

Alternative trajectories of dairy farmers reveal their embeddedness in the mainstream dairying and articulation with structural dynamics

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Abstract: As the 2009 dairy crisis drew attention on the situation of dairy farmers in Europe, the extent of strategical power left to farmers in dairy cooperatives of increasing size is a frequently raised issue. Four dairy cooperatives collect 97% of the milk in the Walloon region. Two of them integrated agrifood multinationals of world scale. We analyzed the trajectories of Walloon dairy farmers exploring alternatives to the delivery of milk to these mainstream dairy cooperatives. Our objective was to understand the issues faced by these actors in relation to the mainstream dairy context from which they emerge. We focused on the areas east of the Walloon Region where dairy farming represents 75% of the farming revenues. In these regions, alternatives consist mainly in farmers processing cheese on farm or delivering their milk to cheese processors. We designed a qualitative case study based on interviews with farmers and cheese processors. The alternative trajectories of interviewees appear embedded in a broader dairy context. The lock-ins emerging from this context determine the evolution of the farming model towards intensification as well as individual identity and capabilities of farmers. We present a model of interconnected and embedded lock-ins, from the organizational framework of the regime to the individual framework. This model illustrates how agency articulates with structural dynamics. We propose structural measures in the organization of agricultural education and in terms of support to alternative supply chains that will favor initiatives of change at the individual level.

Introduction

The 2009 dairy crisis drew attention on the situation on dairy farmers in Europe. Along with the price paid for milk, another frequently raised issue is the extent of strategical power left to farmers in dairies of increasing size, especially in dairy cooperatives (European Milk Board, 2012). In 2012, four cooperative dairies, members of the Belgian Confederation of dairy industries, collected 97 % of the milk of Walloon dairy farmers (CBL, 2013). Agrifood multinationals of world scale have since integrated two of these cooperatives, following a broader European trend (Juliá-Igual et al., 2012).

As literature stresses the importance of considering alternative food networks for their potential to transform food systems towards sustainability (Lamine et al., 2012), we focused our research on the trajectories of actors who explored the alternative options of cheese processing on the farm or direct milk delivery to a cheese processor. This paper aims at understanding the issues faced by these actors in their alternative trajectories.

In three regions situated in the eastern part of the Walloon region, the *Liège grassland area*, the *Pays de Herve* and the *Haute Ardenne*, dairy farming is the dominant agricultural activity and represents over 75% of the farming revenues (DGARNEed. , 2011). When considering other pathways than the delivery to mainstream dairies, farmers in these regions explore the option of processing on farm, mainly in cheese production (Bauraind, 2012), or deliver their milk to cheese-processors collecting their milk directly from farmers.

Methodology

We designed an interpretivist qualitative study based on semi-structured interviews with the actors involved in the cheese processing alternatives. Qualitative research methodologies consist in collecting data and realizing an inductive data analysis with or without the use of a *theoretical lens* – a set of interpretive frames issued from literature (Creswell, 2007). This approach has been increasingly mobilized to study the multi-dimensional aspects of food systems (Deverre & Lamine, 2010), from processes of change at the farm level (Vanloqueren & Baret, 2008) to social perceptions related to food production (Gaspar et al., 2016; Hoek et al., 2017). The relevance of qualitative approaches for a thorough understanding of complex systems is now recognized (Kaivo-oja, 2016; Tran et al., 2016).

Approach

We adopted a “grounded theory” approach (Corbin & Strauss, 2015), taking into account what the data collection revealed prior to and beyond any theoretical hypothesis. We fed our interpretation with the help of a theoretical framework that combined approaches on the stability of systems and processes of change at the individual level.

Materials

We identified actors in the online data of the regional agency for agricultural promotion (APAQ-W) and a published guide of Walloon cheese-makers. We interviewed actors at the level of the farm as well as at the level of cheese processing. Fifty percent of the cheese processors and the farmers doing cheese processing on farm, eighty percent of the farmers delivering to a cheese processor accepted an interview.

We interviewed five farmers active in cheese processing on farm (fc-1 and fc-2) or who had stopped cheese processing on farm (fnc-1, fnc-2, fnc-3). We interviewed three cheese-processors realizing direct milk collection (cp1, cp2, cp3) and ten farmers delivering their milk to cheese-processors (fm-1 to fm-10). Our interviews covered equally the three regions of our geographical study area.

Six of the ten farmers delivering their milk to cheese-processors were of male gender and worked alone on the farm (fm2, fm3, fm4, fm6, fm8, fm9). The four other farmers delivering their milk to cheese-processors ran their farm as a family business with several members of the family involved (man, wife, sons and daughters). We interviewed the man in two cases (fm1, fm5), and the man and the wife in a common interview in two cases (fm7, fm10).

In the case of the farmers processing on farm, farmers ran their farm as a family business too. In one case (fc2), we interviewed the man and the wife in a common interview, in one case the wife (fnc-2), and in the other cases, the man alone (fnc1, fnc3, fc2).

Our interviews took place between November 2013 and January 2014. We asked the interviewees to (1) present their activities and their history; (2) identify the factors of success in their trajectories; (3) describe the constraints encountered.

The interviews were audio-recorded and transcribed. We used the software RQDA to attribute thematic codes to transcription parts and extracted these for analysis. We defined the codes according to the theoretical frame mobilized and enriched them with new elements identified as relevant during the process of data collection.

