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WP4
Local agro-food networks and environmental effects in Brittany

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Summary

This study analyses the development of short food-supply chains and their environmental effects. It has been carried out by the Federation Régionale des Centres d'Initiatives pour Valoriser l'Agriculture et le Milieu rural (FRCIVAM). The FRCIVAM Bretagne links 22 local groups of farmers and citizens with 1200 members. In particular, it has responsibility for development of local agro-food systems and for links with research institutions.

This study has aims which include the following:

1. To identify and explain the main environmental benefits when farmers get involved in a local agri-food network.
2. To identify available methodologies and tools to assess those environmental effects.

The CIVAM intervention method is traditionally based on *education populaire* (popular education). Those methods, adopted by the CIVAM movement since the late 1950s, consider knowledge exchanges as the basis for developing new knowledge and skills. It is used for farmers' training. Peer groups focus on identifying, analysing and improving the best know-how inside the group, with external help from experts, such as academics. Those experts often comment that these sessions are also a training period for them, because many farmers are experts or field researchers through their experimentation and innovation. In many ways, we carried out this study through methods similar to our farmers' training sessions.

Shortening food-supply chains

In the last decade, local food networks – better known as *circuits courts alimentaires* (short food chains) – have been quickly developing in Brittany (Maréchal, 2008). These networks feature traditional forms of short chains, such as open air markets, micro farm-shops and collective shops of farmers. These networks also develop innovative schemes, especially Associations pour le Maintien de l'Agriculture Paysanne (AMAP), which sometimes accept orders via internet for home delivery. New practices are linked at farm level: 30% of direct sales come from organic production, whilst organic producers are only 3% of the overall farmers. Nevertheless they are linked in the consumers' mind, seeing direct sales as organic far beyond the level of official certification.

Traditional forms of short chains, such as open air markets and micro farm-shops, also have expanded. In the late 1990s the Rennes area had 21 weekly markets; by 2009 there were 35, with more being planned. Some new ones are open in the early evening, to target "back home transit" consumers, while the traditional ones are morning or early afternoon markets. Most increasingly favour local or organic producers. At the same time, direct sales seem less present in Brittany than in the rest of France (Denéchère et al., 2008).

Some commentators portray direct sales as a leftover from earlier agriculture or as a disappearing practice. According to the dominant agricultural organizations of Brittany, 'There still remain some farmers who use direct sales as a niche market, but short food chains have no future.' Despite that narrative, *circuits courts alimentaires* have been expanding for several reasons. There are greater demands to protect natural resources (water, air and soil) and to bring consumers closer to producers. Consumers prefer to buy local food products for reasons of freshness and quality, including environmental and health aspects, as well as the proximity of sales (Cardona, 2008). Agro-industrial practices remain dominant in Brittany. Environmental issues are especially prominent there – both in public debate and in the physical world – e.g., pollution from fertiliser run-off, biodiversity loss, uniform landscape, etc. Agro-industrial practices are responsible for nitrates run-off and thus green seaweed growth, especially on the northern coast of Brittany (IFREMER, 2003).

The national context has become more favourable, especially through a public consultation process. Since 2007 the *Grenelle de l'Environnement* has proposed new measures for the local, national and global environment, based on a debate of all stakeholders[1]. Strong commitments for agriculture include an objective of 20% of organic agriculture by 2020 and 20% of organic food in public catering by 2012. For the first time, French law has linked the environment with the commercialisation model of food.

Farmers converting to organic agriculture, or to sales in short chains, have encountered hostility from conventional farmers, even from their neighbours. Adoption of sustainable agriculture or direct sales was considered as a rupture, or even a betrayal, by their professional environment. They have to recompose a new professional network through a higher density of new relations in each territory. Our study investigated how they develop these new relations and change their practices, in ways that also bring environmental benefits.

[1] http://www.legrenelle-environnement.fr/

Reducing GHG emissions

In the context of agro-industrial practices, the environment is considered something external to the farm. Most productivist farms follow the *hors sol (*"out of ground") scheme, where natural spaces mainly serve as pollution sinks, whilst the production system becomes highly artificial, dependent upon chemical inputs. The environment is seen as a "*charge*" (meaning a burden and expense) that is mainly used by authorities to impose tasks and taxes upon farmers.

Our research has shown that re-integrating the farmers' responsibility for their own commercialisation scheme, through short supply chains, leads to a new vision of the environment: It becomes an internal resource that can provide the whole farm system with free inputs and ecosystem services. In this way, the route is no longer to shape environment according to technical external rules, but rather to adapt the whole agricultural system to potentials of the farm territory. The environment becomes a benefit, both for the farmer's (and his family's) needs and pleasure and the whole society.

From our study of how farmers develop short food-supply chains, we identified three distinct routes. The first is followed by farmers who use short chains for only a small proportion of their turnover, as a complementary means to enhance profitability. They continue the conventional model, seeking technical excellence in production and high apparent productivity through large-scale commodity production. The second route is followed by farmers who progressively shifted more of their production through local sales, while also changing their vision of added value. Discovering that they could gain higher prices, they tried to improve their economic efficiency by reducing their input costs (e.g. fertilizers, pesticides). Through this pragmatic approach, a lower environmental impact becomes an extra gain, although it is not pursued for itself. The third group is composed of farmers who have a social and environmental commitment as activists. They always aimed to implement an environment-friendly system, e.g. through organic or low-input production methods.

For improving the environmental practices of farmers, the second group is a major target, given that the first group would be difficult to change and the third one already implements environmentally-friendly methods. For the second group, the environment is initially seen as an externality that can provide the farming system with free resources. Later this environmental care turns into a commercial argument and is thus maintained. This pragmatic basis has great potential for expansion to more farmers. The potential illustrates the development of Agricultural Knowledge Systems (AKS), as highlighted by the SCAR expert report:

> AKSs for instance would focus on ways to reduce the length of food chains, encourage local and regional markets, give more scope for development and marketing of seeds of indigenous crop varieties and foodstuffs, and restore the diversity of within-field genetic material, as well as of farming systems and landscape mosaics (SCAR CEG, 2008: 42).

Public interventions

Until recently, most public interventions on environmental issues have been based on law (new rules) or direct economic incentives (subsidies, grants). Alternative food networks have found little scope to gain support from public authorities, e.g. via policies on rural development or public procurement (*restauration collective*). As our research reveals, local authorities now use indirect incentives (e.g. public procurement, creation of sales points, information on local products) for local sales to gain local environmental benefits that will also address global environmental issues.

Indeed, our research has helped to persuade some local authorities to give such support through new policies. In the Brittany regional context, agro-food policy is still dominated by agri-industrial farming interests. Short food supply chains could not gain support through political lobbying, especially by criticising agri-industrial systems. As a different strategy, our research has highlighted environmental advantages of short food supply chains, especially in the wider policy context of climate change and food insecurity.

In wider discussions over reducing GHG emissions from agriculture, this aim has become a rationale to invest in scientific research towards technological innovation which could use resources more efficiently. Although such efforts may be worthwhile, they ignore or even marginalise farmers' organisational innovations which significantly reduce GHG emissions. Already available, such solutions could be implemented rapidly and at low cost. The main obstacles are farmers' and institutions' mindsets, as well as government policies, which therefore need more research towards overcoming them.

