



ORGANIC FARMING IS IT A SUSTAINABLE AGRICULTURE? DEVELOPMENT ISSUES FOR SUSTAINABLE ORGANIC FARMING IN MIDI-PYRENEES REGION

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Mohamed Gafsi, Solen Le Tron, Christian Mouchet. ORGANIC FARMING IS IT A SUSTAINABLE AGRICULTURE? DEVELOPMENT ISSUES FOR SUSTAINABLE ORGANIC FARMING IN MIDI-PYRENEES REGION. ISDA 2010, Jun 2010, Montpellier, France. 12 p. hal-00521827

HAL Id: hal-00521827

<https://hal.science/hal-00521827>

Submitted on 28 Sep 2010

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Montpellier – France
28 June – 1st July 2010

Innovation and Sustainable Development
in Agriculture and Food

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ORGANIC FARMING IS IT A SUSTAINABLE AGRICULTURE ?

DEVELOPMENT ISSUES FOR SUSTAINABLE ORGANIC FARMING IN MIDI-PYRENEES REGION

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Abstract — By its strong development experienced last fifteen years, organic farming has gain both institutional and professional recognitions. It is well out of its traditional marginal status and production of niche, and to become a serious and promising way of agricultural development in line with the expectations of society. But questions about the sustainability of this mode of production are still raised. The aim of this paper is to analyze the recent dynamics of organic farms, in Midi-Pyrenees region, in order to identify the main patterns of evolution of these farms and to identify priority issues of development of these farms in sustainability perspective. The methodological approach, based on systemic thinking, combines a quantitative method applied to all organic farms in the Midi-Pyrenees region, and another more qualitative and focused on specific topics on a small sample of organic farms. Results show a diversity of organic farms due to the nature of their production system and farm size. Tree trajectories of farms have been identified and analyzed. These trajectories highlight the importance of changes operated bay farmers and the main drivers of change. They depend on the level of intensification of farms before the conversion. Development issues mainly concern the economic and social dimensions of organic farming. Discussion of trajectories of farms gives some insights on the evolution of organic farming last years.

Key words : Organic farming, sustainability, farms trajectories

Résumé — L'agriculture biologique est-elle durable? Enjeux de développement d'une agriculture biologique durable en Midi Pyrénées. Avec un développement important, l'agriculture biologique est sortie de son statut originel marginal et de la production de niche pour devenir une sérieuse et prometteuse alternative à l'agriculture conventionnelle. Mais des questions restent posées quant à la durabilité de cette forme d'agriculture. Le but de cette communication est d'analyser les

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développements récents dans la région Midi-Pyrénées en vue d'identifier les principales trajectoires d'évolution des exploitations biologiques ainsi que les enjeux de leur développement dans une perspective de durabilité. Le cadre méthodologique privilégie une approche systémique et combine à la fois une approche quantitative globale appliquée à l'ensemble des exploitations biologiques de la région, et une autre plus qualitative ciblée sur des thèmes précis dans un échantillon d'exploitations. Les résultats montrent une grande diversité des exploitations biologiques. Les facteurs de dimension et d'orientation technico-économique ont été déterminant dans la différenciation des exploitations. Trois trajectoires-types ont été identifiées et analysées, permettant ainsi de saisir l'importance des changements opérés par les agriculteurs biologiques et les facteurs motivant ces changements. Les enjeux de développement concernent principalement les aspects économiques et sociaux de l'agriculture biologique. La discussion des résultats apporte des enseignements concernant le débat récent sur les modèles de développement de l'agriculture biologique.

Mots clés : Agriculture biologique, durabilité, trajectoires

1. INTRODUCTION

For fifteen years, organic farming has experienced an important development in France. Between 1995 and 2008, organic farms' number and the area under organic farming were multiplied by four. In the meantime, food processing and marketing companies using an organic label had grown from 700 to 7 398 (Agence Bio, 2009). The gross market of organic products has the same dynamics, the average annual growth is more than 10% since 1999, whence the global food market was growing by 3% yearly.

