanings associated with food from the purely personal to wider societal concerns. Translating these emerging new value systems around food into systems-level change, however, will require mobilizing collective action that is coordinated across individuals, movement organizations and institutions. Substantial policy and infrastructural barriers to sourcing any significant amount of food through sustainable regional food channels cannot be overcome by individuals alone or even small institutions making informed purchasing decisions. In addition, this will require collective action strategies that bridge an emerging sense of individual agency with targeted political action strategies at multiple levels.

2.2 Governing sustainability by linking niche and regime developments

The six papers discussed in this section focus on driving forces that govern sustainability transformations, either through public support and policy making or through organised action and initiatives that intend to govern sustainability by institutional arrangements or market instruments.

2.2.1 Niche-regime linking affected by policy making

The first three chapters discussed below addressed the linking processes between niches and regimes that are required to make a new technology or a new farming practice influence regime developments to become more sustainable. These chapters focused on tensions within systems of knowledge, the status and role definition of intermediary organizations and overcoming biases in resources for different types of research.

Pluralistic patterns of change in a niche-regime. The chapter by **George Vlahos, Pavlos Karanikolas** and **Alex Koutsouris** addressed the interaction between niche and regime in canned peach production in Northern Greece. They used the concept of niche-regime to analyse how Integrated Farming has originated from within the incumbent regime. This study identified an area of overlap between niche and regime in which the authors identify a sequence of top-down and bottom-up patterns of change, characterised as '*reconstellation*' and '*empowerment*'. The emerging transition seems to follow a concrete sequence of patterns, causing profound changes in structures, cultures and practices. Rather than an evolutionary dynamic of niche expansion, the dynamic in the area of overlap shows various and sometimes diverging transition paths that seem to unfold simultaneously. The chapter thus identified pluralistic patterns of change, the study of which, the authors argue, will require a non-hierarchical representation of the multi-level perspective (MLP).

Competing narratives for research and extension. In contrast to the preceding chapter, the chapter by **C. Shambu Prasad** and **Debashish Sen** described a case where a global niche has been firmly established and recognised: the System of Rice Intensification (SRI) in India. The chapter argues that the success of SRI relies on the conjunction of institutional experiments and experiments at micro-levels, and the role of non-research actors who show a capacity for learning and experimentation. Nevertheless, the knowledge and experiences with SRI continue to lack policy support due to existing knowledge regimes that do not support agroecology. While the AKIS (agricultural knowledge and innovation system) and the MLP literature have addressed issues of knowledge at the regime and landscape level, the authors argue that the politics of knowledge has not received sufficient attention. Resources for research and extension lie largely with the agricultural research establishments that are more aligned with the dominant narrative of agricultural intensification through genetic engineering, rather than a 'low-tech' alternative like SRI, despite its evident successes.

Allocation and policy support to intermediary organizations. The chapter by **Paul Swagemakers**, **Pierluigi Milone** and **Flaminia Ventura** also considered the interdependency of niches and regimes in two case-studies on alternative practices in dairy farming in the Netherlands and in Italy. Their analysis of the organization of projects and practices developed by farmers and government intermediaries showed the importance of organizational structures that remain highly dependent on policy support. This support is crucial to address environmental concerns and articulate farmers' drives to adopt production efficiency and cost reduction strategies that fit an agroecological paradigm. The authors demonstrated that a better understanding of transition processes lies in the equal allocation of research resources and policy support to intermediary organizations. These contribute to the exploration and incorporation of endogenous knowledge in a future optimization of the agro-food system, and therewith help the wider sector to adopt *resilient* farmers' strategies.

2.2.2 Niche-regime linking through strategizing and governance

The three chapters discussed above focused on how the linking of niches and regimes is affected by policy-making and public support at the national or regional level. The three chapters discussed below target a different level of enquiry. They focus on organised action and initiatives that stimulate such linking by means of entrepreneurial strategies. These chapters describe the strategies of collective action and social movements, and analyse the role of intermediaries and market standards as instruments for sustainable development. The respective studies are clearly transdisciplinary since the researchers themselves were actively engaged in the transitions-in-the-making that they described.