1 Revised Plan for the WP

Objectives

3. To carry out co-operative research on the environmental effects of local agro-food networks, as compared to mainstream supply chains, especially through a case study of Brittany.
4. To identify and explain the main environment effects, especially those which are locally seen as important, when farmers get involved in a local agro-food network.
5. To identify available methodologies and tools to assess those environmental effects.
6. To analyse how government policies (EU, national, local) facilitate or impede environmental improvements through local alternative agro-food networks.
7. To inform debate on EU policy for agricultural research, sustainable development and innovation.

Rationale

The CAP used to have the largest part of the EU budget. From 2008 onwards, the actions described in the Lisbon strategy will have a larger part (€57 billion vs €56 billion). At the same time, environmental issues are now strongly affecting agricultural production methods. For example:

- Farmers' CAP subsidy depends increasingly upon agri-environmental measures for the preservation or enhancement of environmental amenities, e.g. landscape, biodiversity.
- Eco-conditionality is getting a greater prominence in every country, in both pillars of the CAP, but through different or even divergent national applications.
- In some regions, citizens and consumers may misunderstand or distrust European measures, especially if agriculture policies and environmental policies appear contradictory.

Despite policy changes for environmental improvement, the first pillar of the CAP prioritises economic competitiveness of agro-food products, while largely relegating environmental protection to non-agricultural land. Existing measures (or their national applications) have proven unable to solve environmental problems linked to agriculture, such as water degradation. According to research institutions, future directions for French farming depend very much upon how agricultural systems take environmental issues into consideration.

A mid-term assessment of the CAP will be held in 2008. Probably fundamental changes will be supported by some member states. The issue is not only the amount of the CAP, but also its aims and governance. New actors are appearing, such as big metropolis or regions, which traditionally were not influential in agricultural policy. In some places (München, London, Copenhagen, Roma or Tuscany, Andalucia), local policy now promotes forms of agriculture that they consider more beneficial for their territory or for the wider environment; they introduce subsidiarity for health reasons or for environmental improvement, e.g. water quality, biodiversity.

In those trends, the promotion of new supply chains for food is a common policy. Supplementing or complementing subsidies, the new actors use market-related instruments: direct sales for public catering (schools, hospitals), and/or promotion of local alternative agro-food networks for consumers. Those networks are meant to link two kinds of interests that were previously competing: environmental protection and farmers' income. This strategy uses indirect signals to promote environment-friendly practices.

But is this strategy effective? There is little scientific evidence or even research on the topic. This study thus focuses on the environmental effects of agricultural practices using alternative agro-food networks built at local scale for local objectives. It has a similarity with existing research on the indirect environmental effects of fair trade.

Brittany is an instructive case to study for its Europe wide relevance. This formerly poor region became an economic leader in agriculture, through a highly specialized organization of *filières* (single product chains, e.g. for pork, poultry, milk) oriented towards international markets. But the concentration of animal husbandry caused severe environmental damage. In particular these practices damaged water quality (France could be fined by the EC because of poor water quality in Brittany), landscape (destruction of traditional hedgerows) and biodiversity. The global commodity-oriented trade lowered the proportion of local sales for food, especially for the most popular products, such as vegetables. Only traditional fairs have continued. As compared to other French and European regions, Brittany is thus a place where local trade for food products declined greatly.

A decade ago producers initiated local agro-food networks, and recently consumers began to join them. Regional dynamics have developed more freely and strongly than in other regions where

existing interests compete for local food markets. Brittany can thus be considered a European laboratory for the following reasons

- a failure of the old policies (European, national, regional) to address the challenge of water quality;
- a sharp need to implement new production schemes, integrating environmental criteria;
- a strong, rapid development of local agro-food networks, supported by local authorities;
- the presence of multi-disciplinary research teams accompanying the change.

Research questions:

When farmers join a local sales scheme, they often adapt the entire farming system: production, work organization, and relations with consumers. In the short term, demand from the consumer or local authority shows that 'quality' production (traditional or organic, thus environmentally responsible) is more attractive than conventional production. Sometimes this change begins with alternative, non-local sources; green, quality products are imported in order to establish and stabilise a market for local products. In the long term, the higher prices obtained make it possible to change the entire management method. This virtuous circle is frequently described and observed on the spot.

But we still lack scientific evidence on the proportion of farmers that really follow this virtuous circle, as well as the local conditions and wider policies that favour it. Extension organizations, mostly run by rural activists, may be over-rating the success of their influence. On the other hand, academic experts often remain blocked by their academic disciplines and have difficulties to involve CSOs in surveys.

Thus we need to assess any links between the use of direct or local sales schemes and environmental benefits. The mechanisms of this hypothetical link are unknown: Do producers enter a agro-food network because they want to produce in a "cleaner" way? Or do they first adopt a 'quality' mode of production and then valorise the products? Probably both ways around exist, but these must be investigated. The methods and tools to measure the effects are still missing. Existing methods have not yet been adapted for agriculture. Large-scale geospatial effects have been more documented than local-territorial scales.

Any link between market chains and environment has to be rigorously assessed. In particular these questions warrant study:

- What environmental differences or changes are locally seen as most important? What conflict or consensus arises over their importance?
- What environmental meanings are involved? How do these relate to understandings of sustainable development?
- What local forces and joint actions can take environmental issues in consideration?
- What are the significant differences in environmental management between producers involved in local schemes and producers selling to mainstream supply? How do they evolve and do farmers manage the change?
- On which environmental aspects do differences materialise? E.g. use of pesticides and fertilizers, biodiversity, landscape, etc.?
- How do policy contexts facilitate or impede local networks and their environmental benefits?

The general aims had been identified when CRÊPE was written. But, the group that had imagined CREPE, the SALT consortium, went on meeting and working on SALT issues. This continuity helped us avoid negative effects during the long phase of expectation that occurred between the time the project was written and the time we could concretely work. CSOs are not used to such a long time, and expectation generally makes people turn to other urgent or useful tasks and forget what had been written more than one year before. Keeping on working with the core SALT group helped us "keep the pan on the fire" to be able to have a quick start as soon as we knew that concrete work was authorized.

Three main research lines were expected, focused on each one of the three major actors that intervene in Short Food Chains (SFCs) development

- Line 1 - Production approach / farmers: are there some links between environmentally virtuous practices in the farm and commercialisation in SFCs?
- Line 2 - Consumption and global issues approach / consumers and intermediaries: what are the main environmental effects to consider in the food chain (after production), and where do they come from: processing, transport, delivery, home cooking? This line finally focused on energy and greenhouse gas emissions, because a broader approach was unlikely to produce effective results, and this topic is much controversial both in research and for practitioners.

- Line 3 - Strategic approach / local authorities: what kind of environmental benefits are expected from SFCs at territorial scale?

The general aims of the working group, that regularly met during the workshops, were to produce new knowledge and methods on these 3 lines. They were addressed successively, the first two ones first, and the third one afterwards. It means that the CRÊPE workshops included the topics one and two at the same time, and the topic three after the conclusion of those ones.

FRCIVAM, as the one and only integrant of CRÊPE, added the specific issue of understanding how co-operative research works "without knowing". That's why the co-operative process was not a central issue in the successive meetings of the "workshop".

The workshops were designed as the crossroads in a permanent process of monitoring and exchange. They "obliged" all partners to present and discuss their results and ideas on the 3 research lines, and participate in building a common culture on the basis of external shared information (for instance the results of the regional observatory of short food chains in organic farming). From the experience of SALT, we knew that meeting every 2 or 3 months is a condition to maintain a collective spirit and involvement.