Organic farming has known this tremendous development because firstly it encounters strong social expectations in a context of challenging the productivist model of agriculture and debate on new directions towards a sustainable agriculture. Indeed, the social expectations regarding environmental protection, product quality, food safety and revitalization of rural areas, find responses in the method of organic farming which are recognized its virtues in terms of preserving environmental quality, quality of agricultural products and its ethical values. Organic farming is now seen, as evidenced by the decisions of the Grenelle environment as a sustainable alternative to conventional agriculture. Secondly, the AB was supported by public policies that have succeeded in supporting and accompanying this development. The most striking of these policies include the TFC (Territorial Framing Contracts) between 1999 and 2003 and the "Plan Barnier" following the Grenelle Environment 2007. This plan, entitled "Organic Agriculture: Towards 2012" aims to triple the surface in organic farming, to 6% of the UAA in 2012, setting up aid to conversion and training of farmers. In the Midi-Pyrenees region, with approximately 10% of all farms in organic farming, the region ranks first in France. The development of organic farming enjoys strong support from the Regional Council. The PARC Bio (Concerted Action Plan Regional) for the period 1999-2006 planned to keep the region in a leadership position and increase the number of producers (Fargier, 2005).

With this development, organic farming is well out of its traditional marginal status and production of niche to become a serious and promising way of agricultural development in line with the expectations of society. Although organic farming has gain today both institutional and professional recognition; it is sometimes even presented as a model for conventional agriculture. But questions about the sustainability of this mode of production are still raised. Beyond the issues of environmental protection and product quality, which seem to be widely recognized, the achievement of social and economic objectives such as working conditions, participation in the dynamics of an area, farm income, skills development, ... constitutes the major points that deserve consideration. This is especially important, particularly in recent developments in terms of economic situation (grain market, or import of organic products), and public policy (between 2003 and 2007, following the stop of TFC), which have revealed the difficulties for organic producers. In effect, the stop of TFC in 2003 has reduced the number of conversions to reach a stagnation or a decrease in organic area for four years. Yet there is a strong demand for organic products. Organic farmers demonstrate several technical difficulties, economic, organizational, etc. All this raises the question of the conditions of sustainability of organic farming.

The aim of this paper is to analyze the recent dynamics of organic farms in order to identify the main patterns of evolution of these farms and to identify priority issues of development of these farms in sustainability perspective. The Midi-Pyrenees region is chosen as study area for this work. The study of patterns of evolution and development issues requires a detailed analysis of the diversity of organic farms in Midi-Pyrenees. This work requires a methodological approach based on systemic thinking which combines a quantitative and

global method applied to all organic farms in the Midi-Pyrenees region, and another more qualitative and focused on specific topics on a small sample of organic farms.

This paper is structured as follows: the analytical framework and methodological approach are presented in Section 2. The analytical framework addresses terms of debates on models of development of organic farming in recent years. Reference to theories of change and the path of farm's trajectory will be developed. Section 3 presents the results of research: in a first step, an inventory of organic farms in Midi-Pyrenees; second time, the trajectories-types of farms' evolution, and finally the priority issues of development. Section 4 discusses the results and highlights the lessons learned from this research.

2. ANALYTICAL FRAMEWORK AND METHODOLOGY

2.1. Organic farming and its development models: what sustainability?

In order to discuss the sustainability of organic agriculture in light of the recent dynamics, it is necessary to define, firstly, what constitutes organic farming and sustainable agriculture. In a second step, we define a framework for analyzing the dynamics of development with reference to theories of change.

Organic farming is defined as a form of agriculture, which do not use chemical inputs in its production process, and enhancing the biological and ecological processes to promote soil fertility and good health of animals and plants. It involves holistic view and it relies on ecological processes, biodiversity and cycles adapted to local conditions rather than the use of external inputs with adverse effects. It aims also to promote fair relationships and a good quality of life for all involved. According to IFOAM¹, the basic principles of organic farming are:

- The principle of the health: organic farming should sustain and enhance the health of the soil, plant, animal and human as one and indivisible.
- The principle of ecology: organic farming should be based on living ecological systems and cycles, work with them, emulate them, and sustain them.
- The principle of fairness: organic farming should build on relationships the ensure fairness at all levels and to all parties - farmers, workers, processors, distributors, traders and consumers.
- The principle of care: organic farming should be managed in a precautionary and responsible manner to protect the health and well being of current and future generations and the environment.