Portfolio of Promises as a transition tool. The chapter by **Boelie Elzen**, **Arni Janssen** and **Bram Bos** described a tool that can be used to stimulate transition processes. It built on the recognition that in agricultural practice there is a wide range of 'bottom-up' innovation initiatives that are carried out by entrepreneurial farmers. The authors used the term 'promise' to describe a novelty with attractive features but that has also problematic or unknown sides. To help entrepreneurial farmers to reflect on the sustainability potential of a range of novelties, the authors have developed a database called 'portfolio of promises' which contains information on a large number of these promises. This tool can be used by farmers to take decisions on changes they want to make on their farm, as well as by strategic actors and policy makers to inform a broader innovation strategy. Although the underlying database structure of the portfolio of promises may be general, specific interfaces are needed to make the tool useful for farmers, strategists in the sector, policy makers or researchers. Each of these envisaged user groups has different requirements concerning the level of detail of the information they need and the comprehensiveness of the available information.

Variety in social movements strategies. The chapter by **Jan Buurma**, **Karel de Greef** and **Volkert Beekman** focused on the ways in which social movements can trigger change processes in a regime by analysing the dynamics between two types of NGO, researchers and sector organisations in the domain of pork production in the Netherlands. In the MLP terms, the study argued that a 'moderate' NGO focused on the overlapping area between niche and regime while an activist group targeted the overlapping area

between regime and landscape. In terms of effectiveness, one strategy is not systematically more effective than the other while both can support each other's effectiveness. The authors underlined that an effective strategy for change should make use of trends and incidents at the landscape level, but also increase pressure on the regime, in addition to multi-actor arrangements at the niche and regime level. The occurrence of trends and incidents, combined with an activist NGO stressing these, create urgency for change and consumer awareness. The activities of an activist NGO are thus relevant for innovation because their claim of voicing the opinions of the general public stimulates market partners to explore changes, thus creating room for partnerships with moderate NGOs to define and implement such changes.

Standards linking local practices and global markets. As in the previous chapter, **Allison Loconto**, **Anne Sophie Poisot** and **Pilar Santacoloma** also built on social movement theories, combining these with the sociology of innovation. This chapter described 15 cases of creation of various market arrangements in developing countries, based on local networks linking sustainable agricultural practices to global markets. Although smallholders have a limited influence in setting standards, such standards do play an important role in facilitating this linking. The findings showed the entrenchment of both local communities and international dynamics that determine the development of institutional innovations. The role of standards in connecting sustainability niches and globalized markets is complex, as they are only one factor at play in the social dynamics. Other important factors include direct marketing techniques used by groups, charismatic leadership, constructing a common vision for sustainable agriculture, culinary education linking the origin of food and its preparation. These factors all reflect important distributed capacities that help farmers and their organizations to move gradually toward more sustainable practices.

2.3 Knowledge and knowing in regime transformations

The last part of this volume addressed the issue of regime transformations by focusing on cognitive frameworks and narratives that guide action. The cases described different types of social research (sociology of education, system thinking, communication studies and practised based approach) that question the transfer of knowledge as it is practised in the dominant regime. However, the way these four chapters approached knowledge and knowing does not simply consist of replacing one set of values and norms by another, more sustainable set. On the contrary, the authors used very nuanced approaches to study knowledge acquisition, knowing processes and reflexivity in relation to action in transitions.

Improving sustainability training in higher education. In this volume, **Erika Quendler** had a unique take on the sustainable development by focusing on the role of education. She analysed how education providers and employers have been training students on the manifold aspects of sustainable development with a view towards stimulating systemic change. An important overall observation was that Higher Education Institutions (HEIs) training programmes have been suffering from the same inertia as incumbent systems towards changes. Yet, societal pressure, but also the demands from firms, call for significant changes in training programmes, e.g. more attention for sustainable development in general; training in handling complex situations; more attention for the prospect of action, for putting knowledge into practice; and more attention for lifelong learning in a rapidly changing world. Proposing to refresh the current discussion on the role of system innovation in education, this chapter utilised the MLP to tackle the issue of improving graduates' employability, based on improved sustainability knowledge and skills. It thus framed interactions between the education sector, actors striving for educational system innovation and the market in a new and promising way.

Niche as collective experience of opportunity. In their chapter drawing on the concepts of system thinking and transition management, **Frank Nevens**, **Erik Mathijs** and **Philippe Vandenbroeck** discussed an interactive process in which they have gradually crafted an analysis of the agri-food system in Flanders. The chapter discussed the use of system analysis as an instrument to assess problems that originated from phenomena that once marked the success of a system, such as productivity increase. A variety of lessons were drawn from the analysis, contesting or nuancing starting points and findings from earlier MLP work. One finding was that landscape pressures may not only cause regimes to change, they may also reinforce them. A further lesson is that, compared to 'weaker' actors, powerful system actors are more comfortable

in a system thinking setting in which the potential of the dominant regime is part of the picture and of the discussion. From such a position, niches may not necessarily be seen as a threat to the incumbent regime, but also as a collective experience that provides inspiration and opportunity for transforming.

