The effects of transition towards short supply chains on liveability of farming systems: initial findings and further research needs.

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Abstract: *Due to the confidence crisis in the conventional agri-food system, an intense dynamic can be observed in the development of short supply chains (SSC), as we show in two different regions of France. The political support of these SSC emphasizes their role in better valorisation of farmers' production and social recognition of their work. It also helps meet the great expectations of consumers. Nevertheless, as agronomists, we question the consequences of this dynamic on the technical management of the farms in SSC: first results show SSC farms practice general trends such as diversification of crops, of specific forms of SSC at the farm level and of activities specifically related to sales management. Hypotheses are made about two aspects of liveability for farmers: increasing workload and higher complexity of decision-making. A set of hypotheses is proposed as well as a framework for further research.*

Keywords*: short supply chains, technical management, sales management, workload, liveability.*

Introduction

In many industrialized countries, such as in Europe, the United States or Japan (Parker, 2005), at the end of the last century, many consumers, particularly urban, expressed a lack of confidence in "the globalized agri-food system" (Morgan et al, 2006) chiefly for sanitary reasons (Amimeya, 2006). This situation led to an increase in "Engaged Consumption" (Dubuisson-Quellier, 2008), an approach in which consumers give more importance to the methods and the impacts of the agricultural and agro-industrial production in the area of food purchases. According to recent surveys, in France the rate of self-declared "engaged consumers" is increasing rapidly (44% of consumers in 2006 compared to 38% in 2002). The "turning towards quality" (Goodman, 2003; Allaire, 2002) without endangering the quantitative preponderance of the dominant system of food supplies, is resulting in a growing interest for local products (Renting et al., 2003; Sonnino and Marsden, 2006, Smith and Mc Kinnon, 2007) almost everywhere. The development of short supply chains (SSC) better meets these consumers' desire to develop trustful relationships with producers (Prigent-Simonin and Herault, 2005) and is expected to foster sustainable agricultural development (Battershill and Gilg, 1998; Ilbery and Maye, 2005; Watts et al., 2005). Today, SSC are increasing in urban areas (Aubry et al., 2008), giving rise to questions about their role in the maintaining agriculture near cities (Armar-Klemesu, 2001; Moustier and Danso, 2007).

According to Parker (2005), SSC (in this case for food products) will be considered as *"the supply channels characterized by a very few or no intermediaries between the producer and the consumer and / or a small geographical distance between both."* Ideally an SSC satisfies conditions, geographical proximity and close relationships between producers and consumers[1]. In France, the SSC in agriculture have been developing rapidly since the mid-90s (Capt, 1994), even if they were always present, at least in urban areas, with the green belts for fresh products (Poulot-Moreau and Rouyres, 2000) and the cultural importance of urban markets. An intense dynamic of SSC is now observed in various French regions (Aubry and Chiffoleau, 2009). Often considered as a way of increasing the economic viability of farms and the social insertion of farmers (Kirwan, 2006;

[1] Some SSC based on Internet marketing do not imply a small geographical distance.

Chiffoleau, 2009), SSC may nevertheless have consequences in terms of on-farm management: as agronomists, we question the possible interactions between the marketing channels, the technical management of the crops and the management of the productive resources on the farm. On the basis of initial empirical results, we will show, in particular, that the global workload and the complexity of technical decision-making at farm level are increased by the transition from long to short supply chains, with possible negative effects on liveability from the farmer's point of view.

After describing the two chosen French regions and the methodology of the first empirical surveys (2. Material and Methods), the main common trends about diversification of crops, of SSC forms and of activities at the farm level will be given (3. Results). We will then introduce hypotheses about the links of SSC with two selected criteria of liveability and the proposal of a further research framework (4. Hypothesis for further research). Incomplete because of the disciplinary main focus on agronomy, this proposal seems nevertheless useful for contributing to global information about liveability and short supply chains (5. Discussion and conclusion).

Material and methods

Choice of the regions

Two regions of differing social and economical aspects were chosen, the Ile de France (near Paris) and the Languedoc-Roussillon (near Perpignan, in the southwest of France). Their agricultural history and their present proportion of SSC are very different.

