

The co-production of sustainability by learning networks. The case of reconstruction of knowledge and practices around bread production.

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Abstract: According to transition theories, a full adhesion to sustainability paradigm for agro-food system requires radical changes, addressed to redefine the whole socio-technical system underlying food production and consumption practices. Through them a complex re-organization of systems of knowledge, rules and norms of behaviour, and a re-design of the organisational and material infrastructures involved in production and consumption practices take place. Many grassroots initiatives, developing out of the conventional system and aimed at creating alternatives to it, are showing the potentials and also the challenges of this complex process of change. Interaction and learning processes developing within hybrid networks, including all the diverse actors engaged in the change, prove to be crucial to this process of innovation. Within these networks actors mobilise their knowledge and create new frames of common understanding. This learning process results in shared knowledge which, translated into new attitudes and practices, allows a coherent re-configuration of all the components of the system, from the level of production to that of consumption.

In this paper we aim at adopting this approach to deal with the innovation pathways that are affecting one of the agro-food chains which has been most transformed over the modernization of the agro-food system, the production of bread. In response to producers' and consumers' needs, in Italy this chain is at the centre of a myriad of local initiatives. Moving on a common trajectory of social innovation, they are committed to redefine genetic materials (through a different approach to research), cultivation techniques and processing technologies (new knowledge and skills and appropriate equipment), organizational models (territorially and socially embedded), value chain (grounded on different shared values), cultural meanings. The learning processes that drive these changes stem from the interaction that develops among a variety of social and institutional actors.

The analysis develops through a case study on a specific learning network in Tuscany. On the background of the multiple changes involved within the whole chain, an in-depth analysis of the aspects which interest the reorganization of the production phase allows to highlight the challenges to be tackled in order to fully pursue sustainability.

Keywords: learning networks, transition, social innovation, radical innovation

Introduction

Aspects related to health, food safety, environment and ethics are becoming important in defining our approach to food. These concerns grow further in an evolutionary perspective, considering the importance of resilience of food systems in a changing environment. The transition of food systems towards sustainability however requires deep and broad changes, interesting all the dimensions involved, from technological and organizational to social and institutional aspects, at all the levels of the system, from production to consumption. Many grassroots initiatives, aimed at creating alternatives to the conventional system, are showing the potentials and also the challenges of this complex, systemic change.

In this paper we aim at exploring some of these processes by analysing the innovation pathways that are affecting one of the agro-food chains that has been most transformed over the modernization of the agro-food system, the production of bread. In Italy this chain is at the centre of a myriad of local initiatives aimed at re-organizing it. Moving on a common trajectory of social innovation, they see the involvement of a variety of social and institutional actors, who give rise to a fruitful interaction through which new knowledge and practices are co-created.

Drawing on the conceptual framework of transition theories and on a systemic approach to innovation, we read the interaction within and amongst these learning networks and the changes they promote as efforts to redefine the whole socio-technical system underlying food production and consumption practices. Considering the importance of an 'open innovation' model and of the role of facilitation, we also pay attention to the conditions that foster participation and cross-boundary interaction.

Our analysis develops through a case study on a specific learning network in Tuscany (Italy). On the background of the dynamics affecting the whole chain, we focus on the process of reorganization of the production phase, in all its implications, thus highlighting the challenges to be tackled to pursue sustainability and, more generally, innovation for transition.

The paper is articulated as follows: the conceptual framework (2); the description of the bread chain (3), looking first at the features that it assumes in the conventional chain, and then at the emerging experiences of its reorganization with reference to sustainability principles; the analysis of a specific experience (4); some final remarks (5).

