Chapter 10

Neither quite the same nor quite another: diversity, identity and resilience in agroecological transition

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The general understanding of sustainability is quite restrictive and mostly deals with the exhaustion of resources and raw materials. This article adopts a more global view by focusing on the role of diversity in the resilience or perpetuation of a production activity. Though guided by the empirical evidence from two field projects, this article is more an invitation for thought than a detailed field report.

Diversity is a desirable trait in ecology; it is even regarded as warranting ecosystem sustainability. Ecological systems that are not sufficiently diverse are considered fragile: since they are unable to reorganize as a complex system in order to adapt, they are overly sensitive to lasting or unexpected changes.

Surprisingly, the analysis of economic systems reveals quite the opposite pattern. According to Karpik (2007), singularities – i.e., the existence of a large variety of significant diversities within the same category, such as for wines, restaurants, lawyers, physicians, movies or novels – remains unconsidered in economics. Neoclassical economics, which has focused on the conditions of fair competition, has essentially stressed the role of information on quality for the sound identification of homogeneous categories of products. The diversity of goods is justifiable only to the extent that it allows for better adjustment of products to consumers' subtle and diverse 'expectations' and 'preferences'. Additionally, diversity is always limited by the costs and the complexification of the consumers' choices it induces.

The analysis of geographical systems is less clear-cut. Studies on the resilience of territories highlight the importance of both territorial anchorage and local identity and know-how on the one hand, and on the other, openness to other territories and identities, the connection between different territorial scales, and actors' transformation and innovation capacity (Gasselin et al., 2021).

Are diversity *or* identity two possibly antinomic keys to ecological *or* economic resilience – that is, the capacity to last and perpetuate? This chapter investigates

this question, drawing on two international[16] research projects carried out as part of the GloFoodS metaprogramme by CIRAD and INRA from 2015 to 2017. The first perspective is socioeconomic and draws on a study of cheesemakers' denunciation of the standardization of cheesemaking brought about by health standards, particularly milk pasteurization. The second perspective is geographical and explores hybridization, an original form of articulation of identity and diversity to adapt to changes within territories (Gasselin et al., 2020). In both cases, resilience is analysed not as the consequence of an intrinsic or acquired strength, but rather as the outcome of regimes of action with their own calculation devices, forms of organization and resources.

⏩ Pasteurization, a technique for control and optimization

The spatialized character of the economics of dairy production and processing was stressed long ago. Once milk has been drawn, the bacteria that grow in it acidify it and make it unfit for consumption. Dairy farmers are thus forced to establish themselves close to places of consumption. Various cheesemaking processes[17] allow them to get around these constraints and to set up in areas with less land pressure, provided cheese is processed locally (Vatin, 1997). Yet, the same problem arises when an operator decides to collect milk for cheesemaking, as the latter must take place quickly, before the milk bacteria multiply too much, causing the milk to curdle. The geographical scatteredness of farms and the speed of transport has determined the concentration of cheesemaking within cooperative or industrial dairy organizations.

In 1810, Nicolas Appert showed that heating milk improves its conservation. The partial sterilization that ensues allows the milk to be kept longer and therefore makes it possible to collect milk from a wider catchment area. Still, local microbial ecosystems are a major source of milk diversity, which is erased through their partial destruction. Milk heating techniques, particularly pasteurization, thus offer two benefits regarding the industrialization of cheesemaking: economies of scale and a greater control over production thanks to milk homogenization.

To compensate for the destruction of a good part of the flora needed to make cheese, it is necessary to culture the milk with microbial strains grown specifically for that purpose, and especially to mature the cheese. This technique has the major benefit of greatly increasing control over the cheesemaking process; the spreading of pasteurization over the world during the first half of the twentieth century has not only supported the industrialization of cheesemaking, but also the emergence of an industry for cheese culture production. The high uniformity of the resulting production makes it possible to base the product's identity on its regularity. This has fostered a particular marketing strategy: for the customer, the industrial product is guaranteed to match its particular identity.