Methods

1. Literature survey of previous research and other relevant documents
2. Survey of available methodologies and tools to assess environmental effects, by considering the entire chain for agro-food products, not only the production stage.
3. Inter-disciplinary research group linking scientific institutions, CSOs, local authorities, farmers and consumers: workshops
4. Interviews and surveys to analyse agro-food initiatives with two approaches: territorial and thematic.
5. National workshop (see below)
6. Analysis and integration of those information sources.
7. Dissemination of results through the agricultural extension system, including training for farmers and local actors.

Research tasks

CIVAM-Bretagne already has collaboration with academic experts, especially from the local Universities of Rennes, as well as others elsewhere in France. These experts will be involved in the study through information exchange, research methods and theoretical perspectives.

CIVAM Bretagne also first has formal contracts with local authorities (Regional Assembly, Côtes d'Armor county, Rennes Métropole, pays du Centre Ouest Bretagne, Pays de Dinan) for the development of local agro-food systems and then with national networks (Terres en Ville network, Fédération des Parcs Naturels Régionaux) to implement and share the methodology used at a national scale in different local contexts.

CSO networks

The Federation Régionale des Centres d'Initiatives pour Valoriser l'Agriculture (FRCIVAM) links 22 local groups of farmers and citizens, with 1200 members. FRCIVAM Bretagne is part of the CIVAM national federation, in charge of relations with research institutions and the development of local agro-food systems (in a specific national commission called MIAM). Through these links, CIVAM-Bretagne already has a national and international (UK, Wales, Spain, Portugal, Italy, Belgium, Japan and Brazil) network of CSOs and research institutions involved in alternative and local agro-food networks. Since 2007, The FRCIVAM participated as an associate member to the European ALIMENTERRA network[1]. These co-operative relations will help to involve non-researchers in the local study and to share results on a national scale, thus comparing diverse contexts and experiences. In 2009, we participated with Rennes Metropole to build a European INTERREG IV C project called FoodTURE with 11 other cities and countries linked with research in Europe. Unfortunately, we didn't succeed because our project didn't show enough arguments about the cultural changes.

During the CREPE project, our expertise on the SFCs and cooperation with research led us to be involve in new cooperative networks, especially with the Ministry of Agriculture for Ecuador (common project with Agrocampus) and a CSO from Hungary involved in a European Grundtvig project (see below).

Workshops

[1] http://www.alimenterra.eu/

CSO research-network: By month 24 a national workshop called *Les secondes assises de la vente directe* was hold for several purposes: to disseminate results; to share these results with experts and stakeholders elsewhere in France; to engage relevant experts; and to inform the rest of the study[2]. CIVAM-Bretagne invited participation from relevant CSOs and experts throughout France. The workshop was hosted in Brittany (Agrocampus Rennes), which has advantages of a local showcase for the topic, as well as lower costs. More than 280 persons (professors and students 30%, farmers 20%, representatives of agricultural and rural development institutions 20%, representatives of local public institutions 20%, researchers 5%, consumers 5%) participated to the workshop. More than 2/3 of the participants came from Brittany and the others from all the country. We invited a representative of the Ministry of Agriculture from Ecuador with whom we have a common exchange project about SFCs: “how SFCs can help to build new trends to develop small family farming linked with territorial expectations? How do national policies can influence agricultural practices especially at an environmental scale by developing SFCs?”. Among the participants, we received a Hungarian delegation from an engineering consulting firm of agricultural and rural development, working on organic production and direct selling.

EU policy workshop: this study gave a report and a presentation at the EU-level Brussels workshop of the entire CRÊPE project in June 2010.

Partners’ roles

FRCIVAM led the study, with a contribution from the OU. FRCIVAM involved CIVAM local groups in Brittany, the regional network with consumers and environmental CSOs (Eau et Rivières de Bretagne, Bretagne Vivante, Cohérence), the national CIVAM network for local agro-food systems and academic research institutions which are partners in other projects.

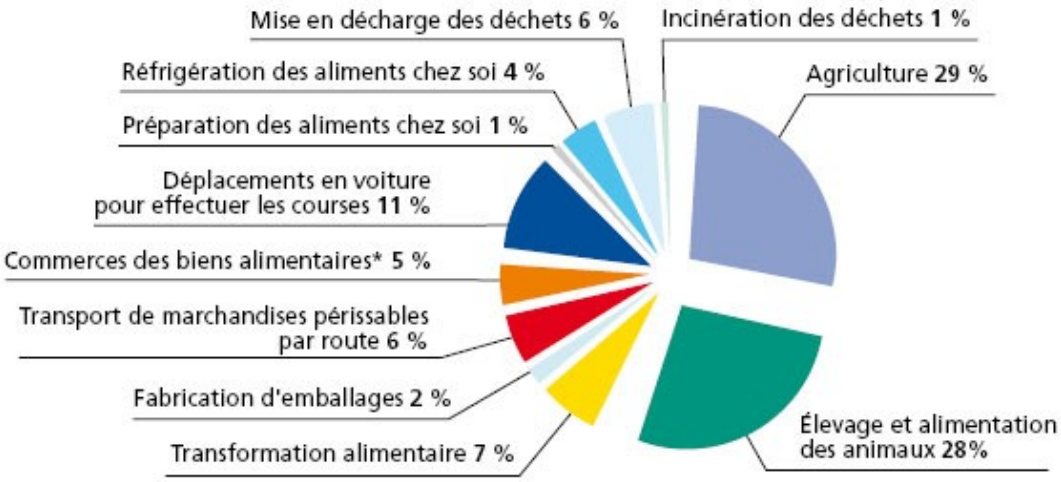
[2] http://www.civam-bretagne.org/civam.php?pj=157&ref_rub=21&ref=59

2 Research Activities

When the project was launched, we had in mind to try to reach results that could help describe a whole territorial situation on the environmental effects of SFCs. This goal had been at least partially reached on economic issues in the SALT project. We aimed at trying to aggregate the results from the 3 research lines (farmers, consumers / global issues, local authorities) in a systemic vision. But it now appears that this ambition was too high. The project obviously will not be able to link systemically the 3 research lines that have been defined. First because our work has confirmed what we expected, the few references on these issues. Secondly, because the scope is very broad and all approaches stay very fragmented. They require very specific methods that hardly can overlap from one topic to the other: e. g. energy can be approached through life cycle analysis methods while farmers choices only can be explained by social sciences. And thirdly, because environmental issues are both local and global: the effects of clean production practices are local (e.g. better water quality) and global at the same time (e.g. lower greenhouse gas emissions). Focusing on only territorial visions would thus undermine the effects on global threats.

Environment is a generic word that covers many domains: pollutions, biodiversity, landscape, climate change,… We can not afford to organize a multi-sectorial research on all those themes. We had to focus on some essential points, and then find a source to decide.

Our research programme has been based on the following chart, that results from a research made the French institute for environment. It measures the proportion of greenhouse gas emissions in each segment of the food chain for the whole french food consumption.



- The production system (agriculture 29%, breeding 28%) that weigh more than half of the emissions
- The transportation (before commercialisation 6%, by consumers 11%)

Although the indicator is only greenhouse gas, it seemed reasonable to use it as a decision tools because

- The two main segments put in evidence are frequently the focus of public debate when environment / food questions are discussed ;
- In the production system, here is a link between greenhouse gas and other environmental problems: fertilizers and pesticides contribute to the emissions. A previous research on milk production in Brittany show that environment-friendly production systems have a lower greenhouse gas emission.