In the Ile de France Region (11 million inhabitants, 53% of the land under agricultural use), 70% of the farms and 94% of the agricultural land are mainly used for arable crops (cereals, rapeseed, sugar beet) with production destined to the global market. Still, one fourth of the 5300 farms of the Region are involved in at least one form of SSC, representing twice the national rate (IAU, 2006). Direct selling is considered as the *"main pillar of the commercialization in the Region"* (AGRESTE, 2005). Two types of farms are involved in SSC in the Ile de France Region: specialised horticultural farms (or orchards) (46% of the SSC farms in 2005, mean area of 12 ha, 2.2 full time workers and a varying number of temporary employees) and the "mixed" farms, meaning arable crop farms with additional specialised production on a small area. Regional statistics show that the latter represented 36% of the SSC farms in 2005 and corresponded to relatively small arable farms (mean area 76 ha, middle-sized arable farms for the region) but with the highest employment rate (4.4 full time employees vs. 1.5 for the "pure" arable farms). The regional trend is towards a decrease in the number of specialised farms and an increase in the number of mixed farms.

The situation in Languedoc-Roussillon is different, where about 600 vegetable farms render the region near Perpignan a major vegetable production area at the national level, structured for decades around long supply chains and highly specialised farms. With growing international competition, most of the small farms are experiencing serious difficulties and are moving increasingly towards short supply chains. Marketing stands (on the farm or roadside, seasonal or throughout the year) and open-air markets are the main forms, due to an urban pole of limited size (Perpignan with 120,000 inhabitants accounts for 60% of the population of the department) but major summer tourist frequentation (about 4 million people spread along 60% of the coast).

The on-farm surveys

These two regions were studied during a primary phase by choosing zones and production systems especially concerned by SSC. In the Ile de France, the Versailles Plain (30 km west of Paris) has a rate of SSC farms higher than the regional level: 26 of the 64 farms of the plain (44%) are involved in at least one form of SSC. Near Perpignan, 31 producers selling directly in the vegetable production basin were selected.

These first survey phases aimed at exploring the diversity of the situations and preparing the next phases. If all the farms in SSC were surveyed in the Versailles Plain, the choice of producers near

Perpignan was made on the basis of the diversity of marketing modes made possible by previous expert knowledge (local extension services). On each farm, the surveys were based on three aspects: (i) a *global characterization* of the whole production system (acreage, productions, seasonality, work forces, equipment, marketing modes), (ii) a *census of the crop sequences and their location* in the farm fields, as well as a description *technical management of the main crops* (chiefly on the Perpignan site), (iii) an *open discussion* with the farmer concerning what for him are the main interests and disadvantages of each commercial chain.

Moreover, in the Ile de France region, a specific survey was made on farms involved in different forms of vegetable box schemes (Blanquart et al., 2009): they face a supplementary workload related to preparation and delivery time. This point combined with the diversity of forms for boxing schemes led us to take a specific look at workload and work organisation in these systems. A preliminary sample of eight farms was constituted: boxes delivered directly to consumer groups like AMAP (French version of the US Community Supported Agriculture or the Japanese Teikei), delivered at railway stations, to enterprises, at relay points for intermediate traders, etc. Four intermediate traders were also surveyed. The interviews were designed to gather information on all aspects of transport and logistics, with a descriptive framework of organisation, transportation distances and an approximation of the weekly working time according to the farmer's opinion.

Results

These first rapid surveys in both regions made it possible to underline three main points related to the relationships between commercialisation modes and technical management on the farms.

The diversification of crop productions at the farm level

In numerous cases, the transition to SSC means for the farmer a greater diversification of his/her production to meet the consumers' desires. Figure 1 shows that in market gardening farms in Languedoc Roussillon, more than 20 different species (and often various varieties per specie) are cultivated (Bressoud, 2006; Bressoud and Pares, 2010).