Traditional on-farm cheesemaking, which does not put such emphasis on large-scale production optimization, uses other techniques to control the production process that involve the milk's microbial ecosystems. Subculturing, which consists

16. The projects' fieldwork included France, Italy, Australia, Brazil, Morocco and India.
17. Milk can also be turned into butter, as in Brittany, France.

in taking a little bit of the whey from the previous day to culture the next day's production, helps to maintain the milk flora and limit its variation, as do the wooden instruments that facilitate the development of the cheese floras and ensure their re-culturing from one batch to another. The maturing cellars are then home to complex microbial ecosystems that help to guide and control the ageing of cheese. Finally, the maintenance of processing facilities precludes any aggressive cleaning, so as not to destroy the ecosystems that ensure the final quality of the cheeses. The sensitivity to environmental conditions of ecosystems fosters diversity within production areas. Maintaining the ecosystems in this way also allows for seasonal changes, particularly within a same farm. In face of the hard competition driven by industrial firms, traditional cheesemaking has progressively contributed to the development of another commercial regime, which does not ground upon a strict stabilization of quality.

The coexistence of these two forms of organization of production has been disrupted by the gradual tightening of food safety standards. In some countries, particularly the United States and Australia, cheesemaking using raw milk has been banned[18] except for cheeses that are matured for more than 60 days, after which time the development of pathogens is no longer considered a risk. For cheeses matured for less than 60 days, in addition to heating the milk, the standards require drastic control of any potential source of contamination. Subculturing, which does not allow for a strict separation of batches, is prohibited. Requirements for cleaning procedures have become more stringent and all manufacturing processes using materials that are difficult to clean, namely wood, are prohibited; stainless steel and plastic must be used instead. As more international trade agreements have been passed, these standards have spread to other countries such as Brazil, where, as Ferreira and Ferreira (2013) show, the wooden boards on which cheese curds were once drained have been replaced by a slate table that upsets the production process and alters the taste of the cheese.

The ban on raw milk has long been the subject of international negotiations at the World Trade Organization (WTO), but the European Economic Community has opposed it (ECC, 1992), at the cost of adopting HACCP[19] rules and stepping up sanitary tests to screen for pathogens such as *Listeria, Salmonella* and *Staphylococcus aureus*, the tolerance thresholds of which have continuously been reduced. It is therefore understandable that 'raw-milk' cheesemakers have grievances about the strict sanitary standards ruining their microbial know-how. They are calling for this sanitary pressure to be lifted, arguing that not only is it not suited to their production system but it is also counterproductive. Montel et al. (2012) have thus shown that traditional techniques, particularly wooden instruments, are in fact not gateways to contamination and pathogens, but excellent bulwarks against *Listeria* in particular.

We should, however, not be too quick to assume an opposition between a rationalized industrial production and a declining traditional artisanal one leading to approximate quality and safety[20]: the two articulate homogeneity and diversity differently.

18. The ban on raw milk started in the 1920s in Milwaukee and extended progressively to other countries. It became effective in all US states by 1987.

19. Hazard Analysis and Critical Control Point: a risk prevention and defect traceability technique.

20. Montel et al. (2012) have thus shown that traditional techniques, particularly wooden instruments, are in fact not gateways to contamination and pathogens, but excellent bulwarks against *Listeria* in particular.

The industrial stabilization of the consumer-product adjustment

Has cheese diversity disappeared in countries that have made pasteurization compulsory? Like Buridan's ass in the work of Cochoy (2002), how could one not be struck by the extreme differentiation of the industrial production on US or Australian store shelves! The variety of ripening cultures is indeed limited, but it structures the international production around a few types of cheese that combine three main families of milk – cow, goat and sheep – with white-rind or washed-rind soft cheeses, cooked and uncooked pressed cheeses, and blue-veined cheeses (i.e., blue cheese). In each category, the differences tend to be concentrated downstream of production: ageing time, added aromatic ingredients (pepper, capsicum, spices, etc.), and variations in presentation (blocks, cuts or individual portions); as well as, of course, the marketing tools to stimulate the demand for cheese.

The differences between products relate to a set of criteria enabling the stabilization of each product's identity (namely strict definitions of the flavour, texture and aspect of the product) on one hand, and the stabilization of demand for that particular product identity on the other. Quality conformity is the keystone of industrial production, as well as the stabilization of customers' expectations thanks to sophisticated marketing techniques.

