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Development trajectories of mountain dairy farms in the globalization era. Evidence from the Vercors (French Northern Alps)

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Abstract: The maintenance of dairy production in mountain areas pose a real challenge in a context of globalization, particularly in France where milk quotas are about to be dismantled. Although acknowledged and sustained for its multifunctionality, European mountain agriculture has significant natural constraints to contend with and cannot follow the same paths of development as in the plains (specialization, enlargement, industrial organization of labour). Mountain dairy farms have thus had to develop their own specific responses. The goals of this study are: (i) to analyze the recent changes in mountain dairy farming in the Vercors (Alpine uplands under residential and tourist dynamics); (ii) to characterize the diversity of farming system development trajectories; and (iii) to discuss the different responses adopted by dairy farmers to last over time, which are not based on the same adaptive resources.

We thus developed an analytical framework that allows us to link evolutions in livestock farming systems and family-farm organizations, via a multi-phase process where each phase of investigation provides more finely grained detail. The process consists in analyzing individual data from: i) national census of agriculture (1988, 2000, 2010) to capture general trends and analyze family-farm trajectories between 2000 and 2010 on 68 dairy farms; ii) semi-directive on-farm interviews (n = 33), to analyze the long term processes of change beyond the family-farm trajectories.

Keywords: livestock farming systems, family-farm trajectories, process of change, adaptive resources

Introduction: futures of mountain dairy farming

Agricultural output is trading in a more fiercely-competitive and global marketplace, in a context of climate change and environmental problems (Darnhofer et al., 2012). The upshot today is the split between production and consumption geography, and territory-scale use of natural resources. These deep shifts force a re-appraisal of the position of livestock farming in regions and populations that depend on it for a living. The challenges come on several fronts - the environmental dimension (i.e. resource use and impacts of agricultural practices), the economic dimension (i.e. the allocation of livestock production value-added), and the social dimension (governance at every scale, from farm up to geographic region and value chains).

Since the milk quotas scheme introduced in the 1980s in Europe, the Common Agricultural Policy (CAP) has provided a regulation of dairy production. In France, with milk quotas about to be dismantled, the dairy farming regions are wondering about the futures of dairy production and the community of family-run dairy farms. The issue is particularly acute in mountain zones, which constrained by tough terrain and climate conditions, cannot hope to keep production costs low enough to stay competitive in the global agricultural marketplace (Dervillé et al., 2012). Moun-

tain farmers can nevertheless find ways to turn geographic niche into added-value and profits (Chatellier et al., 2006), as exemplified in zones like the geographic indication for Beaufort cheese. These external driving forces interact with the dynamics specific to families who live and work on dairy farms, leading them down paths where they either adapt or leave dairy farming (Evans, 2009).

This report sheds light on the processes of transformation at work in family-farm in mountain territories to better understand the way farmers construct their long-term development in order to stay in business. We propose an analysis of development trajectories followed, which questions the resilience of family forms of farming in “marginal” areas. The case study was performed in the Vercors, a dairying area of the Alps.

Material and methods

Analytical framework: farming systems seen as complex evolutive systems and approach based on trajectories of change in farming systems

Farming systems are embedded in a wider socio-technical system (market structure, policies, consumer preferences, ecosystem behaviour...) (Darnhofer et al., 2012) that means they are shaped by a wide array of interacting factors that, like the farming system, change over time. Farms cannot be seen anymore as facing a stable environment, but are now conceptualized as evolving and responsive to an ever-changing environment (Milestad et al., 2012). In this lineage, we consider farming systems as complex evolutive systems, i.e. dynamic systems that co-evolve with their environment (Schiere et al., 2012).

Dynamics of farming systems is a thriving field of research. Recent research output on development trajectories can be collapsed into three types of approach. One approach aims to capture the levers that farm managers mobilize to contend with shifts in context. The responses documented concerns (Johnsen, 2004): the farm scale and type (diversification into new agricultural commodities), farm and/or household expenditure, the reorganisation of labour (change in use of unpaid/paid) and participation in off-farm work, together with the alteration of physical and economic farm practices. A second approach compares system states between date-to-date (Garcia-Martinez et al., 2009) or across a multi-date timeline (Ryschawy et al., 2013). The other approaches are focused on the processes of change. Some teams have investigated how different adaptation strategies are fitted into a series of system coherence phases (Moulin et al., 2008; Cialdella et al., 2008) in order to assess the relationships between farm changes and farm manager strategies. Others decode each facet of the change process, i.e. not just why the change is made (and its strategic dimension) but also how, i.e. the way the system transitions from stage to stage of its trajectory (Madelrieux et al., 2002; Terrier, 2013). This allows a detailed examination of the circumstances surrounding change, whereas the context of individual farm-business changes has been under-studied (Evans, 2009).