Theoretical frame

Path dependency describes how historical events influence development pathways: trajectories are more likely to be followed than others as a result of these events (Sutherland et al., 2012).

The *Multi-level Perspective* (Geels & Schot, 2007; Geels, 2010) accounts for the co-evolution of social systems into stable *socio-technical regimes*. Socio-technical regimes hold dominant routines in production, use of technologies, cultural and knowledge transmission, institutional and social practices (Geels, 2004; Lachman, 2013). These not only orient trajectories, but they also hinder other paths, a phenomenon called *lock-in* (Unruh, 2000). In socio-technical regimes, lock-ins are of technical nature (for example, through the immobility of investments in existing infrastructure) but also result from beliefs, discourses, institutional frames, organization of the transmission of knowledge (Unruh, 2000; Geels, 2004, 2011). In a stabilized regime, lock-ins are at the same time the consequence of path-dependent processes as the source of further path-dependency (Sutherland et al., 2012; Pesch, 2015). *Niches*, developing beside socio-technical regimes, act as protective spaces for innovative practices and sources of transition (Geels & Schot, 2007; Geels, 2010).

In the agricultural sector, systemic organization influences individual practices. For example, supply chain organization, genetic selection, research and public support policies can act in a convergent way and create a context that is not favorable to the adoption of fungicide-resistant wheat varieties (Vanloqueren and Baret 2008) or the reduction in use of chemical fertilizers (Kuokkanen et al., 2017). Production standards (De Greef & Casabianca, 2009; Stassart & Jamar, 2009, 2005; Meynard et al., 2013) orient pathways of production and consumption. The non-integration of supply chains (the absence of vertical or horizontal links between actors) and the unbalance of strategic weight among actors (Fares et al., 2012) act against the financial support of alternatives and the ability of individuals to change their practices. The organization of research and education prevents the development of an integrated approach of production issues (Vanloqueren & Baret, 2009; Darnhofer et al., 2012; Mulder, 2017). At the farmer's level, capital investment, consideration of risk, market configuration, capabilities of the actor act against change or against the ability of the farmer to interpret an event as a trigger for change (Sutherland et al., 2012). Beside lock-ins of technical and financial nature, knowledge and cultural lock-ins play an essential part (Sutherland et al., 2012). Practical experience and formal education contribute to the emergence of these lock-ins, as well as a "farming culture" defined as "the adherence to mutually accepted farming ideals" within the peer group of farmers (Burton, 2004a). The strength of the symbolic value of "good farmer" as identity ideal and behavioral driver has been stressed by Burton (2004b), Burton and Paragahawewa (2011) Sutherland and Darnhofer (2012), Wahlhütter, Vogl, and Eberhart (2016).

A change of practices implies a continuing process of shifts in meanings that interact with the identity of farmers (Burton & Wilson, 2006; Rauschmayer et al., 2015; Pesch, 2015). Hence, one should consider the context in which actors evolve (Avelino & Wittmayer, 2016; Pesch, 2015; Darnhofer et al., 2012; Grin et al., 2010; Giddens, 1984; Fischer & Newig, 2016; Van Der Ploeg, 2003). The concept of agency is a research concept used to analyze how actors manage to overcome lock-ins to implement a change of practices (Geels, 2010; Kern, 2015; Pesch, 2015; Fischer & Newig, 2016; Geels et al., 2016). The agency defines "purposive actions" taken by actors "in an attempt to prevent or generate change" (Fischer & Newig, 2016).

The broader dairy context has an effect on the farmers' trajectories

The description of the experience of farmers in the alternative trajectories reveals particularities of these alternatives regarding farm model that differentiates from a more general trend of farm model evolution (1). The interviewees analyze this trend and the

constraints they face in their trajectories as part of a broader dairy context. We will from now on refer to this context, identified by the interviewees, as "mainstream dairy context". Their description reveals a web of constraints whose significance goes beyond the contingencies of the particular trajectories of the interviewees. Indeed, their description, in line with previous studies on the agrifood sector, discloses the grip of this context on individual paths (2). The web of lock-ins characterizing this grip, combined with what helped the interviewees to overcome these lock-ins (3), leads us to consider the impact of the embeddedness of individual trajectories in this broader dairy context. We propose a model of embedded frames to characterize the effects of lock-ins on the agency of farmers: in this model, the organizational frame of the dairy sector embeds the farmer's frame (4). As these lock-ins appear interconnected and recursively strengthen themselves at the farm level (5), we propose an intervention on one particular lock-in that will help overcome lock-ins at the farmer's level (6). We also elaborate on this embedded approach to suggest that the support to alternative food chains might be a means to support a greater diversity of farm models (7).

1. The alternatives support a farm model that contrasts with the wider trend towards large-scale high-input intensive farms