Still, this stabilization contends with multiple sources of variation. The raw dairy material, which is always fluctuating, is homogenized through the fusion of the catchment area's different sources of supply, pasteurization, and ultimately a strict control of key physicochemical characteristics. With regard to cheesemaking, stabilization also involves the artificialization of processing thanks to controlled cultures. Raw material homogenization is not sufficient to ensure the conformity of the end product and requires a final tuning. Additionally, some variations, either unexpected or resulting, for instance, from new standards or lasting changes in the raw materials or cheesemaking processes, cannot be homogenized and are instead compensated for. Doing so requires resources, that is elements of the product which are not part of the product's identity and do not affect the customers' direct experience. The production process is crucial for this final adjustment and thus kept as free of constraints as possible, so that the end product can be made consistent with its identity with the least possible losses.

Consumer habits are also not set in stone, and are carefully monitored using a range of demand-monitoring marketing instruments. In the event of ongoing or expected developments, like a rising rejection of fat or salt, the organization of production triggers an adjustment process, which aims to preserve the stability of the product-customer adjustment.

Finally, the industrial standardization process is a highly reactive, dynamic process of continuous stabilization of the relationship between a product identity that is stabilized but not frozen in place, and closely monitored consumers' attachments, thanks to products' homogenization techniques and crucial compensation resources.

The alternative management by artisanal cheesemakers

The artisanal organization of cheesemaking involves a completely different identity and diversity management system, which is far less cumbersome and costly. It is based not on the stabilization of production and demand, but on supporting and promoting product diversity.

Variability is part and parcel of small cheesemakers' everyday lives. Just as cooks adapt their recipes to the products delivered each morning, cheesemakers adapt the cheese they make based on the daily specificities of milk, the weather conditions or the draining of the curds. The control of this variability has fostered major controversies in areas with protected designations of origin (PDO).

PDO specifications relate both to animal breeding and milk processing into cheese and their authorized practices, and a series of characteristics of the end product, usually with regard to aspect, texture and flavour characteristics. Some producers support an evolution of the specifications in line with the industrial regime, towards reinforcing the definition of the end product. They demand the PDO name to work as a brand and a promise of conformity to a set of predefined characteristics, namely flavour. Simultaneously, they are also asking for the constraints on the production process to be relaxed in order to increase the resources necessary to comply with the more restrictive definition of the end product. Their opponents are requesting the reverse: a reinforcement of the processing constraints, in order to guarantee the 'authenticity' of the product, and the loosening of the end product identity, in order to open the search for the best quality. For the producers in the first category, variability in the end product is a hindrance to marketing the product. For those in the latter category, who often call themselves artisans or even artists, the quality promise attached to the PDO should focus on the acceptable resources that guarantee the authentic identity of the product; its variable quality expresses the skills of the producer, the terroir or a natural quality, as the case may be.

Cheesemakers all like to quip that *they* are not the cheesemakers, but *the microbes* are! Without microbes, there is indeed no cheese. But microbial life is particularly sensitive to many small variations in the composition of milk, particularly its temperature. Moreover, due to the rapid multiplication of microbes, the duration of the different stages of cheesemaking has a strong impact on the final cheese. Depending on the interpretation of the PDO guarantee, microbes may thus be major troublemakers, which need to be strictly controlled while monitoring the product's conformity, or a key resource in the search of product's quality. The divergence regarding the PDO guarantee goes along with the development of an alternative product marketing approach. Product variability is valued through marketing that is specific to this artisanal system, i.e., specialized shops, direct sales and most of all clients, namely amateurs (Teil, 2021), who value products' diversity, because it fosters their exploration of the product (wine for instance), which stands at the heart of their passion. Their choices are not grounded on rigid taste criteria and are open to new experiences. Here, the sustainability of commercial activities appears to depend less on stabilized consumers' expectations and product identity, and to be more permeable to biological changes and climate transition.

The tightening of health standards, which impoverish the microbial ecosystems of milk and disrupt its equilibrium, is particularly destabilizing for artisan cheesemakers. These standards limit the variability of cheese products and thus the expression of nature and cheesemakers' skills and specificities (cheesemaking techniques, terroirs, etc.). They also contribute to minimizing the difference between the industrial and artisanal regimes of production and commercialization. The vast majority of artisanal cheesemakers have, in fact, gradually been forced to make up for the microbial poverty of the milk by supplementing it with ripening flora similar to those used in industrial production.