Most authors analyze farming system changes independently of type of social organization running the farm (Ryschawy et al., 2013), yet the availability of a family workforce is a major driver of change (Potter and Lobley, 1996). We propose to consider the family-farm system, seen as the interdependence of a farm business and its associated household(s) (Gray, 1998). Extending on earlier literature, we developed an analytical framework that allows us to link evolutions in the livestock farming system as production project- size-scale with evolutions in its operational frame, i.e. the family-farm organization as structure of the work group- on-farm activities system-farmer and spouse pluriactivity. To gain a better grasp of the evolutions at work in family-farm systems, we propose to adopt a diachronic reading and cross-conjugate three approaches: the lev-

ers mobilized, the way these levers articulate within family-farm trajectories (between two dates), and the processes of change underpinning these trajectories.

Material: study zone and data sources

The study zone covers the central Vercors plateau, located in the Vercors Regional Natural Park. Situated in a humid-climate zone at around 1000 metres high, the plateau is characterized by grassland systems and predominantly dairy farming. It is exposed to urban and tourism development (demographic evolution and pressure for land), with the Grenoble urban cluster nearby. It also falls within the boundaries of the geographic indication (*Appellation d'Origine Protégée - AOP*) for Bleu du Vercors-Sassenage, a blue cheese. The Vercors makes a salient choice for study, as its agriculture recently took the path to a regional demarcation through the *AOP*, yet has failed to secure the same success as other emblematic models in France (as the aforementioned Beaufort), since milk price paid to producers is not higher than standard milk price. The move to dismantle milk quotas, when the blue cheese market is already fiercely competitive at national level, questions the future of dairy production in the region.

Our study pulls together different sources of data. A first dataset comes from national census of agriculture (CoA) - 1988, 2000 and 2010²⁹⁵. These data were reworked in order to build synthetic variables connecting to our analytical framework. 71 farms were censused with dairy cattle in 2010 on the studied area. The study also draws on qualitative data from comprehensive interviews carried out on a sample of 33 dairy farms selected to cover a diverse panel of situations (work groups, activities systems, production projects). The interviews were led with the aim of tracing life stories in order to identify family-farm pathways (evolution of the family's on-farm and non-farm activities, production systems, retail outlets, labour arrangements).

Method

The method employs a three-phase process where each phase of investigation provides progressively finer-grained detail:

1) the levers mobilized. They were captured through an analysis of global trends and patterns of change in study-zone farms based on CoA data. This effort enables us to pinpoint which of the recruitable levers were effectively mobilized. We have then held: i) for the family-farm organization: the structure of the work group [WG]; the on-farm activities system [AS] (only-farming or farming-plus-other-on-farm-activities); pluriactivity [P] of farmers and non-farm activities of spouses; ii) for the livestock farming system: production project [PP] (specialized dairy or diversified), and organic farming [OF]; size-scale [S] in LUs²⁹⁶. And we detailed the evolutions between 2000 and 2010 followed by the family-farm systems for each of these levers. We took the opportunity to use the 2000 and 2010 CoA to track the dairy farms date-to-date via the French equivalent of companies' house registration number. We were able to pair up 2000 and 2010 figures on 68 of the 71 farms censused with dairy cattle.

2) the way these levers' evolutions articulate within family-farm trajectories (n=68). Aiming at characterizing development trajectories, rather than use conventional multivariate methods of statistical analysis that extract type-classes according to the explanatory power of the variables in relation to whole-population variance, we preferred to develop a "hand-built" typology (Jollivet, 1965) by rank-ordering the information and selecting the most relevant levers mobilized in the farm systems, based on our inside knowledge of the 33 farms surveyed.

²⁹⁵ The French national committee on confidential statistics granted us authorized access to individual farm data. This privileged access enabled us to build a picture of the study zone, integrating every single farm counting at least one dairy cow in 2010.

²⁹⁶ Livestock units

3) the processes of change underpinning these trajectories, in order to consolidate the trajectories by better grasping the factors at play, based on the knowledge captured from the 33 interviewed farms.

Results

Levers of change mobilized in dairy family-farm systems in the Vercors

In this part, we present both the general trends of evolutions between 1988 and 2010 at territorial scale and the evolution of the considered levers at farming-system scale from the CoA group (n=68) and the sample (n=33), firstly for the family-farm organization and then for the livestock farming system.