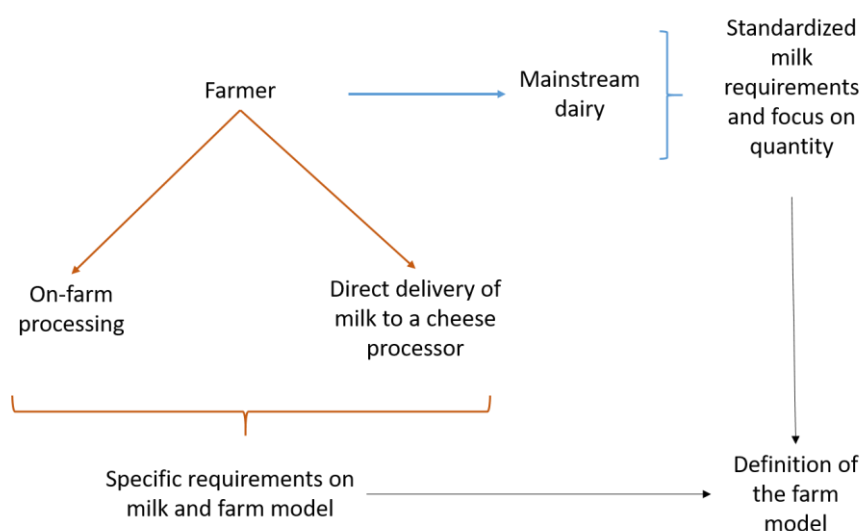


Figure 1. Pathways of milk valorization explored by the interviewees

Farmers explored the alternatives of on-farm processing or direct delivery to cheese processors for various reasons. Some farmers seized an opportunity, as the cheese-processor was looking for organic farmers (fm1, fm2, fm6) or because of the geographical proximity with a cheese-processor (fm4, fm5). For others, it was a conscious decision to explore new ways of valorization of their milk (fm3, fm7, fm8, fm9, fm10). Some farmers left the mainstream dairy they were delivering their milk too; other farmers kept a combination of delivery to a cheese processor and/or on-farm processing with the delivery of milk to a mainstream dairy.

The farmers describe their farms as small-scale, with 40 to 80 cows, Montbeliard and Flekvieh breeds and crossbreeds on a Holstein basis. Their base their farm model on an extensive milk production per cow (5000 to 8000 liters per cow and per lactation) (fm5, fm7, fm8, fm9, fc1) and complete autonomy in feed production (fm7, fm8, fc1). As detailed in table 1, these features allow farmers to answer the requirements of cheese processors or to meet these with good economic efficiency (fm3, fm5, fm7, fm8, fm9, fc1, cp1, cp3).

Table 1. Requirements linked with cheese processing influencing the farm model and practices

Requirement	Influenced by	Constraint for farmer linked with requirement	Practice answering the requirement	Optional practice providing a better economic efficiency when answering the requirement
Gustative quality of milk	Feeding	Limitation in the use of concentrates Farmer has to make silages that are less acidic, thus dryer silages– less nutritional value and higher processing costs (realization of bales necessary)		Extensive milk production Extensive milk production. Autonomous realization of clamps (no recourse to sub-contractors to harvest the grass and make the silages, so that the farmer can take the necessary time to ensure a thorough compacting of the dryer silage)
	Sanitary status of the cow		Extensive milk production More rustic cow breeds	
Cheese-processing properties of milk	Cow selection – cow breed		Selection of another cow breed than the Holstein, or crossings	
Sanitary quality of milk	Sanitary status of the cow and feeding	Farmer has to make dryer silages to prevent the development of undesirable microorganisms – less nutritional value and higher processing costs	Extensive milk production Rustic cow breeds	Autonomous realization of clamps (no recourse to sub-contractors to harvest the grass and make the silages, so that the farmer can take the necessary time to ensure a thorough compacting of the dryer silage)
Distribution of risk among milk producers	Number of milk producers	Farm has to be small-scale	Small-scale farm	
More milk production in winter	Calving season in autumn	Additional feeding costs linked with the displacement of the lactation peak in winter to answer the needs of the cheese-processor (traditionally in spring, supported by the spring grass)		Extensive milk production – low-input approach regarding feeding

Farmers consider themselves at the margin of a broader trend toward large-scale intensive high-input dairy farms based on the Holstein breed (fc1, fc2, fm2, fm3, fm7, fm8, fm9), also described in the scientific literature (Jongeneel et al., 2010).

2. Features of the mainstream dairy context orient individual trajectories

The opportunity to explore alternative pathways plays an important role in the trajectory of farmers. This opportunity, for example, the geographical proximity of a cheese-processor, is nevertheless not a sufficient condition for a change of pathway. Some farmers refused indeed to deliver milk to a cheese processor, although they were close enough and met the requirements of the cheese processors. The interviewees identify a combination of lock-ins that make the consideration of change of pathway difficult for farmers:

1) A strong sense of security linked to delivering milk to mainstream dairies

The delivery to a mainstream dairy is considered safer, although less satisfactory concerning personal value and remuneration (cp3, fm3, fm7, fm9, fm10). Mainstream dairies are cooperatives and are thus compelled to take the milk of farmers. As most of these dairies are considered "too big to fail", it is likely they will benefit from support in case of difficulties. A cheese processor, on the contrary, could go bankrupt or decide to reduce the volume of his production (cp2, cp3, fm3).

2) Dairy farmers define themselves as milk producers

Among the farmers, we noticed that this idea of being a milk producer remained strongly rooted: the idea that they do not have the time or the competences to be involved in the valorization of the milk was often expressed (fm2, fm3, fm4, fm6, fm9, fm10).