Organic farming is it sustainable agriculture? With its comprehensive approach and its principles, organic farming has a certain proximity to sustainable agriculture, particularly as regards the relationship with ecosystems. But the concept of sustainability is broader and more inclusive. It is established now that sustainability is a complex and comprehensive concept that includes three dimensions simultaneously: economic, ecological and social. A sustainable farming system must at the same time be economically viable, ecologically sound, and socially responsible (Ikerd, 1997). While the environmental dimension is

¹ http://www.ifoam.org/about_ifoam/principles/index.html (accessed January 2010)

important, but in a context of sustainability, it is inseparable from the other two economic and social functions. So sustainable agriculture is defined as the ability of farming systems to maintain its productivity and usefulness to society in the long term. This means that sustainable agriculture includes both the long-term viability of farming system itself, and the contribution of this farming system to the sustainability of the territory and the communities to which it belongs (Hansen and Jones, 1996; Godard and Hubert, 2002; Gafsi 2006). The second aspect in this definition is crucial for the meaning of sustainable agriculture, and it must be considered in our assessment framework of sustainability of organic farming systems. It places farmers squarely within the local social fabric; offering local services; maintaining and creating jobs in the rural space; contributing to rural planning; developing environmental services; dealing with negative external effects on the environment; etc.

Given the closeness she has with sustainability, organic farming has experienced these past fifteen years, as noted above, an unprecedented development that has contributed to a debate on the interpretation of models followed by organic farming last years. If this evolution constitutes a positive sign of recognition of the value of organic farming, the traditional actor's of organic farming tend to fear the alteration of the system and its values. These fears were the object of a lot of research, which ended in what is called in the Anglo-Saxon literature as the thesis of the "conventionalisation" (Allan and Kovach, 2000; Guthman, 2004; Lockie and Halpin, 2005). According to this thesis, organic farming loses its identity and its fundamental values and becomes a moderate version of the conventional agriculture, by following the same plans of development and modernization. The "conventionalisation" could be understood by a search for economy of scale, and thus the capitalization and the increase in the sizes of farms, the specialization and the intensification in the production systems (Kratochvil and Leitner, 2005). Seen from this angle, trends towards conventionalisation of organic farming would lead to a bifurcation of the organic sector into two organic farming types: conventional organic farming versus artisanal organic farming (Darnhofer et al., 2010). The first type includes large farms that specialise in mass-producing. The second includes small farms that continue to implement diversification strategies, using artisanal methods. In this schema, the artisanal organic farms symbolize the resistance to conventionalisation trend of organic farming. The fear of "conventionalisation" of organic farming is certainly legitimate, but the attitude of resistance to this model of development should not obscure the need for changing the organic farming to meet the social expectations. Organic farming must inevitably evolve without turning into a conventionalisation scheme. In this connection the theories of change can provide interesting insights. The school systems of Palo Alto (Watzlawick et al., 1975) considers that any open system is in a perpetual state of adaptation / change. Two types of change can be distinguished: a change of first order and change second order. The first allows the system to adapt to the changing environment without losing its identity and its principles; the second represents a radical transformation that may alter the structure of the system. An analysis of change can be globally, that of organic farming as an agricultural system, or at farm's scale.

At the global level, several authors consider that the recent developments of organic farming in recent years is an adaptation to the context evolution without moving away of the principles and values founding organic farming (Darnhofer, 2006). Empirical studies show that the recent converts to organic farming don't adhere necessarily less to the values of organic farming than the pioneers (Best, 2006; Padel, 2008), although they can be more pragmatic and business oriented farming (Flaten and Link, 2006). All this shows that it is indeed a change of first order. However the second-class change of organic farming is not excluding. So the question is where does adaptation stop and conventionnalisation start? Without falling into the conventionalisation pit, the adaptative capacity of organic farming and its professionalisation allow to consider interesting outlooks for organic farming as sustainable model for agriculture.

At the farm, the change analysis is done through the concept of farm's trajectory (Capillon, 1993, Perrot et al., 1995), inspired by systems theory (Le Moigne, 1990). This concept allows an understanding of the relevant dynamic evolution of a farm, taken as a system. The analysis focuses on changes in the production system, and the agricultural practices of farmers and their objectives. Few studies have addressed this issue of farm's trajectories in the field of organic farming. Lamine and Bellon (2009) analyzed the process of conversion to organic farming. Authors identify an opposition, which structure the debates on organic farming evolution, between an input substitution paradigm and a system redesign. The first one remains in the framework of conventional agriculture; the second relies on natural regulation processes.

2.2. Methodological framework

In this research, we wanted to address the analysis of organic farms of the Midi-Pyrenees without using the comparison method, which is often made between organic and conventional. Our approach fits within a more systemic approach that emphasizes a detailed analysis of farms, which have often a specific development projects and unique evolutionary trajectories.