A conceptual framework to analyse innovation pathways in the agro-food system

A full adhesion to the sustainability paradigm for the agro-food system requires complex changes, addressed to define a coherent set of new principles able to replace the old ones. According to the transition theories (Geels, 2004; Smith et al., 2005), this process concerns all the components of technical, technological, cultural, juridical and institutional nature which shape, regulate and legitimise the material and immaterial infrastructures underlying production-consumption practices. Such a process of innovation can however be hindered by path dependence and lock-in processes (Dosi, 1982; Possas et al., 1996), which can make the transition to new socio-technical systems difficult. Radical innovation thus starts its development outside or at the margins of the regime, within niches of fine-tuning of new systems of rules and infrastructures. According to a systemic perspective, the new systems of relations that develop within these spaces, connecting the diverse social and institutional actors involved, prove to be particularly effective in generating radical change, affecting the socio-technical regime as a whole (Knickel et al., 2009; Klerkx et al., 2012). Within them the creation and spread of innovation according to linear, top-down, science-driven, and market-pull models is replaced by the co-governance and co-production of in-

novation that develop through interaction and learning processes²⁴⁷. Within these networks the diverse actors mobilise their visions and their knowledge and create new frames of common understanding. They result in shared knowledge which allows a coherent re-configuration of all the components of the system.

The role acknowledged to the interaction among diverse actors and the related active social learning highlights the importance of the presence of favourable conditions to that end - that is openness and participatory practices (Roling and Wagemakers 1998). The “open innovation” paradigm tries to meet this need of new approaches (Chesbrough, 2003). It implies access to information by all the members of a network and the other actors interested. It endorses liberation and mobilization of expertise and experience, stresses absorptive capacity of information and knowledge by the actors, and promotes exploitation of external information.

The integration of the open innovation paradigm with that of sustainability and its operationalization in approaches and methodologies find expression in the approach of agro-ecology, aimed at re-designing the whole set of farming practices and, to that end, at enhancing and integrating different sources of knowledge. Agro-ecology recognizes the importance of participatory approaches, considering farmer’s knowledge as a key resource for innovation (Ashby and Lilja, 2004). Of course, this goes beyond the scope of food systems themselves, as it concerns such topics as biodiversity and vivid ecosystems conservation, livelihoods of farmers, urban-rural relationships.

Looking at the mechanisms that facilitate the mutual engagement of different actors around shared goals and the integration of different knowledge, useful contributions come from the studies on the role of “boundary spanners” and “innovation brokers”. These are actors (people/organizations) who, by using their particular skills and multi-membership in different (and sometimes higher level) networks, facilitate the connection between different ‘worlds’ (and the respective different knowledge, visions, norms, and practices), accelerating learning processes and cross-boundary interaction (Howells 2006; Klerkx and Leeuwis 2008; Hermans et al., 2013). More recently, they have been collected under the overarching, meaningful term of “transition partners” (Moschitz et al., 2014).

This intermediation role is also crucial for the expression of the potential of the innovation learning networks, in relation to the robustness of the changes pursued (at the single levels of the re-configuration of socio-technical system), to their reciprocal integration and composition within a coherent framework (according to a systemic approach), until to their capacity to impact on the mainstream system. Ultimately, to the effectiveness of their innovation action itself. These actors can indeed favour the relationships with other innovation networks as well as allowing to verticalize the innovation (for instance trying to generate the needed changes at juridical-institutional level). Their support in many cases proves to be essential to enhance the action for change of grassroots initiatives and to boost their innovation potential up to the regime level.

We have applied these conceptual frames to the analysis of the innovation pathways that are occurring in the bread chain.