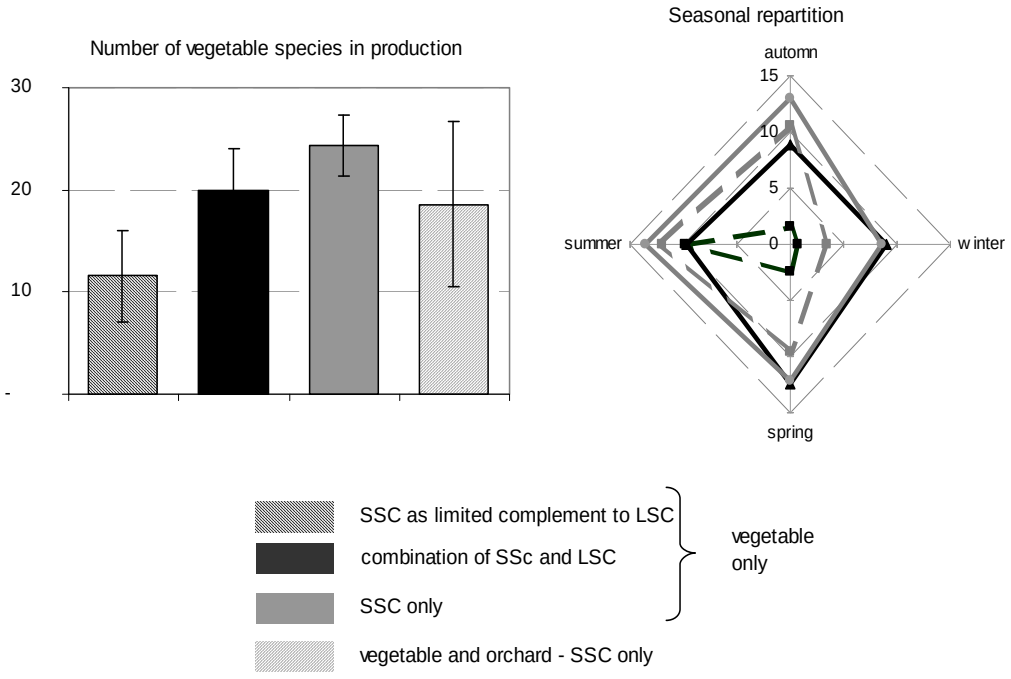


Figure 1. Relations between crop diversity, forms of commercialisation and seasons (Bressoud, 2006).

The distribution of this diversity is not equal throughout the year and some seasons are marked by a higher number of different species. According to the seasonal strategies of marketing, the level of diversification grows with the importance of SSC and/ or the compatibility with others crops.

The same phenomenon has been found for organic market-gardeners (Navarrete, 2009) where the increase of crop diversification with the part of SSC on the farm makes it possible to better manage pest control on lettuce through the extension of cropping sequences and the subsequent extension of mean return time of lettuce on the same field.

In the Ile de France Region, the first surveys also showed this crop diversification trend when one makes the transition from long to short supply chains (Table 1): mixed SSC farms are increasing, which implies the transition from arable crops to mixed arable and vegetable crops and thus a huge diversification of crops.

Table 1. From long to short supply chains in a mixed farm in the Ile de France.

The farm: 14 ha, 5 ha vegetables and 9 ha cereals in rotation; 3 permanent workers, 9000 m² plastic greenhouses (without heating).

Date	1994	2006	remarks
Number of vegetable crops	3 (L, P, C) 4 varieties	27 (+ 16 varieties for L, 5 for C)	old varieties from 2006
Mode of Commercialisation For vegetable crops	Wholesaler Rungis market	* On-farm direct selling * Urban markets * Restaurants * Box schemes	introduced 1995 introduced 1997 introduced 2006 introduced 2006

The diversification of SSC forms on the farms

The SSC diversification of forms is a general phenomenon. On the Versailles Plain, among the 26 farms surveyed, 8 different forms of SSC were singled out (Table 2). If urban markets are the main form of SSC (60% of the farms at regional level), pick-up yourself, on-farm selling, box schemes, direct relationships with Parisian restaurants and even a beginning of direct relationships between producers and local hypermarkets constitute a high diversification of SSC forms.