Methodological framework is based on two methods : a qualitative analysis of farms and the quantitative method allowing for a typology of farms, which integrate the three pillars of sustainability (economical, environmental and social) and some self-characteristics of organic farming, in addition to the criteria traditionally used as the principal technical and economical orientation of farms (OTEX).

Analysis of diversity and the achievement of the typology of farms are based on a questionnaire conducted among 194 organic farms in Midi-Pyrenees. From this questionnaire, variables were constructed to capture the diversity of farms, according to the 3 axes of sustainability adapted to the specificity of organic farming. These variables are presented in the form of five capitals to describe farms: natural, social, environmental, agricultural and commercial capitals. We also included in this typology other variables specific to organic farming as the date and context of conversion. The OTEX classic variables have also been taken into account. The typology was developed from all these variables, using a statistical treatment by MCA followed by a HAC.

After that, in order to identify more qualitative development challenges specific to each type, we conducted a semi-structured interviews with heads of farms (20 interviews in total, 4 per farm types). The themes are again those of sustainability applied to organic farms: economic, social and environmental as well as agricultural and commercial aspects.

The study of trajectories of farms' evolutions over time was conducted with the same heads of farms. We take in this study special attention to the farmer's objectives, their definition in terms of production system and actual practices. This trajectory analysis is focused on three main periods of farms: installation, conversion (when in place, otherwise a few years after installation) and current situation.

Fieldwork has been done in the Midi-Pyrénées region, in southwestern France. A large region with a diversified agriculture: cow and sheep breeding, crops, mixed farming, fruit and vegetable production, wine making etc. Except for small very fertile natural regions, the agriculture of Midi-Pyrenees is not very productive. The environment (soils, climate, slopes...) makes the intensification more difficult here than for other French regions, either for crops or breeding. These characteristics and constraints are also valid for organic farming, which explains the diversity observed on the organic farming in the region.

3. RESULTS:

3.1. Diversity of organic farms in Midi-Pyrenees: strong differentiation in production systems

As expected, the results of the statistical analysis of the questionnaires revealed a wide diversity of organic farms in Midi-Pyrenees. The variables that most influence on the dispersion of the farms are those related to the farm's size and the technico-economical orientation of the farming system such as the UAA, the economic orientation of farms and the number of Unit of Labour (UL). Then there are variables on the history of involvement in the AB (date of conversion, context of conversion). Finally, there are variables for the characterization of the farm's sustainability such as human capital, social capital of the farmer, income, part of aid in income and natural capital. Human capital is the most discriminating of these variables, which is partly explained by the link between this capital and the structure of farming system.

The analysis of the diversity of organic farms has led to the creation of a typology to highlight 5 main types of organic farms in the Midi-Pyrenees Region (table 1). The different types of farms are emerging primarily in terms of the nature of their production system and farm size. But for each type corresponds a precise characterization in terms of capital.

*Table 1: Significant Variables characterizing the different types from the statistical analysis
(p value < 0,05)*

| Type | A – Wine / arboriculture growers | B – cattle and goat farming | C – Crop farms | D – beef farms and mixed crop- livestock farming | E – Market gardening |
|---------------------------|--|--------------------------------|----------------|---|-------------------------|
| Farms number | 46 | 55 | 27 | 40 | 25 |
| Size variables: | | | | | |
| - UAA (ha) | 3-20 | >100 | 50-100 | 50-100 | 0-3 |
| - UL | >1 | >2 | <1 - 1 | 1 | 1 |
| Sustainability variables: | | | | | |
| - Human capital | | Important | Weak – average | Weak – average | |
| - Natural capital | | | Weak | Average | |
| - Social capital | Weak | Important | Weak | Average | Important |
| - Agricultural income | | Weak | Average | Important | |
| Marketing mod | Direct marketing | | Cooperative | | Amap |

Type A includes winegrowers and arboriculture growers and it is characterized by small areas, but more often uses a more than one UL. Producers are less integrated into the networks, although they engaged in the direct marketing. Other capital does not significantly characterize this group. Type B is composed of farms cattle and goat farming, converted to organic for a very long. The human and social capitals are important for this type. The income is rather low. Type C is composed of crop farms the size is rather average. These farmers, with recent conversion to organics, are not included in social networks, their income is rather average, even lower for small farms characterised by multi-activity. Type D includes beef farms and mixed crop-livestock farming. These farms are converted during the 2000s

(procedure TFC). Farmers have average social and natural capitals. They are instead inserted into conventional networks and less in biological networks. Their income is rather important, but they are very dependent on aid. Type E is for gardeners, were generally young people who have settled in farming recently (after 2000) directly into organic farming. They add value to sell their production with the AMAP marketing mode, and they have significant social capital which allowed them to have an important social integration, especially in biological networks.