Reflexivity and learning outcomes. The study described by **Pieter J. Beers** and **Barbara van Mierlo** started with observing that reflexivity is seldom clarified conceptually and that its relation with learning and reflection have hardly been analysed. From a literature review they concluded that that reflexivity has been rarely operationalised and not seem to have been studied empirically at all. In a case study on an innovation initiative on the Dutch greenhouse sector, they predefined 14 learning outcomes. They concluded that of these learning outcomes, only a few have increased reflexivity. Half of the observed learning outcomes were mainly in line with the dominant rules that guide participants' practices and interaction, without an apparent stimulus to increase reflexivity. This lead to the conclusion that not all interactive learning outcomes could be expected to contribute to system innovation. The authors proposed it as possible as well as relevant to distinguish learning and reflexivity, and investigate their relationships and interaction more in-depth. But they also warned that scholars of learning may have overestimated the relation between organised learning and transformative change.

Intermediation as a complex activity. The chapter by **Patrick Steyaert, Marianne Cerf, Marc Barbier, Alix Levain** and **Allison Loconto** focused on intermediation activities at play in situations of sustainability transitions and in relation to what the authors call the 'environmental paradox'. The authors suggested that these activities need to be analysed as the combination of three levels of engagement from intermediaries: contextualization, performativity and reflexivity. On the basis of a crosscutting analysis of case studies they observed that, while sustainability transitions are strongly related to expectations in terms of efficiency and measurement, they are also characterized by some generic attributes of 'wicked problems' that make these expectations partly unachievable. Therefore, the core properties of wicked problems related to environmental issues need to be taken into account: interdependency, complexity, uncertainty and controversy, since these properties condition the understanding and the potential impact of intermediation activities. As a result, initiatives to make agriculture more sustainable should be aimed less towards goals achievement and more towards the process dimension of transformational change. In conclusion, the chapter argued for a research program on intermediation as practice that should address the following three issues: (1) the way intermediation acquires its legitimacy; (2) the objectification and inter-subjectification processes and the way they are articulated through the different functions of intermediation; and (3) the working of the constitutive properties of intermediation, i.e. contextualization, performativity and reflexivity.

2.4 Three research strands on agroecological transitions

The six papers discussed in section 2.1 above all focused on how various actors are tinkering with new agricultural practices in niches or with new social practices of food provision. Three of these chapters considered agricultural production *per se* and the collective design of possible alternatives that address shortcomings of the incumbent sociotechnical regime, while the other three analyse agricultural niches as part of wider local or regional change process for sustainable development. These chapters clearly illustrated that the production of novelties does not occur in an isolated bubble of values, action and intentions. The transformative ambition of those initiatives leads them to develop ties with contextual incumbent systems which they seek to change.

The following six papers discussed in section 2.2 explored linking processes between niches and regimes to support transitions. Three chapters concerned new technology and sociotechnical standards which mobilise public attention and policy making to transform existing systems. This causes tensions in prevailing systems of knowledge, questions the status and role definition of intermediary organizations and requires a different allocation of resources. Three other chapters described a gradual process of transformation by means of strategizing and market standards, focusing on organised action and initiatives that seek to govern sustainability via entrepreneurial strategies and market instruments. These chapters thus provided a distinctive perspective on transitions, one that emphasizes the transformative potential of civic actors, of

liberal market institutions and that is less depending on public support and policy attention for rural and agricultural development.

The final set of four papers discussed in section 2.3 addressed the issue of regime transformations by focusing on narratives, cognitive frameworks and reflexive consciousness that guide action for sustainable development. They analysed a variety of concrete cases, including a chapter on the role of education in sustainable development. Moreover, explored the conditions under which a novelty, that has successfully linked up to the regime, is becoming more widely used. As a result, the incumbent practice of the regime may gradually lose its dominance, which may eventually result in a transition towards sustainable agriculture. These chapters offered empirically grounded insights to set up methods, guidelines and visions to foster transformative changes. Yet, many issues are still open and call for a discussion of scientific frameworks that have been used or challenged in the chapters in this volume.