Analysis of the CoA data finds the same sharp drop in number of farms as seen all across France, with close to one in two farms disappearing from the study zone between 1988 and 2010. The figures show that farms running dairy cows (DC) proved less resilient than farms running other activities, as 63% disappeared (exit or change of orientation) over the same period. The net result is that dairy systems are losing ground (60% of farms counting DC in 1988 *versus* 41% in 2010).

Changes in the family-farm organizations

Work group patterns are also changing, with an increase in number of labour units per farm, which remain predominantly family-based (93% in 2010). Looking closer, there has been a move towards family associations²⁹⁷ which jumped from 3% to 11% between 1988 and 2010, and signs for non-family associations²⁹⁸ (5% in 2010). Activities systems on dairy farms evolved between 1988 and 2010, with almost one in four farms running an on-farm processing activity, and 47% having an off-farm source of income in 2010.

Focusing on our two groups (n=68 and n=33, see appendix 1), the work group trajectories that emerged include continuation patterns, structural change towards family and non-family associations, but also trajectories where lone farmers brought their spouses into the on-farm team and, conversely, trajectories where the WG was slimmed down (due to family problems or because the spouse takes an off-farm job). The new family associations that evolved from lone farmers or couple are cases where a family member (children, brothers, etc.) joined the business. The new non-family associations are cases where the original lone farmer, with no successor to take over the business, elected to bring in a partner to share the burden of workload, duties and responsibilities.

To ensure steadier, and more secure income, farm managers juggle between levers on different fronts (activities systems and pluriactivity) to not put all their eggs in one basket, or search for better value out of their milk production by cheesemaking and direct-to-consumer sales. These trends are sharper in the 33-farm interviewed, as it covered a longer period (between the date the farm owner started up in business and 2012). Some trends date back to before 2000, chiefly with the switch to on-farm cheesemaking driven by the move to *AOP* status (in 1998) There are also trajectories reflecting an activity squeeze, recentering on the farm activity.

Changes in the livestock farming systems

Farms are from an average 27 ha in 1988 to 48 ha in 2010. Dairy herd have doubled over the same period, jumping from 15 DC/farm in 1988 to 32 in 2010, and the share of farms counting over 25 DC rose from 50% in 2000 to 65% in 2010. In dairying, production projects remain largely specialized, although diversification of production units is making inroads (mixed-species

²⁹⁷ Farming association between members of the same family, whether parents–children, brother–sisters, or married in.

²⁹⁸ At least one member of the farming association does not share a family filiation with the others.

livestock farming systems moving from 8% in 1988 to 14% in 2010). Organic farming (OF) is also gaining ground, with almost one in four farms registered in 2010.

Focusing on the CoA group (n=68, see appendix 2), it shows that 44% of farms continued at the same size-scale. A further 38% managed to increase in size, either by building a new farm housing that unlocked this constraint, by securing access to new land, or by switching to OF (where herd numbers can be increased to offset the lower productivity of DC). The remaining 18% registered a drop in size, reflecting cases where dairy activity was scaled back in an attempt to not get bumped up to the full-tax-liable tax bracket or pending retirement with no successor lined up to take over the business. Two out of three farms were farms that already counted less than 45 LUs. Production project trajectories have diversified. Diversifications into plainland field crops occurred or beef prompted by quota freezes or milk price crisis. Others have recentered on a milk-specialized production project, or exited from OF. Indeed, in 2001, despite having initially pressed dairy farmers to go organic, the dairy firms stopped collecting organic milk due to the slowdown in the organic market and the faster expansion of organic milk in a neighbouring region. This prompted some farms to go back to conventional milk given the lack of value-added and the constraints and cost issues.

The levers mobilized vary and forge paths to a broad diversity of trajectories. However, this mono-criterion approach does not give clues as to how the levers find expression and converge into family-farm trajectories, and so the analysis that follows attempts to characterize these paths.

Diversity of family-farm system trajectories and processes of change

Based on the levers studied in the section above, analysis of the 68 CoA cases over the 2000–2010 period reveals 46 different family-farm trajectories and only 10 farms were stable according to these levers (3 are lone farmer and 7 are couple). In an attempt to characterize this diversity of family-farm systems trajectories, we opted to first group the cases into class-types based on stability (no-change) or on changes in what our knowledge of the sample told us were the three most structure-defining variables. Thus, we put in relation the trajectories of change in work group with the trajectories of change in on-farm activities system and production project, where work group includes opening out to non-family members. These types are outlined below and detailed on the basis of population surveyed.

Type 1 (CoA = 38 cases / survey sample = 9 cases): continued activity... These are cases where the farm has continued with its on-farm activities (whether only-farming or with other on-farm activities) and production project, which is either milk-specialized or diversified (and with or without OF). The activities within the system remain much the same. Three subtypes emerge according to work group trajectory.