3.2. Trajectory-types of the evolution of organic farms

Finally, trajectory models of farms have been identified and analyzed. These trajectories are not specific to the type and they instead depend on other factors such as the origin of organic farmers (distinction between those coming from farming families and others) and the origin of farms (take over and old farm or creation of a new system). Then they depend on the level of intensification of farms before the conversion.

There are three main farms' trajectories for organic farmers: the installation directly in organics, conversion of traditional low-intensity farms in the organics, and the conversion of intensive farming system to the organics. In the first case, everything is set and it allows the farmer to orient his farming system to such a feature. In the second and third cases farmers must adapt an existing farming systems to different specificities of the organics. Among the farms studied, it is the direct setup trajectory that was the most common. It covers all the gardeners and orchardists (9 met) and a beef cattle farm. Other farmers are divided roughly equally between two other trajectories: 6 Conversions from traditional extensive farms (including 2 in bovine meat, 2 Crop and 2 in sheep and goats) and 5 for the conversion from intensive farms.

The trajectory T1 of farmers who have settled in farming without farming origin and directly they had chosen organic farming. In general, farmers who set up their system choose to lead their production from beginning to end by making their own marketing. They are often farms with very different workshops (production, processing and marketing). This is very common in vegetable crops. Farmers are generally not from the farming origin; their career-project is often confused with the life-project and it is marked by ethical and ecological values. This is reflected in the choice of marketing method (practice of direct marketing) or engagement and activism in social networks of the organics, or also in technical decisions regarding agronomic practices (denial of greenhouses or practice of animal traction instead of mechanization). Often these farms are facing economic problems after a few years. This pushes them to change their production activities for dropping other less profitable activities or the direct sales market very time consuming a lot of work. Some farmers end up adopting farming practices that seemed for them intensive or against the spirit of organics as the installation of greenhouses or the adoption of mechanization. These changes lead most often to a more complex farming system.

The trajectory T2 is adopted by farmers who have less intensive farms. Farmers can convert their farming system on environmental grounds. Generally, the conversion to organics held in the resumption of farms. The production systems are low-intensive and therefore the conversion process to organics is easier. The economic health is correct; these farmers have no major problem to solve. A few years after the conversion, the farmers keep the same goals by adding it to better use organic products and greater attention to the environmental aspect. The changes in the production system are either minors in agricultural practices or social or economic sides. What may change is how to get this income level, with the reduction of charges but also with lower production.

The trajectory T3 concerns intensive farms. The motivation for conversion may be environmental or also for economic reasons. The conversion causes for these farms a complete change of system, which can last much longer than the official duration of the conversion process of 3 years. These farmers are then often engaged in agronomic practices more innovative and more environmentally friendly than traditional farmers (i.e. trajectory T2). At the beginning of the conversion process, these farmers do organic farming with the same line of reasoning that their old conventional method: research productivity, high input use, ... Then they realize that they must change the way of reasoning, which leads to significant changes in farming systems and agricultural practices towards more organic agronomy and more consideration paid to the environmental aspects.

The farms' trajectories depend on several factors. First, the origin of farm, resume or creating a production system, and secondly, the origin of the farmers, social and cultural origins (from the family farm with luggage and traditions from the family, not from the farming community, with little luggage and with a desire for autonomy and ecological values) and finally the level of intensification of the farming system before the conversion.

3.3. Development issues for more sustainability

Development issues specific to the types have been identified by the study of qualitative interviews. These issues mainly concern the economic and social dimension of organic farming. More transversal issues are also addressed, including issues of recent evolution of organic farming, particularly the trend toward the conventionalisation. The issues of developing farms differ between farm types and level of farm sustainability.

Economically, it is the gardeners and growers who have the most problems, particularly because of their lack of technical master and ideological obstacles. The type of sheep / goat (meat especially) also has economic problems, due to lack of promotion of their products.

At the environmental level, the type of crops farm that would have the most improvement to make, other types are generally well addressing this issue. For agronomic master, this is also the type who has more problems, because the organic farming practices change radically from the conventional agriculture practices. But market gardeners and arboriculture growers also have problems of technical mastery, at least at the beginning of conversion process to organic farming.