Identity, diversity, sustainability

The denunciation of health standards by artisanal cheesemakers is not a plea for greater heterogeneity in production, but rather for a different articulation of diversity and identity. To exist, a being must at the same time achieve to be identifiable, that is, to be 'something', in order to interact; yet, to make this identity last, it also has to be able to transform in order to adjust to the multiple changes constantly arising. Resilience is not immobility; conversely, it is not a perpetual metamorphosis either. Sustainability builds on two legs. The two above market regimes each ensure the sustainability of production in the face of change, in different ways.

The industrial organization emphasize a product's characteristics associated with customers' expectations, which both marketing and production endeavour to make as stable as possible. The cheesemaking process absorbs changes, for instance in raw materials, standards or the production apparatus itself, in order to preserve the product's identity. Changes in demand are monitored to promptly and smoothly adjust production. The resulting succession of small changes allows the product endowed with a strong identity, to still being able to change and adapt.

On the artisanal side, an increase in cheese variability is not achieved at the cost of identity: the existence of the product does not vanish in an uncontrolled set of realizations. Identity is shouldered by the cheesemaker him/herself, the PDO name and specifications, terroir or nature, which allow for a much looser framework leading to acceptable variability of production.

Finally, health standards are the source of a surprising short circuit in cheese manufacturing, where industrial and artisanal regimes coexist. Pasteurizing and heating milk are fundamental instruments for creating economies of scale and controlling the quality of industrially organized production. Used as a sanitary standard, they deprive artisans of their microbes and standardize their production. In order to recover this resource required by the artisanal regime, artisan producers are calling for sanitary standards to be adjusted to the specific characteristics of the artisanal regime, particularly to the microbial ecosystems responsible for the specific diverse quality of their products. A growing number of PDOs thus makes it compulsory to use indigenous microbial starters, to strengthen the milk flora while safeguarding the particular typicity of artisanal products.

⏩ Diversity of organization forms in territorial development

Agricultural and food activities are changing as new development models (e.g., polarized, endogenous or distributed development) emerge (see Albaladejo, 2009), with calls for new forms of territorial adaptation at different organizational levels, from farms to regions.

Hybridization of territorial organization forms

Hybridization is one form of adaptation; it is both a factor of adaptation and also a result of the adaptation process itself (Lardon, 2021). In hybridization, a new form of organization is created through the combination of various elements inherited from previous forms of organization. Hybridization is carried out by certain actors who invent their own strategies to address challenges and engage in innovation and learning processes. These hybridized actors are pivotal to collective actions, such as a regional nature park (Amblard et al., 2018), and contribute to territorial development by connecting different scales and models, from local to global, to achieve an overall coherence (such as the articulation between the Livradois-Forez Regional Nature Park and the city of Clermont-Ferrand, France, for agricultural territorialisation; Lardon, 2015). Analysing adaptation of agricultural and food systems in different territories requires understanding adaptation as a process, and therefore studying the evolution of these systems as an adaptive capacity of forms of organization and as the result of territorial transformations. The 'actors-activities-spaces' model developed in geo-agronomy (Lardon, 2012) allows stakeholders to understand territorial dynamics and take actions to control them. The different dimensions of territorial integration involve the linking of spaces, combination of activities and coordination of actors to meet the challenges of a territory. This frame of reference sheds light on the complexity, transversality and flexibility of the systems studied and their representations through the analysis of socio-spatial configurations.

The territories studied are described through the lens of their socio-spatial configurations, looking at both their spatial organization and social relations (Lardon, 2015). These configurations offer insights into the development processes but also activate new models of territorial development. They are considered from a dynamic perspective to understand the potential and the capacities of territorial development.

Diverse socio-spatial configurations

Several case studies analysed in the FORMAT project show the diverse paths for territorial organization. They also reflect the forms of hybridization designed by stakeholders to adapt to changes and ensure the survival of their systems, such as new demand from consumers for food systems.