3) Dairy farmers share common visions about farming practices:

Farmers mention a shared vision about farming practices among dairy farmers, mainly based on intensification, growth and high investments in equipment (fc1, fc2, fm3, fm9). They mention having felt disapproval from other farmers (family members, neighbors, members of farmers' unions) when they decided to leave a mainstream dairy and valorize their milk in another way (fm7) or when they changed their way of farming towards more extensive or organic practices (fm2, fm7, fm10). According to the interviewees, this shared vision orienting practices towards intensification is stronger in the "Pays de Herve", where less diversity regarding farm model exists in comparison with the "Haute Ardenne". This mention of a shared vision about farming practices among farmers resonates with the symbolic value of "good farmer" discussed by Burton (2004b). The reaction of members of family or neighboring farmers, mentioned by interviewees at their change of trajectories, illustrates the collective dimension of this shared vision. Other studies also described this phenomenon (Rosin, 2008)

The programs of agriculture schools do not prepare farmers for other functions than that of producing milk (cp3, fm1). From their own experience and contacts, interviewees note that schools and public advisors advocate for farms growing in size and following intensification pathways (fm9, fc1). Farmers are more educated than ever before but do not learn to have a global vision of agricultural issues (fc1). Furthermore, future farmers follow programs in specific schools, as from the age of 12 years old. They consequently develop a shared common vision about farming and milk valorization practices (fm7). Other authors pointed out the disciplinary organization of education and research in agricultural and engineering fields

as a lock-in preventing a more globalized and interdisciplinary approach of the related issues (Vanloqueren & Baret, 2009; Mulder, 2017).

The high workload in farms acts as reinforcing technical lock-in: it prevents farmers from considering other options than producing milk solely (fm7, cp3). Furthermore, substantial investments in milking and farm equipment hinder fundamental changes in farming or milk valorization practices (cp3, fnc2, fnc3) and reinforce the reluctance to leave a mainstream dairy (fm9, fm10). Banks take into account where the farmer delivers milk before granting a loan, leaving farmers who do not deliver milk to mainstream dairies in a situation of uncertainty (fm3). Interviewees point out elements linked to the mainstream dairy context that reinforce the trend to large-scale intensive farms:

- 1) Mainstream dairies work with a differentiated payment system in function of the quantity delivered by the farmer: an annual quota of 540 000 liters gives right to a bonus payment per liter (fm3);
- 2) Dairies are more and more reluctant to collect milk from small-scale farms: interviewees mentioned the fact that dairies had refused collection to farms turning around 100 000 liters a year (fm7, fm3);
- 3) The public agricultural advisers encourage farmers to grow in size and invest in equipment. These advisers recommend the use of regional support dedicated to agricultural investment in the framework of the European rural development program (fc1, fm9);
- 4) The loan policies of banks are not favorable to small-scale building projects (fm3).

In this context, cheese processors cannot easily find milk providers meeting their requirements (cp1, cp3).

3. Farmers identify what helped them overcome the lock-ins

The interviewees cited three main factors explaining the success of their alternative trajectories, despite the existing lock-ins:

- 1) Social network: family and previous network connections act positively on a change of trajectory. Prior contacts with cheese processors, for example through organic unions, are sources of opportunities for farmers (fm7, fc2). The implication of family members is an asset to process cheese on farm or to invest time and energy in cooperative schemes with cheese processors (fm7).
- 2) Attitude: competencies and mentality are key factors to succeed in alternative pathways. Interviewees recommend to think out of the box and not to listen to advice from others (fc1, fm9). (fc1, fm9). The experience gathered outside of the agricultural world is an important asset regarding mentality, as well as concerning acquired competencies (fm7, fc1, fc2). This is the reason why one interviewee had decided not to put his children in an agricultural school (fm7).
- 3) Positive feedback: interviewees give positive feedback to their situation in alternative pathways, and it reinforces their confidence in their trajectory of change at the individual level. Many interviewees describe their change of path as satisfactory, because of a more stable remuneration (fm1, fm2, fm3, fm4, fm5, fm7, fm9), and a closer connection with the products processed with their milk. They also appreciate the human side of the direct relations they have with the cheese-processor (fm2, fm3, fm4, fm6, fm7, fm8, fm10). One interviewee (fm9) links the fact that he adopted a differentiated vision about farming practices - not based anymore on intensification and growing in scale - to the fact that he got the opportunity to deliver his milk to a cheese processor. This suggests that cultural conceptions are rooted in the organizational, technical and financial context in which farmers evolve.

Table 2. Factors influencing trajectories of farmers, as identified by the interviewees

Factors orienting farmers' pathways towards intensification	Factors that helped the interviewees consider a change of trajectory
Mainstream dairies offer a sense of security	Social networks and the involvement of the family are sources of support and new opportunities
Dairy farmers define themselves as milk producers	Ability to think out of the box
Dairy farmers share a common vision about farming practices	Experience gathered outside of the agricultural world
Public agricultural advisers and banks support farming practices based on intensification, growth and high investment	A positive feedback reinforces the confidence in the trajectory of change
Mainstream dairies offer bonuses as from a certain quantity of milk and are reluctant to collect milk from small-scale farms	

4. Embedded frameworks characterize the impact of lock-ins on the agency of farmers

We noticed heterogeneity evolving between two types of interviewees: persons having seized opportunities without a conscious commitment to building another way of valorizing milk; persons having taken intentional steps to valorize their milk in another way. Our results are in line with what other studies on changes of pathways noticed (Darnhofer et al., 2005; Sutherland & Darnhofer, 2012).