Table 2. Diversity of short supply chains in the specialized and mixed farming systems on the Plain of Versailles.

Legend: SSC farms: farms with at least one form of SSC among the 64 farms of the whole Plain. SpV: Specialized farms in Fruit and/or Vegetable production; LD Large Distribution (supermarkets with which the farm is in direct relationship); Prof: direct selling to professionals (bakers, restaurants, canteens).

Number of farms									
26 SSC farms	Urban Markets	Farm selling	Pick-up yourself	Box schemes	AMAP	Internet sales	LD	Prof.	Wholesale market
	11	7	3	3	3	2	2	14	14
16 SpV	10	3	2	3	2	1	-	4	8

In both regions, common trends can be seen at the farm level:

(i) The production concerned by SSC are mainly fruits and vegetables, but also some animal products (eggs, chickens, rabbits and honey) and wine in Languedoc Roussillon but rarely products from arable crops[2]. (ii) On a majority of farms, *various forms of SSC can be seen simultaneously,* (iii) as well as a frequent *association with long marketing channels,* often used to complete, throughout the year or temporarily, the range of products offered to the consumer and/or to sell the products or the

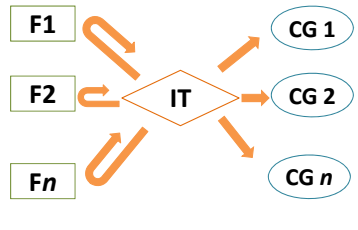
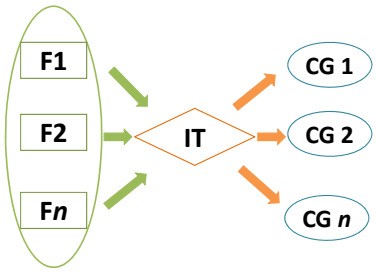
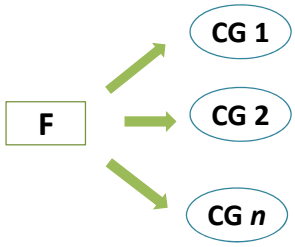
[2] With the exception of some flour or bread short chains in the Ile de France (Pain d'Yvelines®, Pain Bio d'Ile de France®) which represent a very small proportion of the regional wheat production.

quantities that the SSC cannot absorb. (iv) *The recent diversification of SSC forms is general*: most of the SSC forms on the farms today, such as Internet marketing, boxed delivery to enterprises or the AMAP systems did not exist 10 years ago. Some forms are even more recent: in mid-2007 the National Rail Service and the extension services of Ile de France supported the sale of boxes daily in the railway stations frequented by suburban inhabitants working in Paris. In less than one year, 15,000 boxes were sold in 12 railway stations and in 2009, 30 railway stations were involved (number of boxes as yet unknown). Such innovations in SSC forms seem to be particularly frequent, probably due to the relational proximity between consumers and producers.

The diversification of activities at farm level

The transition to SSC also implies for the farmers the addition of a specific commercial activity (or various activities according to the on-farm diversity of SSC forms) to their traditional productive activity. The exploratory study on boxed deliveries systems showed three main models of logistics for farms characterized by indicators of work organisation and induced workload (Figure 2).

There are strong differences for the non-productive workload, with Model 3 being the most heavily loaded but with a high internal diversity. The distances travelled by the farmer to the consumers also vary, with higher distances in Model 3, but also with high internal diversity. With farms often being involved in different vegetable box schemes, global quantification appears to be difficult and a comparison between box schemes would require simultaneously comparison of the workloads and the economical returns for the farms. While under one term, the box scheme in fact covers a variety of functional approaches. The workload associated with the boxing activity can be very variable from one farm to another depending on the organization of delivery, preparation of the boxes (e.g. a person for a halfday), transport to groups of consumers (e.g. from a few kilometres to over a hundred) and distribution to consumers (e.g. from a simple deposit of boxes to several hours discussion with consumers). Some types of boxes seem to be more time consuming than others (AMAP evening in Paris vs. selling point near the farm).