Tracing the evolution of the agrifood sector studied, which involves about 20 cattle breeders, a dairy and a supermarket in the area of the Livradois-Forez

Regional Nature Park in the Auvergne-Rhône-Alpes region in France, reveals the hybridization of the actors' strategies (Baritaux and Houdart, 2021). Working with milk from 'hay-only' operations, the sector produces two PDO raw-milk cheeses (Bleu d'Auvergne and Fourme d'Ambert), sold in Carrefour supermarkets under the brand 'Engagement Qualité Carrefour' (*Carrefour Quality Commitment*). For the cattle breeders, the hybridization takes place through the coexistence of production practices that are more akin to those of an alternative farming system (organic farming, no silage, feeding the cows only grass or hay, barn drying) and distribution practices typical of the industrial model. For the dairy actors, forms of hybridization can be found in the modes of valorization of regional products with the offer of PDO products, on the one hand, and in the standard products sold under their own brand or a supermarket brand, on the other. The distribution networks involved are therefore also hybridized. For the farmers, this is a way to better valorize the milk and secure their operations. For the dairy actors, this is a way to diversify outlets and secure a share of sales, as well as part of the supply through contracts to meet Carrefour's specific demand. For the supermarket, hybridization is a way to respond to competition and changes in consumer demand. All these forms of hybridization reflect the stakeholders' adaptation strategies to meet economic objectives and maintain their agrifood activity.

The marketing strategies of peri-urban farmers on the plain of Pisa, Italy, rely on the share of their total production sold locally through alternative and local distribution networks (Filippini, 2021). Farmers combine both traditional and alternative modes of production and commercialization to meet new demands from consumers looking for different food products. These peri-urban farmers are adapting to the new possibilities of geographical proximity to urban areas by hybridizing not only the forms of organization of local sales networks, but also their relationships with different marketing actors, both local and territorial. They cultivate relations with processing units, retailers and consumers at local and territorial levels, as well as institutional actors who play a role in the recognition of the urban food system. The sustainability of the different initiatives depends on several factors, although mainly on the maintenance of the balance between the urban and rural environment, opening up the territory to outside and coordinating the different supply chains involved.

Building a territorial identity that makes sense for the involved actors

The resilience of territories highlights not only the transformational capacity of territorial actors, their sense of belonging to a territorial identity and their openness to other territories, but also their territorial anchorage, their capacity to innovate and their traditional foundations (Iceri, 2021).

Thus, in the traditional community of Faxinal Emboque, in Parana (Brazil), local independent farmers are innovating by opening up to the outside market, with a view to maintaining their traditional know-how and becoming well anchored in the area (Figure 10.1). In order to maintain their product diversity and above all their autonomy,

the actors of Faxinal Emboque target local and regional markets, on site or elsewhere, including public and/or private markets and via civil society networks. However, they do not comply with all requirements of traditional markets: their strategies aim to adapt to the market, so as to sell on a local and regional scales, and introduce changes to the market itself, through the mobilization of consumers and public policies.

Unlike neighbouring communities, the farmers of Faxinal Emboque have engaged in a process of development, innovation and adaptation by adopting an industrial sales and commercialization model through innovative strategies. This primarily involves a strategy to develop the sale of local products, through access to local markets and industrial outlets, while maintaining traditional and agroecological production practices in pig farming and maté harvesting.

Members of the community have taken the initiative to seek new actors to facilitate access to local and external markets, and to enhance the valorization of local resources and access to industry. They are thus taking advantage of their recognition by the Ministry of the Environment to facilitate their search for external partners and funding.

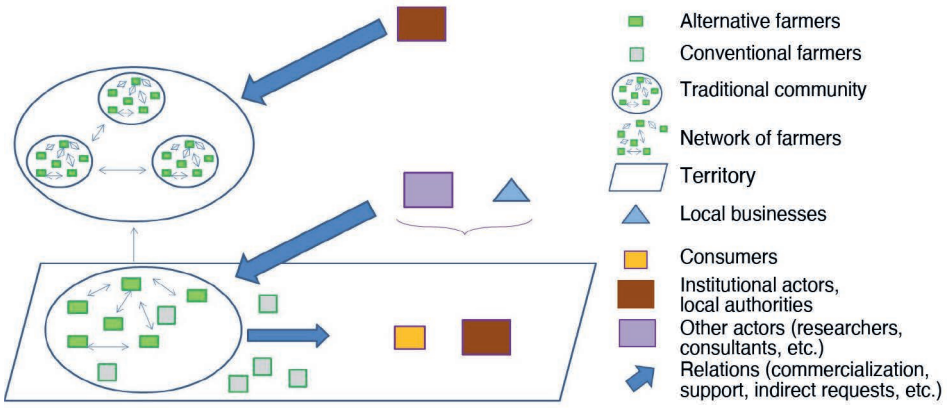

Figure 10.1. Socio-spatial configuration of the Faxinal Emboque community in Brazil.