Reinventing wheat and bread

The production of bread from winter wheat is one of the agro-food chains which have been most transformed by the modernization of the agro-food system since the 1960s and by the related boost to intensification. In the European context, the whole chain has indeed developed according to the paradigm of productivism, implemented in the agricultural policy framework (CAP) and in the production strategy of the agro-food industry (Lamine et al., 2010; Wiskerke, 2003). The need

²⁴⁷ The EU Project SOLINSA focused on the role of Innovation and Learning Networks for Sustainable Agriculture (LINSA), in which the various actors are mutually engaged around sustainability goals in agriculture and rural development and, to this purpose, co-produce new knowledge, share resources and co-operate on common initiatives (Moschitz et al., 2014).

to achieve high yields and to produce a wheat fitting the industrial processing has driven the development of the sector, shaping a corresponding coherent system of knowledge, practices and institutions. Key actors of this innovation trajectory were - and still are - researchers engaged in genetic improvement, institutions for varieties recognition, inputs suppliers (seeds, chemicals), industrial processors (big mills and bakers, agro-food enterprises producing semi-finished product), trade intermediaries (crop collecting firms) and wholesalers, advisors, and producers' organizations. The relations amongst these actors are essentially vertical, both for technical and commercial aspects, and hierarchical, seeing farmers dependent on the 'higher' links in the food supply chain. Also economic aspects have been heavily conditioned by this regime, being the result of the Communitarian Policy and of global market dynamics. The changes occurred into these frameworks have added a marked reduction of profitability to the loss of farmers' autonomy.

Looking at the influence of intensification processes on the bread production we can identify the following effects:

- breeding of very productive winter wheat varieties, characterised by a high content of proteins (essentially gluten) and so suitable to the industrial processing (fast kneading and leavening, the latter generally through the use of baking powder);
- consequent reduction of the biodiversity basis (the genetic improvement has been addressed to select varieties for their capacity to adapt to any environmental context);
- intensification of cultivation techniques (high use of fertilizers and herbicides; the nitrogen fertilization, in particular, is essential to obtain high protein contents);
- difficulty to cultivate modern varieties adopting low input techniques (for instance according to the organic or agro-ecological farming rules) or in critical environments (Wiskerke, 2003; Vanloqueren and Baret, 2009);
- consequent change of the quality of the final product, the bread (there is an growing attention on the health effects of the use of high-gluten flours, and on the nutritional and organoleptic quality of bread).

Seeking and building alternatives

In the recent years new farm strategies and more complex initiatives have given rise to new pathways, aimed at distancing themselves from this dominant wheat regime and looking for a reorganization of the production activities and the related relations.

They are part of the more general process of search of alternatives through which farmers have tried to regain control over their activity, repositioning themselves in the food 'chain' and re-embedding their work in the territory and in the society. This process has found expression in the re-internalisation and/or diversification of farm activities (e.g. production of inputs, on farm processing and direct selling) and, in many cases, in the turn to environmentally-friendly farming methods. The establishment of direct relationships with consumers has accompanied this re-organization. These strategies have been very successful in Italy in general and in Tuscany in particular.

Since the 1980s and 1990s many cereals growers turned first to low input and then to organic farming. Going beyond the influence of the policy framework, some of them later engaged in shortening their chain, looking for alternative market outlets and even starting to process their wheat and introducing direct selling. These initiatives have spread across the Country and are contributing to the renewal of the image of a crop traditionally producing a commodity of little value, and to the development of a new culture of bread.

The reorganization of farm activities has entailed many deep changes and consequent difficulties. The choice of organic farming, together with the shared desire to produce bread of a different quality, have in fact demanded to intervene at different phases of the production process - from the availability of seeds to the method of bread-making -, facing rather challenging problems.

The choice of varieties has represented the first hurdle to overcome. In organic farming the modern varieties of wheat do not perform well, because of their selection for high use of chemical inputs (especially nitrogen fertilization) and optimal agronomical conditions. The cultivation of organic farming requires varieties capable to compete with weeds, to resist to pest and diseases as well as to difficult climate conditions, and to develop an expanded root system. They should also have a broad range of environmental adaptability (Wolfe et al., 2008). Compared to this needs, there are not enough varieties available and, in general, the amount of organic seeds is not sufficient. Although organic agriculture is well established in most European countries, only little attention has been given to specific breeding programs. To overcome these limitations, farmers started to adopt landraces and old varieties (fruit of the genetic improvement of the first half of XXth century) (Newton et al., 2010). These varieties are not available for sale on the seed market, because they do not comply with the standards set by the current legislation. It has been thus necessary to retrieve them, with the help of national and international networks, and to initiate their reproduction and spread.