Model 1	Model 2	Model 3
		
Specialized farms of medium size		Diversified and small farms
IT makes direct contracts with a set of farmers (crops, quantities, rhythm of production). He/she collects the vegetables on the farms. He/she constitutes the boxes and delivers them to consumers. The farmer is devoted to the productive activity, all the sale activity is taken in charge by IT.	IT manages the box service with consumers: box preparation, delivery, customer management. Farmers organized in producer groups manage the production (choice of crops, distribution of crops inside the group, group contract with IT). They deliver crops to the site of box preparation for IT. The farmers are devoted to production activities (common planning of crops, production) and only partially to non-productive activities.	All the productive and non-productive tasks are carried out by the farmer. He/she prepares the boxes and delivers them to the consumers (often organised in groups). He/She manages the relationship with the consumer groups. Highly variable workload according to the type of boxes and relationship with consumers (i.e. only deposit or sharing the distribution time among consumers), the accorded delivery hours during the day, the site of delivery (urban, railway station, near, far from the farm) and the number of CG (1 to 10 in our sample).

Legend: F: Farmer; IT: intermediary trader; CG: consumers' groups

Figure 2. Boxed delivery farms: three main models of work organisation in relation to logistics.

These first empirical results make it possible to identify some trends for analyzing the liveability of SSC farms. For example, the global workload seems to be related by farmers to liveability. Indeed, a global indicator of overall "liveability" for farmers is the transmission of the farm from parents to children. In the case of the Versailles Plain, 11 of the 26 SSC farms will have no family successor in the next 5 to 10 years. In 10 cases, they are farms selling mostly on urban markets. The first argument for the refusal of children to follow their parents is not the economic one (the viability of the system seems generally good) but is the excessive workload generated by such systems *("when urban workers living near the farm work at a pace of 35 hours per week"* as one of them said) and the consciousness of the economic and administrative difficulties. Life imposes less administrative tasks to wage-earning workers. Producers-sellers in urban markets consider their total incomes as good but also that the hourly pay for their work is particularly low, even compared with other agricultural sectors. This non-acceptance of the workload is all the more regretted as running a stand in a market in Paris or the suburbs represents a heavy investment and is transmitted from generation to generation as a heritage. However, many of these producers-sellers said they have themselves discouraged their children from continuing with the farm *"so they will not experience our infernal rhythm of life."* Conversely, children of farmers agreeing to continue with the farm in SSC operate a conversion from urban markets to other forms of supply chains, delivering boxes and/or Internet marketing, that they feel less stressful.

As shown in other farming systems (Macombe, 2007), the workload can be a main reason for lack of farm continuity in SSC systems and/or of deep changes in the marketing channels for the successors.

Hypothesis for further research

These primary results (diversification of crop production, diversification of SSC forms and diversification of activities) led to some hypotheses related to the effects of transition to short supply chains on the technical management of the farm, and specifically on two indicators which can be considered as indicators of liveability for farmers: the workload and the complexity of the technical management.

The first hypothesis (H1) is that *the workload is higher at farm level in SSC than in long supply chains* (for a given farm size). This increase is mainly due to:

(i) *The increasing of the workload in the production part of the farm activity*: The diversification of crops and of SSC on the farm implies the transition from arable crops to a combination of arable crops and vegetable crops, and/or the diversification of vegetable crops. These vegetable crops are more work intensive. At least part if this work is manual, especially when some crops need specific operations on the plants themselves (pruning, disbudding, truss pruning, etc.). If it is established that SSC are more work to satisfuy consumers and represent a way to valorise family workers on these farms, it nevertheless could be difficult to find the additional wage-earning workers, full-time or part-time. In the Ile de France these difficulties are severe, because family members have better opportunities in the urban employment basin, the local urban population has no agricultural skills, and the costs of housing discourage eventual migrants to come and work for the low levels of agricultural wages[3]. Thus, a lot of SSC farmers face a high workload on the productive part of their activity.

(ii) *The increasing work time for selling activities*: As shown above, the work time can be seriously increased by selling activities, especially in Model 3 when the farmer assumes all the tasks him/herself. However, the great variability of additional work time needs to be further investigated.