A primary conclusion from this chart could have been to focus on the production system, as it is the dominant factor, and thus the main segment where progress can be made. The question is: how can short chains schemes help adopt safer practices in the production system? But, from a practical point of view, this question suffers severe limits. Changing a production system takes time, and we know that farmers hesitate to make decisions with long term implications. We considered that we need to study a segment where local decisions can produce results quickly. And obviously, the transport segment was adapted to this goal. Question: Do short food chains and long chains in food transportation make a difference in greenhouse gas emissions?

The first period of the research in CRÊPE focused on those two questions, that can be read through the pattern of our research questions.

The description of the research activities follow the frame drawn for the original plan

Literature survey of previous research and other relevant documents

The 2 questions are different in the references that can be found

- Environment / commercialisation scheme at the farm level is a new question. The evolution of European, French and Breton agriculture has led to a progressive de-linkage between production and processing-commercialisation. Only recently environment focused production practices have integrated the commercialisation question as a relevant variable. For example, there is no indication about sales in the organic rules in Europe, whilst in Japan the organic movement considered that only a product sold locally could be called organic. Only in 2008 the Biocoops[1] integrated the preference for locally produced food, as part of their environmental aims. There was almost no literature available in french and we had to rely only on neighbouring literature.
- By contrast, for greenhouse gas emissions compared between short chains and long chains there are many documents. But most of them are unfounded assertions, used by activists or commercial companies to sustain their positions. In scientific literature, relevant documents are very few. An article has created very polemic discussions, written by Schlich (Giessen University) and translated in the “revue de l’environnement” of the INRA. It compares the GHG emissions for a lamb fed in New Zealand and another lamb in Germany, served on a German table. The conclusion is that the environmental balance is better for the “distant lamb”. There have been many critical points of view published on this article, most of all by civil society. Some scientific comments have been made, generally on the method, considering that the life cycle analysis methods generally favours the most industrial and concentrated tools.

Survey of available methodologies and tools to assess environmental effects

We sought to consider the entire chain for agro-food products, not only the production stage. An initial survey has been made, comparing different tools: life cycle analysis, ecological footprint, carbon footprint, specific sustainability diagnosis for farms, energy compass, etc. Most of them can prove interesting, depending on the context. It appears that life-cycle analysis generally gives some “advantage” to industrial processes compared to small scale ones.

But we discovered that those indicators/tools will not be useful for some time, for lack of baseline reference points. The methods to apply the tools are well known, but there are no general data for the “average farm” and few data for the “average consumption scheme” in order to have a comparative approach. The farm level is the weak link of the chain, as we could not identify reliable data on environmental factors in French statistics. Our project can only point out this lack of quantitative data, as statistics depend on national political decisions. The sharp opposition between environmental CSOs and some farmers organizations, as well as the threat of European fines because of environmental problems in France could explain this lack of overall statistics.

We thus decided on a sociological approach to study the dynamics that could link short chains and environmental care, except for transport where we can gather quantitative data. The objective at farm scale is to explore how farmers consider they join a trade scheme (that could be only an economic solution) and a specific farm management (that could also be approached from a less expenses / more profit point of view) in a single strategy for the farm. We focus on the historical background of the farm and the evolution of farmers’ representations, using the real practice of the farmer as a control point to check the possible gap between representations, speech and action. Some cases of explicit links are known: in Japan the first charter for organic farming considered that a product only could be called organic if it was sold in a short chain system linking farmers and consumers ; in Brittany the “association de la vache bretonne Pie Noire” (farmers producing and processing the milk from one single local breed) gathers members who all adopted a local sales scheme. Considering the needs for a sociological advice we successfully contacted the “centre de sociologie des organisations” in Paris to be co-leader on this survey.

For greenhouse gas emissions in transport, we compared various methods. For each of them we tried to gather information on the scientific background but also on the way it I used by actors. We compared food miles, life cycle analysis, carbon assessment, ecological footprint. Our conclusion is that none of the fits our purpose. They are all dependant of a hypothetical chain that is studied and evaluated using standards figures. We wanted to compare field practice in order to assess variability. We thus decided to build our own method, in order to integrate all the transportation (to the sales point + consumers). It is based on greenhouse gas emissions, but the originality is that the figures are extracted from the real practice of actors and not a hypothetical scheme.

[1] http://www.biocoop.fr/, national movement of local consumers co-operative for organic food

Policy contexts facilitating/impeding local networks

This question had not been studied before. However, the "*Grenelle de l'environnement*" showed that the national context impacts both the actors of short food chains and policy makers.

Now that more than half of the world's population is urbanized, food is beginning to rise up urban sustainability agendas, given its unique role in sustaining human life, its intensive use of natural resources such as land, water and fossil fuel and its connections with a wide range of municipal and regional policy areas (from land-use planning to infrastructure and transport, from environmental conservation to housing and economic development).
In the last decades, rapid urban expansion has produced an equally rapid loss of agricultural land in periurban areas, disconnecting cities from the natural resource-base of their surroundings and from the productive systems that were associated with it. As urban-rural linkages have weakened or even disappeared, cities have become increasingly dependent on the global industrialized food system. Although comprehensive accounts of the impact of the global food system on urban areas are still lacking, the studies produced across different disciplines emphasize how the intensification tendencies of industrial agriculture, with its heavy reliance on the use of pesticides and fertilizers, have exacerbated urban water pollution and waste problems (Pothukuchi and Kaufman, 1999). Socially and economically, increased marketplace activities of corporate chains have displaced local food retailers (Dixon et al., 2007: 124-125), creating urban "food deserts" where people especially low income people have little or no access to fresh, nutritious and healthy food (Wrigley, 2002; Guy et al., 2004). In this context, there is an urgent need for integrated urban food policies that create new linkages and new relationships between different stages and actors of the food chain to improve urban food provisioning and to create positive connections between food, the environment, health, the economy, and culture. Pioneering city-governments all over the world have begun to address this need by devising food strategies that aim to calibrate demand and supply. Social scientists from different disciplinary backgrounds have documented the emergence of these strategies (in Rome, London, Toronto and Amsterdam).

In 2009, this question was studied with The Terres en Villes[2] network. The Terres en Villes network was partner in a project whose aim was to try to identify more precisely which are the environmental objectives that its members[3] follow when they define policies to support local food chains. We decided with the steering comitee of CREPE/SALT, to lead a study about the research question:

What kind of environmental benefits are expected when local authorities implement policies to support SFCs?

In another part, the service of Rennes city council[4], in charge of water quality contacted us for a common work on how can the development of short food chains contribute to better environmental practices in the region where the city takes its water

The study with the Terres en Ville network focused on 3 cities, Lille, Rennes and Saint Etienne, selected to present a wide range of situations: amount of inhabitants, place and role of agriculture, number and characteristics of SFCs, age and expression of local policies on SFCs.

The criteria used to choose territories to study were initially based on recommendations from the steering committee:

-Rennes Metropole, a region of intensive agricultural production, with an archipelagic town structure, and where we lead a big part of the previous studies in Brittany (we already had a precise idea of local food chains on the territory).

-Lille, a large Metropole with a strong political and economical views on the territory. Lille was characterised by a "mixed" system, including both intensive production systems orientated towards large scale supply and farms orientated towards horticulture, AOC and SFCs.

-Saint Etienne was characterised by a "green belt" of small agricultural farming systems orientated towards horticulture, with an influence of a "Parc Naturel Régional" which helps to develop SFCs by developing tools like an identifier on the products.