This heterogeneity stresses the importance of the environment on the farmer's agency. As noticed by Morgan et al. (2010a) and Murdoch et al. (2000), all contexts do not present the same "ecological conditions" (Murdoch et al., 2000) for the development of alternative models of food production. Regions "that have not been fully incorporated into the industrial model of production" (Murdoch et al., 2000) or "where opportunity for large-scale, intensive and industrial farming has been restricted" (Morgan et al., 2010b) are more likely to host a greater diversity of farm models, and hence, to host differentiated food systems. In our study, farmers of the *Haute Ardenne*, because of the heterogeneity of farm model remaining in this region and of the presence of local cheese processors could seize an opportunity to valorize their milk outside of mainstream dairies. Our results suggest that the agency of actors relies on the context in which these actors evolve, and on the lock-ins and opportunities, this context produces.

We propose in Fig.2 a model illustrating how the farmer's frame, regarding competences, identity or consideration of risk, is embedded into a set of lock-ins belonging to the farm-model frame and the more general cultural and knowledge frame of the mainstream dairy context. Both these frames are themselves embedded into the organizational frame of the mainstream dairy context.

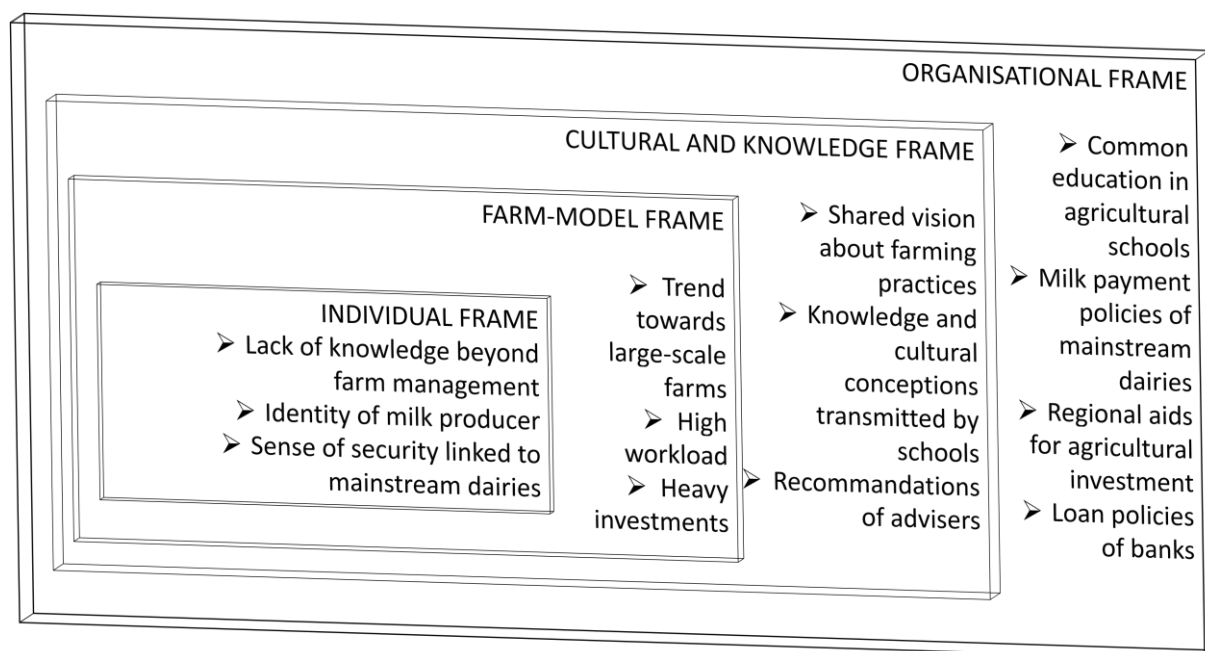


Figure 2. The embeddedness of the farmer's frame

This model stresses the role lock-ins play at the individual level, namely by influencing the interpretation given to what others perceive as an opportunity (Sutherland et al., 2012). The fact that dairy farmers consider it too risky to leave a mainstream dairy also illustrate the tension described above about socio-technical regimes. Change at the farmer's level in a direction that is not supported by a concentrated downward sector, goes necessarily with a great deal of individual risk (Fares et al., 2012). Hence the importance of

5. Lock-ins are interconnected and reinforce themselves at the farm level

At the farm level, we identified, besides technological, cultural and 'knowledge-driven' lock-ins, lock-ins we call 'organizational', linked to the way the actors of the mainstream dairy context act and organize their work. Collection policies of dairies, advisers' recommendations, public support policies and bank policies act coherently in support of the trend towards large-scale farms.

If we refer to the description of the interviewees, lock-ins appear connected to each other at the farm level. As presented in Fig.1, organizational lock-ins (1-4) can determine cultural lock-ins (5). All these lock-ins work along with a knowledge lock-in (6) in favor of a technical and financial lock-in (7-9) associated with the farming model. This technical and financial lock-in contributes (along with knowledge and cultural lock-ins – 6) to create a cultural lock-in regarding farmer's identity (12). This cultural lock-in interacts with the knowledge lock-in (13) and further strengthens the technical and financial lock-in from which it originates (7). We identify here very clearly what Pesch (2015) describes as "a self-reinforcing pattern that becomes hard to avoid" when he describes lock-ins emerging from the stability of socio-technical regimes.