Type 1a: ... and continued family-based WG (lone farmer, couple or family association) (24 CoA cases / 7 survey cases). In the interview-survey population, this type corresponds to lone farmers or couple that already started out as small-scale structures, who find themselves blocked to expand the farm, and gambled on pluriactivity or cheese production and direct-to-consumer sales to make a living. A typical case is a couple that took on the family farm in 1972 with 12 DC on 20 ha. Hemmed in by their enclosed geographic position, they have stayed small and worked off-farm (in a ski resort during winter, and extra 'odd jobs' for the husband). Today they count 20 DC on 33 ha, and hit their 105,000 L quota. As they are unable to increase output, they try instead to minimize their overheads. As they are not feed self-sufficient, they have stopped using fertilizer and switched to compost from the wastewater treatment plant on top of their own organic manure, but this move runs counter to grow more forage that would at least make them self-sufficient on feed.

Looking at family associations, they continue as only-farming and specialized dairy, banking on complementary revenue or on growing in size.

Type 1b: ... and change in WG trajectory (increase or decrease) by remaining family-based (11 CoA cases / 2 survey cases). This type subdivides further into a type 1b' (7 / 2) where the WG expands but stays family-based (lone farmer to couple or lone farmer and couple to family association) and a type 1b'' (4 / 0) where the WG shrinks (couple to lone farmer).

In the survey sample interviewed, type 1b' corresponds to a family member joining the farm business but without a change in activities. The levers for change mobilized are turned towards size-scale and intensifying production. A typical case is the farm where a son joining the father's business marks the switch from a dairy-specialized farm where strategy is turned towards a couple leaning on self-sufficiency on different levels (grass system, feed system, finances) with little mechanization, a relatively small herd, to a farm looking for ways to increase dairy output through the intensification of tillable land and productivity through feed and diet, with a substantial herd, modern mechanized farm buildings enabling labour efficiencies, and a WG transition to a farm run by two brothers.

Type 1c: ... and non-family WG (3 CoA cases / 0 survey cases). In type 1c farms, the WG has either continued as or evolved to become a non-family association.

Type 2 (19 CoA cases / 24 survey cases²⁹⁹): development in activity... These are cases marked by developments in activity, either where the farm has continued with its on-farm activities system - in which case, contrary to type 1, the production project evolved towards OF and/or diversification - or where the on-farm activities system switched from only-farming to farming plus other on-farm activities while the production project either continued without change or evolves towards OF and/or diversification. Here again, three subtypes emerge according to work group trajectory.

Type 2a: ... and WG continued in a family-based configuration (5 CoA cases / 12 survey cases).

In the interviewed population, it corresponds to farms looking for ways to protect themselves from changes in the dairy sector, especially since they are not necessarily heavyweight structures. They are essentially lone farmers or couples. Some join the dairy cooperative-led initiative to switch to OF as a strategy to squeeze better value out of their milk production and profit from the security of a 5-year-guaranteed price floor. Others bank on diversification of the production project or on-farm activities system, looking to cash in on the zone's residential and tourist dynamics. Others still juggle combinations of these options. Either way, the degree of reliance on off-farm revenue streams either continues or increases at more than half of these farms.

Type 2b: ... and change in WG trajectory (increase or decrease) while remaining family-based (10 CoA cases / 4 survey cases). This type subdivides further into a type 2b' (4 / 4), where the WG expands but stays family-based, and a type 2b'' (6 / 0) where the WG shrinks.

In the surveyed sample, type 2b' corresponds to a family member joining the farm business and bringing change in activities that goes further than size alone. The farm managers thus bank on a switch to OF, diversifying the production project to integrate a meat sub-activity, or on-farm pro-

²⁹⁹ The higher number of cases in the 33-farm sample than in the bigger population of CoA farms supposedly including them comes from the fact that study period (from start-up in business to present) is longer. This 33-farm interview sample also stood out by (i) non-family associations over-represented, (ii) no regression patterns of change, and (iii) OF businesses over-represented.

cessing and direct-to-consumer sale of all or part of their output, which for one in two farms entails ending pluriactivity for workload reasons.

Type 2c: ... and non-family WG (4 CoA cases / 8 survey cases).

In the interviewed population, the cases with a only-farming activity systems and a specialized production project made the switch to OF. The other configurations squeeze better value out of their production via on-farm processing of all or part of their output, with some also going organic. The fact that they need to increase income but with limited perspectives for expansion and without within-family arrangements possibilities means they are under more pressure to find ways to better monetize their farmed produce. The spouses generally work off-farm and farmers stop any pluriactivity when they have one or it sparks tension.