Interviews and surveys to analyse local policies to support SFCs

The first stage of the study was to collect opinions, motivations and reflections of elected representatives. Material was collected from diverse sources, including the local newspapers, newsletters, official documents, discourses and policies adopted. We also sought the opinion of service personnel, professionals, researchers and other local actors who are implicated in processes related to SFCs in their territory.

[2] http://www.terresenvilles.org/

[3] metropolitan areas between 100.000 and 1.000.000 inhabitants

[4] http://www.rennes.fr/

In order to identify key actors in each territory, we first consulted resource personnel: the representatives of *Terres en Ville* for the agglomeration in each territory. These professionals, with a technician profile, were our first confidential and privileged contacts. Our aim was to collect their expert point of view in relationship to their field experience. During the interviews, questions related to the principal policies with relevance to SFCs were asked. The interviews were semi-directed, and conducted in a very flexible way. The first aim of the interviews was to trace the history of the diverse policies implemented to support SFCs in the territory, and the second one was to identify the principal actors implicated.

Similar interviews were conducted with researchers in the universities of each territory. The information received was privileged, and included fields of expertise such as environment, sociology, socio-economy, geography, territorial management and political science. Our aim was to collect the opinions and knowledge of experts.

A second stage of interviews was led with different types of actors directly implicated on the territories: administrative, technical, political.

We began from the hypothesis that the expectations of local authorities would depend on the scale from which the SFC-environment question is addressed. According to the levels of territorial governance, there are different categories of actors and different objectives regarding the environment. For example, the elected people at the city level will have different expectations from those at the agglomeration level, there is also inter-territorial variability to take into account.

The place of agriculture in the economic strategy of the agglomeration will also affect the working domains and functions of various elected representatives.

Inter-disciplinary research linking actors

Our research linked scientific institutions, CSOs, local authorities, farmers and consumers. The research group was already working along inter-disciplinary lines, as we used a former project to build a steering committee. This committee is in charge of the work plan for the interns and the whole project. It generally gathers 20 persons: farmers, CSOs representatives, scientific institutions and local authorities. The meetings were held:

- in 2008: on April 3rd, June 12th and December 5th,
- in 2009: March 6th, June 18th and September 29th
- in 2010: January 29th, April 9th, June 24th

Every meeting of the committee has a workshop for scientific and practical investigation and conclusions. There are 3 local authorities in the project, and we stopped recruitment of extra ones for management reasons.

Interviews and surveys to analyse agro-food initiatives with two approaches

We combined territorial and thematic approaches by choosing a different territory for each issue

- For the research at farm level, we chose the Rennes Métropole territory, where we made 16 long comprehensive interviews (1 to 3 hrs).
- For the transport study, we chose the Pays de Dinan. We studied 7 sales systems in short chains, comparing it with 1 long chain shop. (Only a shop of organic products accepted our request for detailed information about the origin and “travel” of the products). We studied the results for 3 products: carrots, potatoes and tomatoes. The assessment of the consumers’ practice was made by questionnaire and we had 114 exploitable returns.
- For the SFC environment study, we compared 3 cities’ strategies at a national scale by leading enquiries with different actors (researchers, administratives, technicians and elected politicians).

National workshop

On April 27th 2010 we co-organized with Agrocampus Ouest and the University of Rennes 2, a regional conference called *Les secondes assises de la vente directe*. It was the second regional conference about SFCs in Brittany, the first one took place 2 years ago in Saint-Brieuc, dealing with the beginning of our cooperative research in the SALT project. The first conference aimed at putting the bases of what represent the SFCs on a territory and can bring in terms of relocalisation of the farming and the creation of social link. It took place after a cooperative research exchange program with Japan.

2 years later, the conference aimed at focusing more closely on 3 issues:

- Short Food Supply Chains' place in a local economy: what do they represent? How are they organised? How many employment do they create?
- SFCs and the link with environmental practices: how can they contribute to a better environmental quality (e.g. water quality, GHG emissions, energy consumption) at a production scale, transport?
- Local and global policies: how can SFCs contribute to improve local policies on the environmental aspects in particular? What are the possible issues and using tools to change practices in relation with consumers' demand and national policies (e.g. Grenelle de l'Environnement)?

Analysis and integration of those information sources

Our initial objective was to lead every study specifically one by one to try to dread the endogenous mechanisms susceptible to answer our research questions. Then, and only in a second step, it was planned to analyze the results, if possible in a dynamic and combined way. The systemic territorial approach seems relevant for the analysis of the actors' strategies and the possible control levers susceptible to advance this analysis in a forward-looking and dynamic field.

Since the beginning of the cooperation with researchers on the whole study, we built step by step a new methodology to analyse SFCs at local scale. When we led this work, especially in Rennes Metropole, where it was the most complete in the end, it seemed to appear more and more interest on behalf of the other local territories in Brittany. It could be explained by 2 elements:

- the impact of the national measures like the "*Grenelle de l'Environnement*" and the "*Plan National Nutrition Santé*" on the local policies. These two measures put a new focus on the fact of replacing the food supply as a potential control lever of reorganization of the agriculture farming on a local scale, considering the system of production.
- A new awareness of the interest of the SFCs according to the consumers demand, to reconsider the farming systems in the municipal or inter-municipal scale (territory corresponding to a population center) and make a link with environmental effects (e.g. facilitate the practical adoption of new farming systems protecting the quality of the water, the biodiversity, and lower GHG emissions)

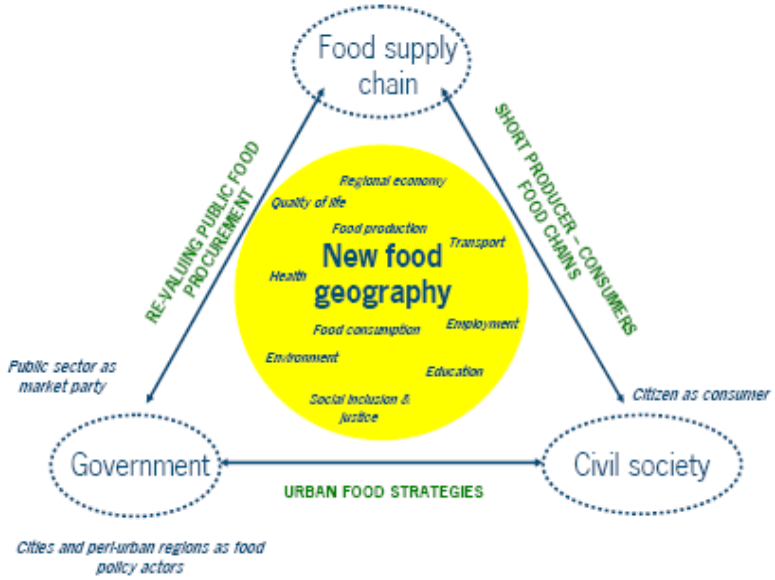
As a response to the multitude of food-related health and sustainability concerns, it seems that a new food geography (or collection of new food geographies) is forcing itself onto the scientific and political agenda (Watts et al., 2005).This new food geography is grounded in a different logic and incorporating different values than the industrial global food geography. Central to this new geography of food is a sustainability discourse that no longer accepts the externalization of environmental, social and even economic costs (Morgan et al., 2006). The emerging new food geography is driven by new concerns about food quality and safety, nutrition, food security and carbon food prints. It develops along three interrelated, mutually reinforcing societal axes (see also figure):

- Short producer to consumer food chains – new relations between civil society and the chain of food provision (the civil society – market axis).
- Re-valuing public food procurement – new relations between the public sector (as buyer and consumer of food) and the chain of food provision (the market – state axis).
- Urban food strategies – the rise of municipalities and city-regions as food policy makers, pointing to new relations between the (local/regional) government and civil society (the state – civil society axis).