3 Challenges in the study of agroecological transitions

3.1 Articulating and contrasting seminal research frameworks

A large number of publications have already resulted from applying the MLP to the analysis of transitions in various sectors. By using the concept of 'transition pathways' (Geels and Schot, 2007), more insight has been gained into the governance of the discontinuation of problematic sociotechnical regimes (Stegmaier et al., 2014). This attempt to re-think sociotechnical regimes as large evolutionary reconfiguration processes that also have politics, policies and political, has been connected to more critical perspectives on the politics of transition management (Smith and Stirling, 2010). However, few studies have addressed transitions-in-the-making in the agricultural sectors or the agri-food system. Seeking to close this gap, this volume presented several chapters that use the MLP to analyse a variety of practical attempts to trigger or stimulate transitions.

All chapters in this volume used a systems perspective and either implicitly or explicitly build on the legacy of 'Farming Systems Research' (e.g. Darnhofer et al. 2012) to structure debates and innovation processes in response to the shortcomings of linear innovation models and technology transfer approaches. From the beginning, and also inspired by the studies of development in rural areas in developing countries, the main principle of Farming Systems Research has always been to consider the need for partnerships between farmers and researchers, including both technical and social scientists. More recently, these analyses also started to include extension agents and policy actors, attempting to involve farmers in the design of novel solutions to tackle sustainability challenges (Norman 2002; Pant and Hambly-Odame 2009).

System thinking in the domain of food and agriculture is certainly not new. Some system perspectives have resulted from critiques on earlier, dominant perspectives on agricultural innovation that consider innovation as a social phenomenon that first spreads via communication in social systems through networks of personal contacts. In later stages of the diffusion process, according to this perspective, mass media play a key role when large groups are spurred to adopt a new technology or product (Rogers 1995). The critique of the diffusion paradigm was carried further by the Agricultural Knowledge and Innovation Systems (AKIS) approach that extended the boundaries of analysis to the whole sector and webs of national and international institutions. Adopting a soft systems perspective, AKIS approaches emphasize that a system and its boundaries should be understood in diverging ways to acknowledge the diversity of actors' objectives and situations. In this interpretation, the focus is on the diversity of actors who are part of a 'human activity system' (Röling 1992) that negotiates the arbitrary boundaries established by institutions and regulation. Thus, the systems concept became used as an action-research strategy to make people think of themselves as being part of a system, which would require novel forms of coordination (e.g. Engel 1995).

Concomitantly, Agricultural Innovation Systems (AIS) thinking emerged (Assefa et al. 2009; Pant and Hambly-Odame 2009) that was influenced by ideas and concepts on 'national systems of innovation' as developed by Lundvall (1992) and pioneered in the agricultural domain by A. Hall and others (e.g. Hall, 2006). AIS thinking has further broadened the scope by addressing complex interactions between a multitude of institutionalised players and infrastructures. The chapters of this volume did not advocate a convergence of those approaches, but together they provided a testimony of the diversity in studying, analysing and interpreting transitions in agro-food systems.

The authors of this volume shared the common vision that much contemporary research naively assumes a general need of enhancing innovation or stimulating the knowledge economy through improving the functioning of the 'system'. Such studies tend to neglect that the goals, interests and perspectives of interdependent actors in agro-food systems diverge widely. This results in conflicts in processes of change, implying that there is no general acceptance of what constitutes a system or structure. This is where the sociotechnical regime approach (MLP) certainly has provided a refreshing method to address transition processes.

In our view, the notion of system or regime in sustainability transitions literature is well equipped to contribute to the agroecological agenda, since it acknowledges the multiplicity of values, conflicts and contestation. Moreover, it supports transformative change since it addresses questions of the emergence of new sociotechnical arrangements, the simultaneous reconfiguration of incumbent systems by overcoming path-dependencies. The multi-level perspective forms the backbone of this approach in which systems are regarded as the whole of actors, their relations and recurrent practices, which are heavily influenced by the regime of cognitive and normative rules. Socio-technical novelties that hold a promise to radically change these regimes can only survive if they are protected in the early stages of development, nurtured, and empowered vis-à-vis the dominant regime. If they are, they may eventually develop into new systems of their own and either take over the dominant regime or transform it. Yet, however relevant it seems, using a sustainability transitions perspective in the agricultural domain is still rare, and has not received the attention that it deserves.

3.2 Transition and agroecology: governing reconnection

To connect issues of transition with the agroecological turn requires addressing how transition processes are both matters of scientific enquiry and matters of action. The objectivation of 'transitions' – as normative pathways of governing sociotechnical regimes – brings back contentions and discussions between those who reify sociotechnical regimes to purposefully discuss the management of change ('governance on the outside') and those who take a more reflexive and political stance towards governance of change, bearing in mind the indeterminacy of sociotechnical arrangements ('governance on the inside'; cf. Walker and Shove 2007; Smith and Stirling 2007).