The quantification of the workload in SSC farms is thus a subject which would be interesting to deepen, both as concerns productive and non-productive aspects of the work in SSC.

[3] During recent meetings between farmers and elected officials of that territory, the first farmers' requirement was "help us to pay and house our employees!"

The second hypothesis (H2) is relative to the *higher complexity of decision-making on the technical management of farms in SSC*, compared with long supply chains on at least two types of decisions on the farm: the reasoning of *crop sequences and spatial localisation of crops* and the *management of cultural practices on each crop.* This complexity could thus contribute to the appreciation of liveability by farmers, due to the fact that this complexity can lead to a heavy mental load for the decision-maker (Salmona, 1994).

Once again two main reasons emerge from the initial results to justify this hypothesis:

(i) The *diversification of crops*: the decision–making for spatial crop allocation and temporal crop sequences, more difficult for vegetable crops with short cultural cycles than for arable crops, is even more complex when a lot of manual work is required and when the diversity of crops is high (Mawois, 2009). The farmer can no longer plan simple crop rotation, as is almost always the case in long marketing channels. He/she has to take into account the diverse cultural cycles, the possibility or impossibility of preceding-following couple crops, the fact that a lot of crops have to be present on the farm at certain times in the year for commercial reasons and compare it with his/her global work offer at different times. The existing models for representing such decision-making on vegetable farms, as in the SaladPlan Model (Naverrete and Le Bail, 2007) would thus need a revision to give an analytic framework.

As for cultural practices, it is nearly impossible for a human brain to reason and manage all the cultural practices on all the crops for all the fields of a diversified farm. For example, how can we handle pesticide applications, each one concerning a specific crop for a specific pest, if 30 different crops or more are present on the farm? If one considers this technical point crop by crop, it will require such a great diversity of products that the farm will look like a chemist's shop! Moreover, for some crops seldom cultivated in a region, it could be difficult to find the adequate product, and some of these diversified crops even have no homologated available pesticides.

(ii) The *diversification of SSC at farm level*, each one with possible different requirements at the technical level. These differences may concern crop choice, quantity and rhythm of production at a given moment of the year, the instantaneous diversity and/or the technical way of producing according to, for example, the various qualitative requirements of the product. For example, it could be easier for consumers in AMAP than for market consumers or restaurant directors to accept that a certain week, a certain vegetable will not be present in the box, or that it carries some disease spots. This diversity of requirements can lead to a diversity of technical management on the farm for a given crop.

Two subsequent hypotheses result from H1 and H2:

The *choice of SSC*, their *combination* and their *evolution* on a farm is highly dependant on the *workload* (productive/selling activities) and of the *balance* between complexity of decision-making and possible complementarities at the commercial and technical levels (H3).

The adaptation of technical management to face the complexity is done *through the simplification as far as possible of the processes* aimed at reducing the crop-by-crop reasoning (H4). More precisely, this technical simplification is conceived by farmers through *specific spatial and temporal organisations* of decision-making. On arable farms with a large number of fields per crop, it has been shown that farmers do not conceive and apply technical management field by field but rather group them in lots with homogeneous practices (Aubry et al., 1998). We suppose that *SSC farmers facing diversity will also design allotment rules to group crops* liable to receive the same technical management at the same period and/or to be included in the same groups of crop cycles and succession rules, etc.

A practical consequence of both H3 and H4 is that these SSC farms could have *a low consumption of inputs*. For example, Bressoud (2009) showed technical adaptations often guided primarily by the aim of work-time gains, simplification of the reasoning and valorising the specificities of the relationships with consumers. A frequent change is observed from fertilizing irrigation (common in systems related to mass production) to the use of organic fertilizers gradually released, applied once

at the beginning of the season on all the fields. Chemical plant protection is often limited to an absolute minimum, just in case of serious and proven risk, the "engaged" consumers being more tolerant of small defects in the agricultural products when they buy them in SSC. We therefore consider that the SSC farms could be "closer" to organic management than other systems.