The development of SFCs or alternative food networks (AFNs) is generally considered to be the first sign of the emerging new food geography (Renting et al., 2003; Watts et al., 2005). AFNs represent spatially bound relations between consumers and the food supply chain and in general more direct links between producers and consumers. Quite often these alternative networks also produce alternative food (e.g. organic, regionally specific, artisan). Another dimension of the new food geography is the rising awareness of the power of the (semi-) public sector to enhance sustainable food production and consumption patterns by changing its food procurement strategies.

By relocalizing, greening and moralizing public sector food procurement the government and (semi-) public bodies such as hospitals, schools and prisons have the capacity to deliver health and sustainability objectives: nutritious meals for patients and school children, enhance regional employment in the food sector, reduce food miles and CO2 emission, et cetera (Morgan, 2006; Morgan & Sonnino, 2008). The third dimension of the new food geography regards urban food strategies, i.e. the active role of cities and metropolitan regions as food policy makers. For decades food policy was considered to be the responsibility of the state (or even the supranational state if we

consider the EU's Common Agricultural Policy as a form of food policy), implying that cities are becoming a new actor with regard to food policy design and implementation. Although urban food strategies differ from city to city, the common denominator is the intention to connect and create synergies between different public domains that are in one way or the other related to food (Wiskerke, 2010).



Source: FOODLINKS project

Thus the new food geography, as visualized in the figure above, not only reflects a territorial (as opposed to global) approach to food production and consumption, but also an integrated conceptualization of food. In the new food geography, food is a product and a process that links environmental pollution (e.g. food miles), environmental degradation (e.g. loss of biodiversity), environmental quality (e.g. productive green spaces in cities) social (in)equality (e.g. differences in access to food), public health (e.g. obesity and malnutrition), employment (e.g. food stores, restaurants, urban farmers), education (e.g. food lessons at primary schools, farmer-to-school initiatives), et cetera. The new food geography can thus be characterized as an integrated territorial geography.

In this way, we were able to identify certain interest, on behalf of the elected representatives of local authorities on this question of relocalisation of the food supply. It puts however several postulates:
1 - A better knowledge of what are really the SFCs on the territories. What do they really represent on the territory? How do they materialize? How are they organized? To what modes of production do they correspond?
2 - The evaluation of the development potential of the short circuits on a territory. What is the existing dynamics (forward-looking vision)? What are the references in terms of development?
3 - The short circuits, a means to answer the environmental, social and economic stakes. With what stakes confronts the development of the SFCs? What can be the control levers of share to facilitate their development?

Our CREPE study is situated in this context, which consists at the same time in identifying better the existing links between SFCs and environmental practices on one hand then in establishing the interrelations with the local policies to estimate the potential control levers of action.
Moreover, linking interdisciplinary food studies and interdepartmental food policymaking is, at present time, the real challenge. Hence, the definition of problems, articulation of questions, design of research activities, collection and analysis of data, interpretation of results, formulation of recommendations, implementation of activities, monitoring and evaluation of activities, definition of new problems, et cetera is a collective and interactive process of scientists, policymakers and other stakeholders, albeit it with clearly defined roles and responsibilities (resulting from specific capacities and capabilities) for the different actors involved.

Dissemination of results through the agricultural extension system

We have integrated the environmental dimension of short chains in the conferences, debates and training sessions in which we participate. We touched 4500 persons

On 14th October 2009 we were invited for a session in a conference co-organized by the CIVAM movement and WWF France on agriculture and environment. The audience gathered 300 persons, and the conference was opened by the french minister of agriculture. Our presentation focused on environment and short food chains, due to the results we produced.

First book about short food chain

Gilles Maréchal was the co-ordinator of the first book in France on short food chains. It has been made in a co-operative research way. The overall organization and the list of chapters was discussed by a mixed committee of CSOs members and researchers. On 14 chapters, 7 have been written by researchers, 6 by CSOs and 1 by a mixed team. Two chapters are focused on environmental issues and short food chains: one by the editor of the "courrier de l'environnement" on the impact of short chains on environment, the other on using the ecological footprint indicator for food chains. It has been published by Educagri, a public company of the french ministry of agriculture, in charge of pedagogical documentation for professors, trainers, students and trainees (agricultural schools in France are attached to the ministry of agriculture).

Debates and presentations in conferences and meetings

Pascal Aubrée was invited in March 2010, 9th for a meeting in Montpellier, organized in Supagro by students and an economist about "how Fair Trade could be developed at a local scale, according to an example in Perou". http://deseoetico.over-blog.com/

In 10 th July 2009 Pascal Aubrée was invited to present the results of our study especially about the link between SFCs and the impact of production on environment (GHG approach) in a national training course organized by the territorial centre of resources ETD[5] and ADEME[6] for technical agents of local public institutions. More than 20 participants resulting from all France attended the presentation.

On 12 th to 14 th May 2010 we were invited for two conferences in Hungary, organized by a CSO, about short food chains and environmental practices in agriculture in Europe. The first audience took place in a high school around of Szolnok during day dedicated to experiences and studies about environmental policies and initiatives in Europe. It gathered about 50 persons (most of them were students from Hungary, Germany and Czech Republic).The second was organized specifically about relocalisation of food and environmental impacts in Europe, based on our experience in Brittany. It was organized by our CSO partner in Karcag. It aimed at showing how to build new tools for governance at a local scale, between different actors to link environmental strategies in agriculture and food consumption. It led to articles in the newspapers and reportage on national TV.

Research programs and new projects

The CREPE project helped us to recognize our expertise on SFCs through the links created with researchers, especially at a national scale. In 2009 The Ministry of Agriculture launched a new call for projects within the framework of a national device co-financed by the state and EU called "French Rural Network[7]". After examination of our file by the national scientific committee, FRCIVAM obtained a pilot study about "The forms of support for farmers' establishment in short food chains in regions". It gathered 9 regions and 5 national structures (NGOs + institutional organizations of agricultural development).

As a rationale for the study, development of the SFCs is strongly limited by the incapacity of an adapted supply, quantitatively and qualitatively. The installation of farmers capable of answering it and the launch of new projects in existing farming schemes establish a key factor of the development of the SFCs.
It is considered that territorial strategies, spread by the coordination of the local actors, are able to support a harmonious development of the supply and the demand.
The exchanges of experiences and the voluntary coordination are thus necessary to exceed the compartmentalized visions, organize the complementarity of the forms of SFCs and express the potential.
The aim of the project was, by the combining of the experiences and the knowledge of local actors of varied nature and different regions, to produce original references and to improve the practices of accompaniment of the actors for the development of SFCs by the installation of agri rural stakehoders in SFCs.

[5] http://www.projetdeterritoire.com/

[6] National Agency of the environment and control of energy - http://www2.ademe.fr

[7] Réseau Rural Français - http://www.reseaurural.fr/

It ended in 2 major productions:

- In coordination with the Fédération des Parcs Naturels Régonaux[8], we produced references of operational analysis and good practices to various types of public for the development of the SFCs to the territorial scale.
- A national seminar organized to the ministry of agriculture in Paris on 15th September 2010. It aimed at analysing the obstacles to be raised and experiences to be valued, to estimate the conditions of success of territorial initiatives of promotion of the SFCs by increasing the supply in order to satisfy the potential demand from public policies (at the national and local level).