Landraces and old wheat varieties are preferred also for the qualitative characteristics of the grain (Ghiselli et al., 2010). One of the most significant properties, in addition to the high nutritional value, is the low content of gluten, which is widely being considered unhealthy. These varieties, not selected to meet the needs of the food industry, adapt well to traditional, artisanal processing methods. This has initiated a process of redefinition of techniques for bread-making and, even before, for producing flour. The techniques for milling, kneading and leavening, are in fact considered to be able to strongly affect the nutritional, healthy, organoleptic and preservability characteristics of bread. A 'good technique' of milling, supported by proper facilities, should ensure the preservation of all the nutritional components of grain. Similarly, a 'traditional' leavening uses sourdough and involves long lead time, to allow the biochemical processes in the dough to work properly.

This redefinition of the whole production process and of the product quality itself is also accompanied by a new market valorisation, which compensates with better prices the low productivity (due to the lower yields) and the 'inefficiencies' of the system (for cultivation and baking). The wheat is sold out of the rules of the global cereal market. The bread is sold via alternative channels and through a direct relationship with the local communities, which know this system of production and acknowledge the special value of the product.

Open innovation within and amongst learning networks

The re-construction of the production process and of the whole value chain demands important learning processes. Farmers face them not alone but through the interactions that develop within the new networks of relations in which they are embedded.

Many actors are part of this new relational environment: other farmers, being now no more single individuals vertically integrated in their own chains, but social actors increasingly interrelated horizontally; other small entrepreneurs, sharing the interest in a different quality of the final product and looking for new outlets; advisors, able to treat farmers as equal; researchers, characterized by an alternative approach to the creation and spreading of new knowledge; non-governmental or civil society organizations, in different ways committed to sustainable agriculture and food issues; sometimes public administrators, open to experimenting with new strategies of valorisation of territorial resources; and, as actors no more at the end of the chain, consumers,

more and more demanding for healthy food, increasingly sensitive towards ethics and open to new forms of cooperation with producers.

The exchange of seeds and experience about the cultivation and performance of the different varieties with other farmers is the first way through which new knowledge is created and shared. This process should not be underestimated, both for its potential and its necessity, after decades of dominance of the agro-industry needs in shaping knowledge and practices. Not all the cereal growers were/are able to understand the potentials of undertaking alternative paths in the cultivation methods or in the choice of varieties, nor do they had/have the necessary skills.

Together with farmers also small artisanal millers and bakers, survived to the modernization, represent the pioneers of this process of 're-qualification' of bread. They and the most sensitive and active farmers have become, through their experimental work, the leading actors in the research aimed at getting the best baking performance from flours with a force lower than those used in the conventional (that is mostly industrial) production of bread.

This shared growth of awareness and capacity has found a fundamental support in the collaboration with other actors, who have significantly contributed to the re-organisation of the production system.

The work of genetic improvement meeting the specific needs of the agro-ecological approach and of the traditional baking has in fact stemmed from the fruitful interaction developed between farmers and some researchers. These researchers were already engaged in exploring qualitative properties of wheat varieties different from those emphasized by the market and the scientific world. But, above all, they have shown openness to other kinds of knowledge and to a close and equal relationship with farmers in the experimentations. They are experts (belonging to public research institutes) who have been applying participatory breeding methods for many years and who, for this approach and for their commitment to the 'cause' of biodiversity conservation and production of 'good food', have earned farmers' respect and willingness to cooperate. The encounter between these two different sources of knowledge has indeed proven to be extremely significant for the successful construction of a new basis of knowledge and expertise. Through it, it has been possible to identify the 'old varieties' most promising in specific environments and in terms of quality of grain, and to fine-tune the best cropping practices according to an agro-ecological approach.