At the social level all types (to a lesser extent perhaps cattle meat) are complaining about excessive workload. Isolation of organic farmers may be sources of problems for certain types as those of ancient organic (farmers and sheep / goat) who suffer from isolation. Crop farms are affected differently by the isolation that prevents sometimes be well served by cooperatives.

Finally, problems of access to land is particularly evident in the types of market gardening and fruit growers, who settled mostly outside the family-farm. It also may be a consequence of the problem of access to land: this pushes candidates to the installation to choose an establishment on a relatively small area, which then becomes available.

By contrast, all types are affected in much the same way by the current issues of development of organic farming, although not all are the same stage. Firstly, at the farm level there is the question of their adaptation to the specificities of the organic or maintaining them in a conventional pattern of specialization. Then comes the challenge of building agro-food chain, which can be constructed closely to the farmers location like as what market gardening and arboriculture growers of the Department of Tarn et Garonne try to do.

4. DISCUSSION:

The results of statistical analysis show that the structural variables of production systems play a strong role in the differentiation of organic farms. The main finding of our study is that adding variables related to sustainability, in addition to conventional Otex, did not materially affect the classification of farms. On the other hand, each of the types of farms, primarily differentiated by its system, has its own characteristics in terms of sustainability.

The qualitative analysis of the trajectories of farms highlights up against variables by origin and history of the farmer. The two results are not incompatible and could explain the existence of types more consistent than others such as gardeners and growers / winemakers. Indeed, the installation of a large proportion of members of types of gardeners and arboriculture growers (A & E) is grouped in the same period and has a relatively similar profile: establishment outside of the family-farm and a project with direct marketing and little farming experience. These results are reinforced by another study carried out by Bonnaud and Leseigneur (2000) on the trajectories of converting farms in Bourgogne region.

Our analysis of the trajectories of evolution of organic farms allows us to discuss the dynamics of change at two levels: the nature of change, and the important factors of change.

With regard to the nature of change, there are two types of changes: minor changes or first-order, and important changes or second-order. The latter are to redefine the farming system. The analysis of the trajectories of exploitation allows to observe these two types of changes. First-order change was observed in the traditional low intensity farms. The conversion to organic farming simply reinforces practices that farmers had adopted prior to the conversion period, as they had already practices similar to those of organics. Second-order change was observed in the other two types of trajectories: the trajectory of farmers settled in organic farming outside the family-farm, and the trajectory of intensive farms. Near this classification change, Lamine and Bellon (2009) distinguish two main paradigms for converting operating the AB: a paradigm of inputs substitution, where there are little changes, and a paradigm for redesigning the system, where there are major changes.

It should be noted nonetheless that this redesign of the system observed in the trajectories of farms, has not made deliberately and after a conscious decision of the farmer. In most cases farmers are converting from intensive farms explain their motivations for conversion are principally economic. But they say it has evolved over time: they often enjoy more they feel their job more rewarding since their passage in organic and they also like the "return" of nature in their farming systems. The conversion makes them so gradually become aware that they preserve their natural assets thereafter more. In terms of sustainability, these farms move toward a better state of sustainability.

As for the drivers of change, the factors most cited are the initial motivations of farmers, and also the characteristics of the farming system in terms of intensification or extensification. Our analysis shows the importance of these two factors, especially the second which was a key differentiation of the trajectories of farms. But the approach of trajectory analysis allowed the relative role of these two factors.

Studies on the conversion to organic farming often distinguish two types of motivations for conversion: opportunistic conversions and conversions more activists (Darnhofer et al. 2005; Lamine et al., 2009). Our data showed the presence of two cases of conversion. From a traditional or intensive farms, there are both "opportunistic" conversion and "militant" Conversion. In the other hand, given our results, it seems not be relevant to draw a distinction between farms according to the initial motivations of the farmer for their conversion in organic farming. Indeed, the differentiation of farms is more compared to their

past than on the initial motivations of farmers. Modes of conversion and changes caused by this conversion are indeed nothing similar between farmers who convert to organic farming by conviction from an intensive farming system, and those who convert to organic farming by conviction also but from an extensive farming system. The motivation of the farmer to the conversion, which is often the object of investigation (Lamine and Bellon, 2009), is ultimately less interesting than the original farming system to understand changes related to farm trajectory.

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