The adaptation strategies of the Faxinal Emboque community rely first and foremost on the development of their socio-professional network through the active search for funding and partnerships with new actors outside the community. In particular, actors from the research community are helping them to improve their breeds and their production, while civil society organizations handle the commercialization of local products in long supply chains. Secondly, these strategies involve initiating changes in their farming systems to enhance the quality of their products, while still operating within a traditional or even alternative farming system. These farmers have maintained their strategy of diversification of production and sources of income and their role in the area's forest resources by introducing new products (candied pork, maté soda and ham) and expanding their outlets.

This hybrid approach has enabled the Faxinal Emboque farmers to initiate the development of the community's socio-professional network in order to develop their local production and products. The community is opening up to new products,

new actors and new forms of organization without losing its identity by combining territorial anchorage and openness to other territories, with a traditional base and a capacity for innovation, in a socio-spatial organization (Iceri and Lardon, 2018) that is 'common' (Ostrom, 2009).

This form of organization, which connects scales from the local to the global level and combines traditional and industrial models to better innovate in a territory, is nourished by different territorial development challenges: maintaining and securing farming operations, strengthening traditional practices to secure the forest, developing collective projects, disseminating know-how and knowledge (cooking, gardens, etc.), and bringing recognition of individual and collective 'talents' of the involved actors.

Conclusion

Resilience is often analysed from the perspective of capacities of beings or characteristics of systems of beings, such as the diversity of ecosystems in ecology, the homogeneity of goods in economics or the plurality of forms of organization in geography. The cases we studied offer a different pragmatic understanding of resilience: it is no longer the more or less predetermined effect of intrinsic qualities, but the always uncertain result of an activity and effort to continue to persist, which relies on a number of instruments, know-how, collectives and methods of coordination between stakeholders. Our multi-disciplinary perspective, at the interface between socioeconomics and geography, converges towards the ever-renewed quest for adaptability to change in order to survive, a kind of perpetual conquest of innovation and interaction.

In the first section, cheesemakers, indignant about health standards, led us to differentiate between two regimes of market activity with their instruments, their constraints and their own ways of steering action, and ultimately two ways of ensuring sustainability by articulating identity and diversity. It is because they blended the instruments of these two regimes that health standards and pasteurization have become a source of conflicts of coexistence. Yet, however different, such activity regimes are not strictly compartmentalized.

In the second section, the forms of organization of farming and food revolve around the dual dynamic of recognizing the diversity of organizational forms and inventing a common territorial identity. The examples from Auvergne, France; Pisa, Italy; and Parana, Brazil, thus show how actors in the field are finding ways to distinguish themselves by hybridizing modes of production, commercialization and multi-actor interaction. Hybridization makes it possible to sustain farming and food activities, while aligning with the individual and collective strategies of the actors and, in so doing, to contribute to territorial development dynamics.

Hybridization allows for regimes to coexist according to several sustainability dynamics. But it is also a new source of discord. For all those who defend the coherence of their production and marketing regime, hybridization threatens their own identity as an 'artisan' or a reliable 'commercial brand', hence the controversy

within the PDOs. They thus constantly seek to better differentiate themselves by advocating the exclusivity of resources, or by highlighting those resources which, like unmixed and non-standardized raw milk, for example, in contrast with pasteurization, hamper the homogenization-based industrial regime.

The different abovementioned regimes and their hybridizations are structured by resources, commercial dynamics, and adjustments of the identity/diversity duo; both aspects are compatible to varying degrees and a possible source of conflict. Their coexistence can also be a resource for the sustainability of territories, provided that there is a commitment to recognizing these different regimes and preserving the resources linked to their own forms of sustainability.

The sustainability of farming, whether in peri-urban or rural areas, requires new types of relationships and territorial anchorage. The quest for better integration into the terrestrial networks of interaction (Latour, 2017) thus constitutes an alternative path for the ecological transition sought. It is an exciting avenue to pursue!

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