The seminar gathered 120 persons among whom of the representatives of the set the actors of the agricultural and rural development, the representatives of farmers' unions, researchers and institutional representatives (national and local).

A new research program with the Ecuador ministry of agriculture about food sovereignty and agroecology. “How to develop short food chains in Ecuador? How does a national policy can take into account territorial resources for small family farming by developing local agro-food networks?”.

Our expertise on environment and food also allowed us to be invited to participate in:

- 2 European projects under Grundtvig,

- a European Intelligent Energy program about local policies called European Network of information centres promoting Energy Sustainability and CO_2 reduction among local COMmunities – ENESCOM, which promotes information and dissemination activities in order to:

    - increase the number of RU local communities engage in the mitigation of the climate change through the promotion and adhesion to Covenant of Mayors’ initiative,
    - develop capacity building in energy sustainability and adoption of intelligent local sustainable energy policies,
    - promote integration and institutionalization of energy efficiency saving and use of energy efficient behaviour within EU local communities.

- another FP7 project about governance of Short Food Supply Chains called "Foodlinks" – Knowledge brokerage to promote sustainable food consumption and production: linking scientists, policymakers and civil society organizations. The overall aim of the project is: To develop and experiment with new integrative modalities of linking research to policy-making in the field of sustainable food consumption and production, thereby contributing to the establishment of new policy-relevant communities of researchers, policy makers & CSOs and enhancing the use of research insights in policies to promote sustainable food systems. FRCIVAM will lead the study in Rennes Metropole.

Food (production, processing, distribution and consumption) is a highly relevant policy issue for brokerage activities to promote sustainable consumption and production patterns. Food is an intrinsic element of everyday life as everyone eats (or should eat) everyday. Many of today’s sustainability problems (water shortage, GHG emissions, pollution of soil and water, decrease of biodiversity, urban waste, etc…) are related to the prevailing pattern of food production and consumption (including processing and distribution). Hence, developing more sustainable food production and consumption patterns will have a significant impact on sustainable development in general.

We identify several demands at a local scale to lead studies in this way. In particular, a specific pilot study followed by an experiment in terms of recommendations is going to start on 2 territories in Brittany considered at high risk of water pollution in the department of Côtes-d'Armor (territories of Saint-Brieuc and Lannion).

The FRCIVAM was sought to work on it from the method developed in the projects SALT and CREPE.

[8] http://www.parcs-naturels-regionaux.tm.fr

3 Results

Context of the study

For a long time, Brittany has been dominated by conventional agri-food chains. This applies especially to animal products (meat and milk) and to some vegetables (e.g. artichokes and cauliflower), generally cultivated in monocultures. Competitiveness is focused on large quantities and low prices, which generate basic commodities with a low added-value for producers. Technical excellence and production skills are considered the 'one best way' to compete in such markets. Large co-operative organizations provide inputs and commercial services for producers, while making them feel strangers to a commercialisation system that is led by supermarket chains. Farmers' professional skills in technical and production management are over-estimated, while their own marketing capacities are devalued.

In this conventional agri-food context, farmers see the environment as something external to the farm. Most productivist farms follow the *hors sol* (out of ground) scheme, where natural spaces mainly serve as pollution sinks, whilst the production system becomes highly artificial, dependent upon chemical inputs. The environment is also seen as a *charge* – a burden and expense – that is used by local authorities to impose tasks and taxes upon farmers.

In the last decade, however, local agri-food networks – better known as *circuits courts alimentaires* (short food chains or SFCs) – have been quickly developing in Brittany (Marechal, 2008). These networks feature traditional forms of short chains, such as open-air markets, micro farm-shops and collective shops of farmers. By 2005 there were at least 21 collective initiatives – e.g. box schemes, collective shops of farmers, groups for public catering; by 2008 there were 82 and by 2009 more than 100. These networks also develop innovative schemes, especially Associations pour le Maintien de l'Agriculture Paysanne (AMAP),which accept orders via internet for home delivery.

Direct sales and quality of production have become linked in the consumers' mind. New practices are linked at farm level: 30% of direct sales come from organic production, whilst organic producers are only 3% of the overall farmers. Nevertheless they are linked in the consumers' mind, seeing direct sales as organic far beyond the level of official certification.

Traditional forms of short chains, such as open air markets and micro farm-shops, also have expanded. In the late 90s the Rennes area had 21 weekly markets; by 2009 there were 35, with more being planned. Some new ones are open in the early evening, to target "back home transit" consumers, while the traditional ones are morning or early afternoon markets. Most favour local or organic producers.

At the same time, direct sales seem less present in Brittany than in the rest of France – in 2000 6.7% of the farms in Brittany, 18.1% in France. They also seem in decline – 12% in 2000 in Brittany (Denéchère et al., 2008). Some commentators portray direct sales as a leftover from earlier agriculture or as a disappearing practice. According to the dominant agricultural organizations of Brittany, 'There still remain some farmers who use direct sales as a niche market, but short food chains have no future.'

Despite that narrative, *circuits courts alimentaires* have been expanding for several reasons. There are greater demands to protect natural resources (water, air and soil) and to bring consumers closer to producers. Given the domination of agri-industrial practices in Brittany, agri-environmental issues are especially prominent there – both in public debate and in the physical world (pollution from fertiliser run-off, biodiversity loss, uniform landscape).

The national context has become more favourable, especially through a public consultation process. Since 2007 the *Grenelle de l'Environnement* has proposed new measures for the local, national and global environment, based on a debate of all stakeholders[1]. Strong commitments for agriculture include an objective of 20% of organic agriculture by 2020 and 20% of organic food in public catering by 2012. For the first time, French law has linked the environment with the commercialisation model of food.

[1] http://www.legrenelle-environnement.fr/

Research questions: answers

[Original questions are shown in italics.]

What environmental differences or changes are locally seen as most important? What conflict or consensus arises over their importance?

In Brittany the main environmental concern is pollution; water quality is symbolic of the changes that society is demanding. Our qualitative interviews confirmed that farmers spontaneously focus on the quantity of fertilizers they use, although the environment is not defined. On our approach, the most important question is "How does a short chain commercialisation scheme help farmers to use less fertilizers?". But in fact the fertilizer question brings in other virtuous practice. In order to lower their consumption, farmers have to change their whole production system, most of the time radically (organic or sustainable agriculture). So their itinerary also includes less pesticides, valorisation of hedgerows, higher biodiversity under the fertilizers driver. There is a social consensus over the importance of this question, but this does not mean that practices take it in account. **The changes are focused on local challenges**.

On transport, the importance of carbon and GHG emissions are consensual. **The challenge is clearly global**: "*How can we locally contribute to a global solution?*". But this consensus only delimits the battlefield. If the GHG indicator is consensual, conflicts and misunderstandings rise over the use of it. According to commercial propaganda on the web, "*buying on our website allows you to reduce your emissions by a factor 8.3*". A closer exploration, or direct questions to the company, did not show any evidence, nor even a study to fund this assertion. It supports a social creed that shorter is obviously less consuming of resources. According to our research, this assertion is potentially true, but in practice the potential advantages are cancelled by other factors: eating tomatoes during the winter or delivering 3kg of carrots by van entirely undermines the saving in GHG and energy that could be achieved by a shorter travel.