Some organizations have also played a key role, by performing a function of intermediation between these two worlds. In Tuscany, the regional network of organic agriculture (Tuscan Coordination of Organic Producers - CTPB) has supported the interaction amongst farmers as well as their involvement in the collective work of plant breeding, providing technical support and helping the creation of local networks of closer relationships. Similarly, since 2007 the national Network of Rural Seeds has been doing a precious work of intermediation and animation among farmers, supporting capacity building and coordination, as well as exchange with other experiences (e.g. foreign farmers networks). Moreover, this organization is engaged in an important work of communication and advocacy at cultural and juridical-political level on the question of the intellectual property rights on genetic resources and of the right to self-produce and circulate seeds, also in connection with the lobbying activity of networks at European level. Working both on farming and on processing, also the local section of World Wide Opportunities on Organic Farms (WWOOF) association has contributed to the re-organisation of the involved farms.

The participation of concerned consumers is another significant element of this environment favourable to innovation. Their involvement in the creation and dissemination of a new 'culture' on bread and the related production system is essential, not only to create a new value chain, but also

to contribute to the strengthening of the ‘co-production’ approach (Brunori et al., 2011) in the relationship between production systems and society.

Depending on the attitude towards experimentation of innovative paths, in some cases these emerging networks also see the participation of local public administrators who support (or even promote) local initiatives of reintroduction of ‘old varieties’ of wheat, through funds and help in terms of communication.

The formation of these collective environments - spaces of interaction, exchange and co-production of shared knowledge - proves to be crucial to this process of innovation. Within these networks the diverse actors involved redesign – or are committed to redesign - all the components of the system: the genetic materials through a different approach to the research; the cultivation techniques and the processing technologies (new knowledge and skills, proper equipment); the related advisory system (based on peer-to-peer exchange); the value chain (grounded on shared not economic values); the organizational models, including the forms of coordination along the chain (territorially and socially embedded); the cultural meanings attached to the production system and the product; the institutional-juridical framework that govern the system (highlighting and overcoming legal barriers).

The experience of Floriddia farm

Seeking and building alternatives

“Pratini” is an organic farm situated in the province of Pisa (Tuscany, Italy). It is run by the families Floriddia (Rosario and his brother Giovanni). On a surface of 300 Ha, major crops are cereals, legumes and fodder. In the second half of 1990s the farm developed as a conventional cereal farm, strongly dependent on CAP subsidies and integrated in the agro-food chain. The turn to organic, in 1987, was a first manifestation of the willingness to regain some control, both on the technical and the economic level.

Looking for a more profitable but also satisfactory management of the farm, in 2005 they obtained the authorization to process and sell food on farm. Initially they bought a small electric stone mill to produce their own flour and began to make bread, selling it to the local bakeries and directly to consumers. Later, in 2010, the success motivated a much greater investment, financially supported by the regional Rural Development Plan. It consisted of: a shed for grains storage; a cutting-edge plant for seeds cleaning and selection, a professional stone mill for flour production, a plant for pasta and baked goods production. This plant is considered one of the most advanced in Tuscany, able to produce high quality flour, and is a good example of innovative technology sized to not industrial exigencies and dimensions. Its equipment and functioning have been the result of a close collaboration between the Floriddia brothers and the firm which installed it.

In 2006, acknowledging that the modern wheat varieties were not suitable for organic farming and traditional processing, they began to cultivate old winter wheat varieties. Thanks to the good agronomical and economical results obtained in the early years, since 2009 they have been growing only old wheat varieties and landraces, with some innovations in the agricultural techniques: no-till sowing; fertilization only through green manure; self production of seeds for sowing and use of blends of different varieties. This last point is particularly significant for the farm re-organisation. Studies on agro-ecology have in fact demonstrated that agro-ecosystems can achieve a high degree of stability and resilience through biodiversity (Altieri and Nicholls, 2000). For this reason the farm created its own seed bank, where the varieties more suitable for the specific environment are reproduced.