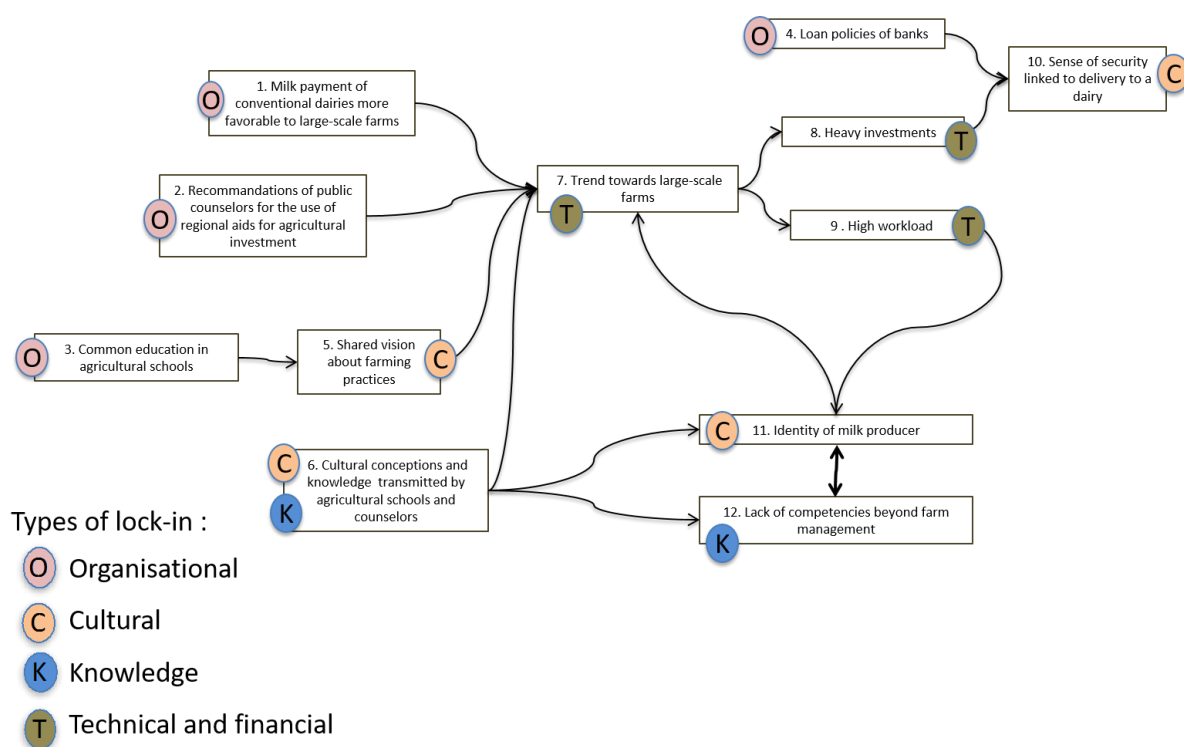


Figure 2. The interconnectedness of lock-in at the farm level

6. Addressing an organizational lock-in can help overcome lock-ins at farmer's level

We would like to interpret in our results what helped the interviewees overcome the embeddedness of their individual frame in this socio-technical dairy regime.

Which factors allowed the interviewees to exercise agency in favor of change despite the existence of these lock-ins? We identify five factors:

- the ability to question the shared vision about farming practices among dairy farmers

- the ability to stand against reprobation from neighbors and family members
- competences going beyond farm management solely
- a familial implication in the farming-related business
- access to a prior network of connections

Previous literature also identified these factors as drivers for change (Andrade, 2015; Mc Fadden & Gorman, 2016). These factors stress the importance of knowledge as a source of individual power (Avelino & Rotmans, 2011) and the interpersonal network around the individual as a source of adaptability and resilience (Milestad et al., 2012).

When we consider the education of farmers, as described by the interviewees, we understand that its organization is designed to equip farmers with a strong technical background linked to their specific speculation. Gathering farmers together from a young age can ensure the integration of common standards and practices. This logic makes sense in the eye of the national and European agricultural policies as they have been defined throughout the twentieth century (Milestad et al., 2012). Our results suggest that a modification of this educational policy might be favorable to a greater adaptability of farmers: (i) in terms of content: as adaptability also depends on management competencies that go beyond the technical aspects of farm production or farm management, wouldn't it be relevant to integrate these elements in the educational programs? Do these programs sufficiently equip dairy farmers regarding capability and adaptability? (ii) in terms of organization: wouldn't an education of farmers less separated from other professions allow greater openness to competences and networks that might prove useful concerning their adaptability to a changing environment?

7. Does supporting alternative food chains support a greater diversity of farm models?

Our study stresses how the broader organizational frame of the agrifood system embeds the farm model and the farmer's identity. One interviewee (point 4.3) draws a clear link between the evolution of his vision about what consists in “good farming practices” and his experience of milk delivery to a cheese processor. Such a phenomenon, also described in other case studies (Sutherland & Darnhofer, 2012) and theoretically discussed (Burton & Wilson, 2006; Rauschmayer et al., 2015) suggests that change in farming practices can lead an individual to perceive differently the farming context in which he evolves and question the cultural lock-in he had previously integrated.

Besides working on the empowerment of actors, these findings suggest that change in farming practices, and hence in the farmer's approach regarding farming, might also be fostered by supporting agrifood supply chains based on a differentiated milk quality.

Constraints to cheese processing as alternative food chain

At the levels of cheese processing and product marketing, lock-ins create constraints acting against small-scale cheese processing initiatives that differ from standardized agro-industrial production (including on the aspect of milk collection) (1,2). The interviewees active in cheese processing identify as risky the expansion of their activities in this context (3).