For continued non-family associations, it is the switch from a simplified taxation allowances scheme to a full-tax-liable taxation that forces the activity forward. Cases where a family farm opens up to a non-family associate often reflect a workload problem (overload of work and the decrease of parents help), and require revenues to be increased in order to pay a second wage. An example is provided by a livestock farmer who, in a context where assets and quotas were frozen, but where the new *AOP* scheme was proposing subsidies for cheese-processing unit, saw on-farm cheesemaking as an option and so looked to recruit a cheesemaker as business partner.

Type 3 (11 CoA cases / 0 survey cases): scaleback of the activity... either by continuing with the on-farm activities system but downsizing the production project, by specializing in milk or withdrawing from OF, or by recentering the on-farm activities system on only-farming and continuing or downsizing the production project.

Type 3a: ... and continued family-based WG (7 / 0).

Type 3b: ... and WG changed within a family-based set-up (4 / 0).

Discussion–Conclusion

Added insights brought by the analytical framework and multi-scale approach

Given the challenges family farms have to face to adapt and survive a widening range of site-specific and global pressures of unprecedented speed, magnitude and uncertainty, the study of family-farm transformations and trajectories is fast climbing the research agenda (Darnhofer et al., 2012). The complexity of these evolutions prompts us to stress the utility of thinking in terms of trajectories or process-types instead of types of farmers. In fact, typologies of farms and farmers, which are quite often based on practices, mask both the diversity of circumstances through which farmers come to change (Evans 2009) and the roads travelled to get there. This approach allows us to better understand the interpenetration of individual, family, local, and global histories, as well as the diversity of development paths.

Most papers on development trajectories rely on survey data from relatively large farm samples, and few have privileged in-depth farmer interviews to assess farmer strategies (Cialdella et al., 2009). We attempted to combine these two approaches as they appeared complementary and liable to cross-fertilize. This cross-converging approach makes it possible to take the in-depth interviews on-farm, and re-situate them in a wider scale providing a key to statistical representativeness.

The originality contribution of this research is that it factors in the family-farm organization through both the work group dimension and the pluriactivity of household members, i.e. not just

the farming system but also its family-farm organization which is decisive in shaping the system's trajectories (Bryden 1994). The flip side is that it overlooks the technical management (except for OF), even though we are well aware that these strategies are also differentiating factors shaping trajectories taken, especially through feed self sufficiency tactics or the search for dairy productivity increase. We plan to address this issue as we move forward with our research. The other issue would be to investigate whether the processes at work in our interview sample are replicated in the CoA-farms, thanks to other clues from the CoA dataset and further farm surveys.

Adaptive resources

We found a broad diversity of family-farm trajectories, despite covering a small territory where development perspectives are certainly more limited than elsewhere. Given the context - constraints tied to a mountain area-, local consensus to drive development on dairy output, and the frame of milk quotas - we had expected to find fewer trajectories, and more stable trajectories. This finding means that there was no one prevailing pattern of development to emerge from Vercors plateau dairy farms over the 2000–2010 period.

The development trends observed in the Vercors mirror the general patterns found across France and in relationships between family and farming (Hervieu and Purseigle, 2013), with a 'defamiliarization' of farms and conversely. In the Vercors with its low-profit-yielding *AOP*, there is a tangible pattern of farmers turning towards on-farm processing of all or part of their output, with the cooperative operating a form of regulation; OF; and a reliance on other sources of revenue at household scale. As Ryschawy et al. (2013) stated, it seems that farming systems attempt to protect themselves from contextual changes by maximizing self-sufficiency and diversifying their activities. Our 33-farm sample counted only three farms that made a livelihood exclusively as specialized dairy farms without any added-value on their milk or other revenue streams (13 farms in the 68 CoA dataset). Will that be enough to enable the survival of dairy farms in the region once the quotas scheme is abandoned? Either way, the future for 'specialized dairy farming' in the Vercors region is realistically inconceivable without also factoring into the equation other on-farm activities, and non-farm activities led by households and underlying shifts in farm work groups. Striving for adaptability needs to be balanced against maintaining efficiency and also ensuring acceptable liveability. Indeed maintaining quality-of-life and job satisfaction is a core consideration to ensure renewal of the farming population (Milestad et al., 2012). Ultimately, the association trajectories observed, especially integrating non-family members, are indeed driven by workload problems and the need to free up time for family or wider social life, and to share the burden of responsibility that, for many, has become too heavy for a lone farmer - even if these moves bring a new set of tensions in collectively-run outfits.

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