Open innovation within and amongst learning networks

Rosario Floriddia had the courage to undertake a process of radical change in his business and in his personal life. However, the real strength of this innovation process has come from the favourable relational environment of which this entrepreneur has become part, due to the key role played by the interactions with the other farmers and with the many other partners and networks.

The interest in the old wheat varieties started to develop in 2005, thanks to the interactions within the *Tuscan Coordination of Organic Producers* (CTPB), of which the Pratini farm is a member. In the belief that a special attention to the availability of proper varieties and related seeds was necessary for the success of organic farms, the President of CTPB organized a meeting with Floriddia, a geneticist (Prof. Benedettelli, of Florence University) and an agronomist (Cerretelli, expert of organic farming) to discuss the issue. This first interaction and the related project aimed at collecting the old varieties to be seeded at Pratini farm initiated a broader process of exchange and collaboration which has progressively involved many other actors, such as the technicians and the other farmers members of the Rural Seeds Network and of the WWOOF association, but also international networks of farmers and bakers and seed banks. The work of plant breeding and seed conservation and reproduction and, lately, the evaluation of the biochemical components of these old grains, useful also to establish the baking performance, are the most important activities at the centre of the collaboration with the researchers of Florence University. More and more interested in the issue and committed to actively manage its genetic resources, Pratini farm has moreover started other collaborations with several research institutions (also within EU projects). The success of this collaborations is strongly linked to the ways through which the researchers and the farmer interact, grounded on a tacit acknowledgment of the equal dignity of knowledge and skills, which are pooled to achieve shared goals (the conservation of biodiversity, the spreading of organic farming, the production of healthy food).

The relational activity of the network has however seen an important development also on the side of the interaction with other farmers. Some of them are local farmers who have joined the network, starting to collaborate with Floriddia, because looking for alternatives and thus attracted by this different model of management and the possibility to find more satisfactory outlets. Three of them began the activity of seeds reproduction, fully espousing the cause of the retrieval of old varieties and the agro-ecological approach. With them Rosario shares the role of “custodian grower”, a role formally recognized to farmers committed to reproduce genetic resources at risk (it was introduced in 1997 and formalised through the Regional Law no. 64/2004). It represents a further acknowledgment of his activity and, even more significantly, well expresses the position achieved in his ‘communities’. In other cases, this shared commitment to biodiversity conservation remains tacit, but strongly characterizes many relationships. More generally, also thanks to the opportunity offered through the milling of organic grain, Floriddia has become a reference point of for many farmers in the region. As important are the relationships established with other local entrepreneurs, as bakers, small retailers, owners of restaurants and, of course, consumers.

The interactions, however, have developed also beyond the local scale, as in the case of the exchanges with similar experiences in other contexts, including also foreign networks. The success of some events organized at the Pratini farm are illustrative in this regard. One of this is the “*Participatory Plant Breeding Week*” (an initiative included in the *National Seed Production Plan for organic farming* promoted in 2010 by the Ministry of Agriculture and by the Italian Association for Organic Agriculture (AIAB)). The two editions of June 2010 and 2012 saw the participation of many farmers, technicians and researchers, exchanging information and experience about the management of the genetic resources. Another significant international event was, in June 2013, *Let's Cultivate Diversity*, the second European meeting on cereal cultivation and processing, organized in Italy through the help of *Rural Seed Network*. It gave rise to an extraordinary exchange of knowledge and practices, about the characteristics of the various old varieties, the

techniques of cropping and bread-making, the nutritional value of bread. For its importance the event received considerable attention by the media.

All these initiatives have been very important to the growth of this innovative experience, its capacity to communicate to outside, its impacts on the local 'communities', as well as its potential to generate broader changes. Are examples of this last point the strengthening within these networks of the willingness to lobby to change the legislation on seeds, or the contribution to the emerging debate on the 'qualitative' properties (for health, environment) of different breads and the related production systems.