1. Cheese processors experience constraints acting against direct milk collection

Cheese processors favor direct milk collection to have a better control on the features of the milk – taste, protein content, hygiene (cp1, cp2, cp3, fc1, fc2). They can also process milk more quickly after milking, which guarantees an optimal protein configuration (cp2). However, milk collection is costly, since they do not necessarily find the ideal farmer near

them (cp1, fc1, fm3, fm4, fm6, fm7, fm8). They also have to invest in equipment for milk collection approved by the sanitary services (fm2, fm3, cp1).

The milk collection policies of dairies create a lock-in effect of organizational nature against direct milk collection by cheese processors. Dairies tolerate less than before variations in the quantity of milk delivered by a farmer (fnc1, fm2, fm5, fm10). This is a problem for small-scale cheese processors, as they cannot ensure to collect the total production of one or more farmers (fm10, cp3).

Farmers overcame this lock-in by mobilizing their milk quota for direct sales (fm5, fc1, fc2, fnc1, fnc2). Cheese processors overcame this lock-in by concluding agreements with newly created cooperatives of dairy farmers valorizing their milk on the European markets. Nevertheless, contrary to direct agreement with farmers, the difference in size may affect power of negotiation in terms of milk price. It is also tempting for these cooperatives to make exclusive delivery agreements with bigger processors to the costs of smaller ones (cp3).

2. Small-scale businesses face non-adapted distribution pathways

Cheese production generates large quantities of whey and, when the cheese processor uses skimmed milk, cream (cp1, cp2, cp3). Selling cream on the market is not easy for quantities generated by small-scale cheese producers (cp2). Calves and/or pigs can consume whey and this is how farmers who make cheese on-farm valorize this by-product (cp1, fc1). The elimination of whey and cream as waste is otherwise costly (cp2).

Direct sales to consumers are not an option in most geographical areas covered: the location of farms or cheese-processing factories (fc2, fnc3) is remote and local consumers favor mass retailers (fm9, fnc3, fm7). One farmer situated near an urban center developed direct sales successfully (fnc1). Some had experience in selling on markets, but this is very demanding in time and energy (fc2, fnc3). Price is an issue, as consumers remain mainly price-driven (fm8).

Cheese-processors mainly cooperate with generic wholesalers distributing their products to specialized and mass retail. They mention one wholesaler dedicated to small-scale organic productions. This wholesaler distributes products to specialized retailers and catering services. The interviewees confided feeling uncomfortable in front of non-dedicated wholesalers focusing on quantities, promotional plans and prize-driven competitiveness (fnc1, fnc2, fc1, fc2, fm7, fm8, cp3). Wholesalers were reluctant to collect small amounts of products, especially when the cheese processors were geographically remote (fc1, cp1). The negotiation with these non-dedicated wholesalers is difficult (fnc2, fc1, fc2, cp3): there is an imbalance in terms of power of negotiation (fnc2, fc1, cp3) and pressure on quantities and price (fc1, fc2, fm7).

When they upscale and produce larger quantities of cheese, cheese producers face specific requirements of mass retailers (packaging and promotional schemes) that are not sustainable for small-scale structures (fm7). When they upscale, cheese processors rely more than before on generic wholesalers and mass retailers. Some interviewees, therefore, prefer to remain small-scale and rely more on specialized distribution pathways (fc1, fc2).

3. Elements that might alleviate the constraints on the alternative enterprises

The interviewees cite two main factors contributing to the success of their trajectories of cheese processing:

- 1) Experience in business matters outside of the agricultural world provides competencies in management (fc1).

- 2) Interviewees appreciate the existence of a dedicated wholesaler specialized in organic, small-scale farm products. The creation of this wholesaler, son of one of the interviewed farmers doing cheese processing on farm (fc2), makes contacts and delivery to specialized retailers more accessible, as these connections are otherwise time-consuming (fc2, fnc1). Interviewees appreciate not having to lose time and energy on marketing issues (cp1). They would like specialized retailers to emphasize more on local cheese production (cp3, fm7).

The interviewees identify the need for more organization among cheese processors. By the time of the study, there was no collective organization to promote small-scale non-industrial cheese productions. The interviewees mention a general mentality not oriented towards collective action in the concerned regions, contrary to other European countries where farmers and small-scale producers were more collectively organized (cp1, fc1, fc2, cp3).

Food chains as key to integrated approach to farming issues?

Cheese processors wishing to work with another quality of milk than the standardized milk expected from mainstream dairies rely on the existence of farms capable of meeting their needs. On the other hand, due to a series of interconnected lock-ins, farmers are not encouraged to maintain a farm model meeting the needs of these cheese processors, unless they get the opportunity to work with one of these cheese processors. A convergent set of lock-ins linked to the organization of the supply chain constrains the cheese processors and does not encourage them to create, maintain or expand their activities. At the level of the supply chain, as illustrated in Fig.4, we find again this feature of "self-reinforcing pattern that becomes hard to avoid", that Pesch (2015) describes characterizing the stability of socio-technical regimes.