To test the above hypothesis, a new research program is being built simultaneously in both regions at the beginning of 2010. It consists of:

a. *The choice of sample farms*, selected to have various degrees of crop diversity and to be inscribed in various combinations of short or short and long supply chains. Ten to 15 farms in each zone will be selected.
b. *A survey method* based on both in-depth surveys and weekly visits during the main market-vegetable season.

The items surveyed will be (i) the relationships between choice of crops and their diversity, and the types of supply chains chosen by the farmer, (ii) the description of the decision rules for crop localisation and crop succession building and (iii) the description of decision rules for crop technical management.

More precisely, the marketing modes will be characterized by their requirements in terms of crop diversity at each period, rhythm of production, quality of products and work organisation for the selling activity. The influence of workload on SSC choice will be assessed through a history of recent evolutions of SSC combinations on each farm, perspectives and an open question about the reasons for the respective parts of the workload and other reasons will be treated. On the other hand, the scattering of productive and commercial tasks among the collective of farm workers will be quantified, with an initial quantification of working hours. The topic of the complexity of decision-making will be assessed by registering the ways the crop sequences and the main cultural practices (implantation, fertilisation, weed and disease management, water supply) are on one hand considered and planned and on another hand realized for a given season. The hypothesis of numerous fields and/or crops or practices will then be tested.

Discussion and conclusion

The first results obtained on SSC farms from global appraisal led us to put forward the hypothetic relationship between SSC management and liveability on farms. They legitimate our will to deepen the knowledge about these relationships. We firstly resume them through the criteria of workload and of complexity of technical management due to the high level of diversification (crops, forms of SSC, activities) faced by these farms. Our hypothesis as well as the previewed research framework are built on these selected criteria which are relevant to our disciplinary skills of agronomists.

Obviously, by this selection and our disciplinary posture, we do not aspire to take into account all the aspects of liveability on the SSC farms, nor even all the aspects of the selected criteria. For example, the complexity of decision-making in diversified situations of work has been treated in terms of mental load by specialists of social and cognitive sciences (Salmona, 1994) or in terms of flexibility by economists (Mundler and Laurent, 2003). Our hypothesis about simplification by grouping fields, crops and/or practices can be an adaptation to too heavy a mental load, but we will work only on the results on agronomic and management points of view, not on the cognitive processes.

On the other hand, other indicators, implying other research disciplines, can be evoked to explain the choice by farmers of such a combination of short supply chains and/or of such a degrees of diversification. One of the other indicators is linked to the perception of work by farmers and not only the "quantitative" workload and complexity: what is "a load" and what is "an interest in work" obviously varies at the individual level and gives different "values" to the same number of working hours. The complexity of decision-making and the various skills required may also be perceived as a deal and not only as a problem to avoid. Previous research has shown that the preservation of social relationships (for example in the markets, direct relationships with consumers), the "taste for work", the "pleasure" and even political engagement could be evoked to "justify" a hard or complex choice

of SSC (Chiffoleau, 2008; Lamine, 2008; Pasquier 2007). On a more comprehensive project, sociological and/or anthropological sciences should thus participate. For the moment, only the specific case of the setting up of new SSC farms in AMAP systems in the Ile de France is studied (Pasquier, work underway). They are mainly former urban dwellers having made a drastic professional "switch." For them, the search for "fun at work" and the "meaning of work" going against the current of urban relationships with work, seems predominant in their setup. The economic results of these farming systems are often very weak and very much lower than the previous wages of the new farmers.

If the interest of agronomists for SSC is more recent than our social science colleagues' interest (Deverre and Lamine, 2009), the first studies tend to underline some practical problems on farms often evoked by farmers as difficulties which can, in some cases, draw into question their acceptance of at least some forms of SSC. On the other hand, the attempts to constitute groups of farmers to face the new forms of SSC may present some disadvantages for farmers (Bernard et al, 2008). It thus appears that a better knowledge of the diversity of the SSC farmers' problems is a domain that has to be better addressed. An operational aim of such research could be to design more adapted forms of extension services and/or more adapted decision-making tools to sustain farmers in these transitions.

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