As far as agriculture is concerned, such debates about change and transition management (*on the outside* versus *on the inside*) are as ancient as the critique of the modernization process of agriculture (Weber 2013). We need to acknowledge that the agricultural sector features a permanent process of change of both techniques and farmers' practices and the correlated adaptation of agricultural policies to food security goals. However, over the past fifty years, farming has become a matter of serious societal concern: food provision, food quality and sustainable diets have progressively emerged as problematic issues related to problematic modes of agricultural production, echoing critiques of the treadmill of production (Barbier 2010). Simultaneously, academic notions of 'the system' in agricultural innovation processes have widened from primarily encompassing farms and farmer groups within their direct biophysical and socioeconomic context, to encompassing wider innovation systems, including organizations like agro-food companies, public research institutes and governmental entities, and, in some cases, consumers, as well as technical infrastructure and their relations. Within this perspective, learning and change extend beyond agricultural research institutes and extension systems (Klerkx et al. 2012).

Meanwhile, the launch of the European Innovation Partnership (EIP) on 'Agricultural Productivity and Sustainability' has spurred the AKIS approach to rethink interactive links between agricultural research and innovation by incorporating policies, rules and regulations, as well as Operational Groups that depend heavily on brokering activities, intermediaries and boundary type of work. While this approach is not new for those who have studied rural and agricultural development initiatives, this recognition is seen as a contribution to a more effective European policy on innovation in agriculture and rural areas, to counterbalance the Knowledge Based Bio-Economy (KBBE) approach (Knickel et al., 2009). In research, two streams have recently evolved in agricultural and rural studies: one on the ecologization process of agricultural production, and another on the transformation of food systems and consumption. These two streams have initially developed rather separately, except for those who pioneered the analysis of organic or peasant farming and agri-food networks (Lamine et al. 2012; Chiffolleau 2009) and who have questioned the reorganization of connecting the production of food to space (Campbell 2009).

The progressive alignment of separated visions of agriculture and food provision – either in dialectical, systemic or actor-network frameworks – has certainly been an intellectual challenge, that received more attention after the BSE (mad cow disease) crisis. It lies also at the heart of the agroecological agenda to reconnect agriculture and food provision, thus enriching a productivist Farming System perspective with considerations on learning and change in a context of environmental and food quality concerns (Cerf *et al.* 2000). This systems research epistemic community has lingered until recently (Darnhofer et al. 2012) and clearly harnessed research on the alignment of agricultural systems and agroecological challenges. But it has also roots in systems thinking theory and its application to agriculture (Bawden and Packam 1993) that has fostered a critique of technocentric or ecocentric approaches of action (Bawden 2000). In these approaches, knowledge is supposed to objectify reality which enables goal oriented action. But knowledge can also be considered as a 'flow' in action, which calls for a holocentric (human centred; Bawden 2000) approach of sustainability transitions to support transformational change. It leads to a cross-fertilization of systemic and pragmatist approaches to be able to give a full account of transitions of agri-food systems (Lamine et al. 2015).

Despite the existence of more holistic evolutionist frameworks to capture knowledge dynamics in action and transformation, we still face a complex challenge: the notion of agri-food systems, which purposefully reassembles the ecologization process of agricultural production and the transformation of food provision and consumption into one perspective. By consequence, this could lead to a reification of agri-food regimes, i.e. regimes to be governed 'on the outside'. However, a wide variety of studies warn against this and stress a need to seriously address 'governance on the inside'. The debate about the conventionalization of organic farming provides a good example of such tensions (Buck et al. 1997), while warnings have also been voiced against the possible absorption of agroecological innovation into one big corporate-environmental food regime (Levidow 2015). Another emblematic contention concerns the research system itself (Vanloqueren and Baret, 2009) and the re-association of agroecological innovations as matters of fact for the agronomic knowledge regime. As analysed by Ollivier and Bellon (2013), different labels of ecologized agriculture have appeared over the past decades within an opposition between holistic approaches (sustainable agriculture, integrated agriculture, eco-agriculture, multifunctional agriculture, agroecology, alternative agriculture, organic agriculture) and technology centred approaches (precision agriculture, conservation agriculture).