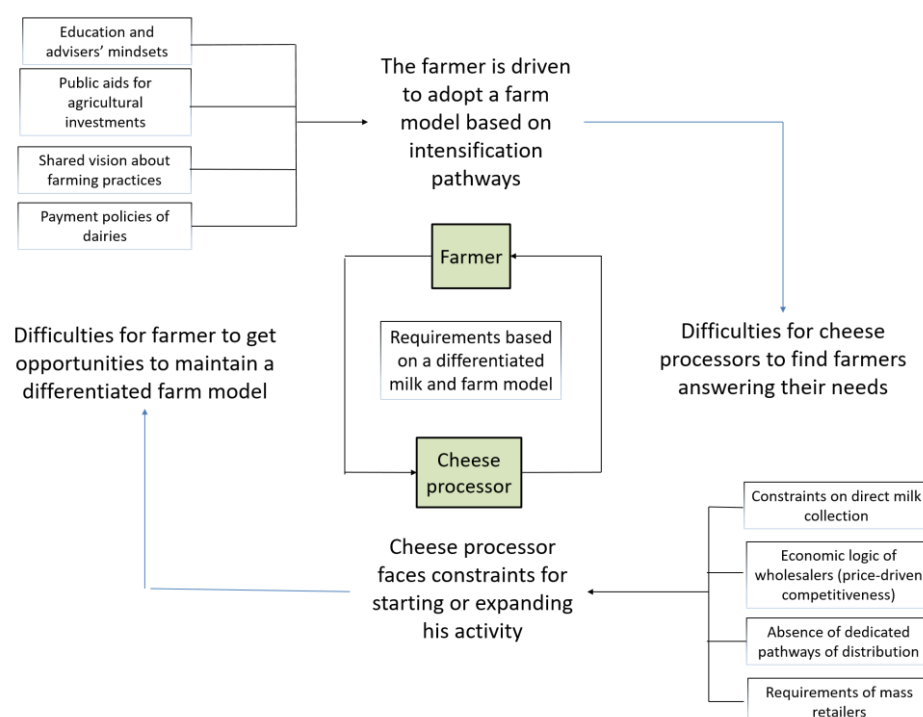


Figure 3. The self-reinforcing pattern at the level of the supply chain

The global context in which the interviewees of this study evolve can be characterized as a socio-technical regime as defined by the evolutionary theories on systems (Lachman 2013). This socio-technical regime, to which we referred as the "mainstream dairy context", seems

to have followed a path of co-evolution, from public policies to consumers' behavior, in line with the organization of the industrial agrifood system of product processing and distribution. Its organization constrains the ability of individuals to follow an alternative path. At the level of this socio-technical regime, the farming model appears influenced by the needs of the mainstream dairies for standardized milk. De Greef and Casabianca (2009), in the case of the Dutch pork chain, described a similar organization driven by commodity logics and standardized quality, where all pork is equal in the eye of the consumer. Diversification towards less “standard” productions mainly failed “because of price effects” and reluctance of processors and of the retail sector to consider and support alternatives. They similarly noticed a direct consequence of this organization on farms, lead on “an industry-driven route of increasing size and efficiency”. De Greef and Casabianca (2009) in the case of the Dutch pork chain and Fares, Magrini and Triboulet (2012) in the case of the French wheat supply chain stress the non-integration of the value chain, that is the absence of links between farmers and the downward processing structures. These authors attribute to the non-integration of the value chain the difficulty to consider and support strategies for change. Concerning our case study, we might notice that the milk sector seems more integrated than the Dutch pork chain (De Greef & Casabianca, 2009) or the French wheat supply chain (Fares et al., 2012). Milk dairies are indeed cooperatives, and there is thus a vertical link between dairy farmers and the milk processing structures. Nevertheless, the present configuration of cooperatives, merged with industrial agrifood groups, leaves the farmers with little strategic power (Juliá-Igual et al., 2012; European Milk Board, 2012). Fares, Magrini and Triboulet (2012) stressed that this situation of non-integration, in the case of the wheat supply chain, generated lock-ins: these downward concentrated actors have a strong power of negotiation over other actors and use inter-professional agreements to impose production standards. Upward actors, especially farmers, have little space left to engage in alternative production or transformation pathways, and if they do so, have to support significant personal risk. On this last aspect, our study revealed a similar lock-in. Besides issues of individual capability, support to differentiated food chains has hence to take into account the need for dedicated services regarding the distribution of products, risk management, and adequate representation.

This study invites to consider the role of agency in transition processes as a dialectic process, at the crossover of individual or network capabilities and structural change. In this regard, our study ties up with the most recent theoretical discussions on how to approach processes of change (Darnhofer et al., 2015; Gallo-Cruz, 2017).

Conclusion

The analysis of alternative pathways of milk delivery revealed convergent and interconnected lock-ins originating from the mainstream dairy context. This mainstream dairy context answers to the evolutionary definition of socio-technical regime. Our study stresses the grip of lock-in on the agency of actors. The interconnectedness of lock-in goes indeed from the organizational frame of the socio-technical regime to the capabilities and identities of actors. This suggests that pathways of transition might be favored by acting at first on the organizational lock-in that plays a key-role on these aspects, namely the educational systems of farmers. Our study also stresses that the broader organizational frame of the agrifood regime influence farm practices and individual identity. Alternative processing actors may support another evolution of farming models.

Our approach mobilizes a combination of evolutionary approaches on transition processes and considerations on individual pathways of change. The *Multi-Level Perspective* states that alternatives develop through the emergence of protective spaces called niches. Rather than a niche configuration, as defined by the multi-level perspective, our study revealed the embeddedness of alternatives in the environment in which they emerged. This has

consequences in terms of opportunities actors may seize. This embeddedness also affects how individuals perceive their environment and which personal resources they may mobilize. Rather than endorsing a deterministic approach about agency, our study stresses that individual empowerment is a matter of connections, experience, and education and that drivers for transition lie at the crossover of actors' empowerment and systemic change.

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