Conclusive remarks

The emergence of new pathways and mechanisms of innovation, grounded on social and territorial embeddedness, openness and effective interrelation within network interaction, is expression of the development of a new geography of innovation.

At the basis of this emerging model there is the increasing awareness and the willingness to get involved around food-related sustainability issues - health, food safety, environment and ethics - of growing parts of society, from production to consumption, from private to public sphere. In this new perspective of social innovation for sustainability, the multi-dimensionality of innovation finds new trajectories. The change of practices requires a deep and broad transition, interesting all the dimensions involved (technical-technological, juridical, institutional, organizational, cultural), at all the levels of the system. Behind them there are significant changes of frames. Some processes of radical innovation developing within 'niches' are showing the potentials and also the challenges of this transition pathway.

The radical innovation experiences interesting the bread chain are characteristic in this sense. As the specific case analysed has shown, they provide interesting insights about these processes.

The integration between a shared willingness to fully adhere to a sustainable farming model and that to produce and consume a healthy and highly nutritious bread triggers a process of reconfiguration of the whole production process, of its deconstruction and reconstruction. This entails a shared redefinition of many aspects, closely interconnected: the modes of creation of new knowledge, the production techniques and technologies and the related systems of knowledge and skills, the approach to the natural resources utilized and the related rules, the conception of the quality of the product, the organizational models of economic relationships and the degree of their social and territorial embeddedness, the link between economic and not economic aspects in creating value, the cultural meanings of the product and the social value of production systems, the spread of these new approach and practices.

New shared systems of knowledge and values inform this complex process of reshaping. It emerges in this regard the important role of the processes of social learning which develop within proper relational spaces, able to favour the development of a common understanding and the alignment and cooperation around common visions and goals. The importance of the encounter of different kind of expertise, moreover, makes crucial the development of effective interaction among the actors involved, able to allow the expression of the diversity of visions and interests. Conditions of openness and inclusiveness and of active participation are thus essential.

More particularly, this offers significant insights also with regard to the definition of the goals and to the methods of the research, as it is clear from the case. It emerges the importance of the openness to different interests and sources of knowledge, and to the processes of experimentation and innovation which develop at grassroots level, in specific contexts. The direction is that of the de-institutionalisation and democratisation of the research (Pimbert, 2006), so that it is not controlled and managed only by scientific/academic institutions (Hinrichs, 2008). In its turn, this is part of a broader process of democratisation of innovation (von Hippel, 2006).

The dynamics that characterise these innovation networks also highlight the key role that intermediation functions can play in enabling innovation processes, horizontally and vertically, by facilitating the connection among different 'worlds'. The experiences illustrated have shown the importance of this intermediation to support the interactions within the networks (e.g. amongst farmers, and between farmers and researchers); but also its role in creating synergies with other experiences of innovation, by favouring the openness to other networks and the initiation of other 'co-production' initiatives. This last aspect introduces the other important function of these bridging organizations: the strengthening of the effectiveness of innovation pathways. As the experience of Floriddia farm network shows, this radical innovation is context specific, as it is based on social learning processes, knowledge and experiences that develop from and are applied to particular settings. At the same time the openness of this kind of networks and its capacity to establish relationships with other similar experiences, giving rise to more powerful articulations of relations, broaden the opportunities for change, horizontally and vertically. To that end, as for the questions of the direction of the research for the genetic improvement and of the legal barriers concerning the genetic resources, these organizations help these networks to become aware of their innovation potential and to adhere to broader shared strategies, so creating the conditions for greater impact.

Overall, the features that this social innovation shows - its embeddedness in specific contexts, its capacity to experiment radical change but also to put pressure for specific change in the regime, and its broader potential due to capacity to develop connections with other innovation pathways - appear extremely promising and interesting in the perspective of redesigning innovation for transition.

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