3.3 Studying transformative change as a scientific challenge: regime shifts and paradigmatic conflagration

The contributors to this volume all lean on some form of evolutionary and systemic approach to analyse the sociotechnical dynamics in a variety of cases, whatever the level of their enquiry. Understanding those processes as a distributed manifestation of the co-evolution of tension streams, either at the heart or at the fringes of the agriculture and food regime, requires a certain variety in approaches to analyse pathways of change, causality, lock-in and performativity. Certainly, at present this enquiry may be divided up into too

many fragments of research interests, or a curiosity cabinet. But this volume can also be seen as an effort to organize and somewhat focus the study of agri-food transitions-in-the-making.

One thing the authors of this volume share is that the institutionalisation process of making agriculture more sustainable is at the same time a de-institutionalisation process of the sociotechnical traits that have made it so un-sustainable. The ecologization of agricultural policy has become less and less sectorial, making ecological critiques and proposals less local and more global. The initial greenwashing response to sustainability concerns has become increasingly criticized, resulting in more systemic and systematic approaches in practice. We witness a reorientation of research, development and production that treats the ecologization of farming as a major bottleneck for sustainable agriculture. At the same time, changes take place in the links between food provision and food consumption. This is supported by a variety of insights on food security or (un)healthy food habits, and can be observed in the consumption movement as well as in transformative processes that target changes of agricultural production in relation to short circuits or alternative food networks.

These changes, although important, do not necessarily mean we are on the right track. We can observe changes that may result in two very different types of transition pathways: a modernisation of mainstream and intensive agriculture for which the KBBE paradigm presents a roadmap; and an agroecological redesign of intensive farming that is supported by the organic movement. These paradigmatic transition pathways compete in many ways, but may also co-operate since some farming technological issues or problem definitions are shared in the same institutional arenas and may even be at work at the level of new farming practices. Also, both pathways are based on a vision that deviates from the prevailing 'productivist' paradigm: more incremental in the first case, more radical in the second, and of course with different visions of sustainability.

Therefore, considering a pure opposition of paradigms would not only be simplistic but would also make a caricature of the ongoing changes. The critiques of the absorptive capacity of the dominant regime of productivist agroindustry, with its emphasis on profit, growth and modernization, should not obscure the studies of transformative changes. Transition studies of agriculture and food provision should start with the analysis of changes of practices, since radical or incremental innovation and resistance towards productivism do not operate in a vacuum but are embedded in systems of actors, routines, technology and regulation. Different actors have also different capacities to foster and absorb innovations (Nemes and Augustyn 2017). Here, some of the burning questions may be: How can the critique of the productivist 'milky-way' be translated into practical challenges rather than utopian visions? Does the absorptive capacity of the dominant regime operate like a mangle for initiatives for change? What are the effects of absorption and according to what type of transition pathway and learning processes? These are complex questions, for sure, but they also provide inroads to deal with the systemic nature of transitions.

With this volume we take an agnostic stance towards change processes. The reference to the canonical MLP model of niche-regime-landscape dynamics should not lead to a simplistic divide between, on the one hand, a global vision of the modernisation of the regime via incremental innovation pathways and, on the other hand, a local account of the many agroecological niches that nourish great expectation outside the dominant regime. Important research themes have blossomed in the area of transition studies, and many of them take the MLP as a heuristic to organise research questions on the dynamics at play. As a result, this heuristic has nourished the justification and framing of purposeful transition management issues. The proposal for a social science agenda on the dynamics of agri-food systems by Thompson and Scoones (2009), and the necessity to recover narratives on productivism in agriculture in line with contemporary or even future challenges of food provision (Marsden, 2013), together present a challenge for many scholars concerned with agri-food systems. The efforts to congregate scientists with different disciplinary backgrounds to deliver research insights on transformation and system innovation within the agri-food sociotechnical regime, thus contributes to the objective of fostering a distributed and collective enquiry of transition processes (Barbier and Elzen, 2012).

The purpose of the present volume is to keep the ambition high for this perspective. This is reflected in the chapters in this volume that are not necessarily confined to a specific programmatic vision of transitions,

nor are they bound to a specific reflexive account of doing transitions research. But they might be captured under the umbrella of 'social studies of transition-in-the-making'. Together they represent a collection of transition studies and not a set of proofs to defend a specific theoretical framework. Rather, this Cabinet of Curiosity of transition studies provides a collective enquiry based on empirical investigations to compare and contrast practices, and analyse innovation efforts towards changes and breakthroughs that are grounded in a critique of the incumbent agri-food system.

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