What environmental meanings are involved? How do these relate to understandings of sustainable development?

We identified that environment is the main issue for interviewees about sustainable development. Both farmers and consumers include and mix local issues (quality of water, landscape) that they can physically evaluate, and global concerns they aware of -- firstly global warming.

What local forces and joint actions can take environmental issues in consideration?

As an hypothesis, we thought that direct relation between producers and consumers was a powerful driver for direct sellers to improve their environmental performance. Our interviews did not show any evidence of this assertion, though it may have some truth. We see such a relation as indirect: when selling directly to consumers, many farmers think they have to improve their environmental practice (even if the question is not raised by their clients). On the other hand, consumers (except some very informed ones) do not feel able to assess the environmental sustainability of a farm. They keep distant from direct environmental issues. We evaluate that the exhibition of the farmer to the consumer's gaze opens a space for environmental improvement.

But not for all farmers. Some of them (see group 1 beneath) do not want to be considered as an "ecologist" by their reference social group (the conventional farmers' organizations), and so avoid any reflection on environmental issues beyond legal requirements.

But we discovered an unexpected influence. All the interviews show the determining power of social relations within the farmers groups and organization. Attitude towards environment is strongly determined by the agricultural peer group: if I actively participate in a trade union that considers environment as secondary I shall express this point of view in my production practice. By contrast, if I want to change my production scheme to a more environment friendly way, I often have to abandon my reference group and it is psychologically and socially costly. The interactions made possible by direct sales (meeting colleagues on the marketplace or consumers in my shop) allows me to recompose a new social network to re-ensure my project.

Local authorities have a role to play to facilitate the evolutions. First because their strategic options about agriculture and food contribute to building the "local normality". Social rejection of an innovative project becomes harder when it is defined as desirable by local power, even more when this support is not conditioned by party options. Secondly because most of the projects link the local authorities way at one time or another: to organize a market, to find a local to distribute boxes, to get some advertising in the local newspaper, Authorities have the opportunity to express directly their will about environment and agriculture to the project holders. Finally because some local authorities have understood that their bargain and economic power can be stronger when they link environment and short chains. This position is clear when they use public catering to stimulate organic practice. Local

authorities in France have limited power on agriculture, both for legal and financial reasons. But they recently discovered that they can motivate ecological agriculture with small extra budgets, by using already existing expenses for food.

For GHG emissions, the problem is known and intellectually taken in account by all actors. But obviously, all of them consider that the other farmers must initiate improvements. The most relevant groups to better the environmental impacts seem to be the organized groups of farmers, citizens or mixed groups. Most of them want to act for lower emissions but lack references. Our study showed that there is a very high diversity in the emissions of local food schemes, by a factor of 10. According to a communication to the general assembly of the AMAP (box schemes) of Ille et Vilaine, our results stimulate action, when they know that they can do something as compared to the neighbouring AMAP. For example, our presentation in 2009 at the national training course for technical agents of local public institutions, showed they began to be convinced by using these new arguments in favour of short food chain as a mean to change paradigm.

What are the significant differences in environmental management between producers involved in local schemes and producers selling to mainstream supply? How do they evolve and how do farmers manage the change? On which environmental aspects do differences materialise? E.g. use of pesticides and fertilizers, biodiversity, landscape, etc.?

The challenges on linking production system and commercialisation system are mostly local. We tried to approach those questions by using statistical data on environmental practices in the farms. We discovered that there are no data available that could allow us to compare a selected sample of farms in direct sales to the overall population of farms. As described above, we thus moved to a sociological approach.

We found that analytical approaches will be unable to correlate short chains in general with environmental benefits. At farm level, we can classify the farmers we met into 3 groups

- A first group, for which local sales are up to 20%, use short chains as an economic means to raise the profitability of their farm. Those farmers are conventional farmers. They are not driven by environmental concerns and are not willing to change their production scheme for sales reasons.
- A second group of conventional farmers is driven by a different economic reason. The use of direct sales led them to a sound reflection on the value added to the product. Considering that profit = sales – expenses, they think that they can try to reach lower costs, just as they can get higher prices. For economic reasons, they try to spare energy, fertilizer, inputs. This rationale leads them to an evolution of their production system, driven by economics, but environmentally efficient.
- The third group is composed by engaged farmers, often activists in trade unions or associations. For them, environmental care, local sales and relations with consumers belong in the same global objective of “sustainability”. There is no “one best way”: converting to organic agriculture makes it easier to sell locally, or local clients make it easier to convert to organic. But the overall path includes from the beginning both environment and local sales.

For greenhouse gas emissions in transport, there is no evidence that generally “short chains are environmentally better than long chains”. Due to the refusal of supermarkets to give us transparent figures for conventional chains, we only have one comparison point for long chains – a biocooperative that we see as more aware than the average. Using carrots, potatoes or tomatoes, we can stress that seasonality has a major influence: the difference (within long chains) between Breton products and foreign products (from Italy, Spain or Egypt in that case) reaches a factor 2 to 3. But the best results in long chains re comparable to the worst ones for short chains. Within the short chains there is a factor 10 between the most efficient practice and the worst ones. This high diversity leads to the following conclusions

- Short chains are generally, but not always more efficient environmentally than long chains
- But short chains have a high diversity which can also prove inefficient.
- There are thus many possibilities for food chains to improve the environmental impact of food, e.g. by raising awareness on the diet (seasonality), and by rationalizing the logistics.

Typology of strategic approaches

Inspired by a comprehensive sociological approach and elements of justification theory, we proposed to identify the nature of arguments and to built a typology. We concentrated on possible constants in the discourses, in valorising local specificities.

The following table shows the main lines of argumentation, and thus the implicit strategy, of each territory:

Argument register	*Lille Métropole*	*Rennes*	*Saint Etienne*
SFCs as a diversification strategy for local economy and new jobs			
SFCs as a means to implement and reinforce the urbanization schemes			
SFCs as vectors of change for agricultural practices			
SFCs *as a means of reducing greenhouse gas emissions*			

Table 3: main motivations for promoting SFCs on the selected territories

The first conclusion of the workshops for this research line is that the range of main expectations is surprisingly quite narrow. Four main concerns appeared clearly, whilst many other ones appear in official discourse or in newspapers. Priorities are thus more selective than they appear to be.

The interviews and their comparison also showed common expectations and concerns:

1. In all expectations and concerns about SFCs, local stakes come first. First in importance: quality of water and air, scenery, walking paths are the most spontaneously quoted objectives. First in time, because those are the ones that motivate concretely the initial steps in local SFCs policies, even though other ones are quoted. It is the core of the approach.
2. Inside the local concerns, reducing the impacts of agriculture on environment is a major perspective in local SFCs policies. It very deeply affects the way local authorities deal with the question of pollution. In France, it has mainly been seen as a technical problem or a lack of skills for some farmers. Using SFCs as a means for change opens a completely new approach, based on a systemic view of the production/processing/commercialisation interactions. This study confirms that SFCs are seen locally as tools both for food policies and for agricultural policies.
3. As the second major trend, SFCs expansion is expected to maintain or improve the urban frame, or precisely the way natural and agricultural areas structure the urban and peri-urban configuration. Expectations on an influence of SFCs practices on urbanism, directly linked to quality of life for authorities, are very high. Probably because it deals with their main legal competence in France. But many of them are going much further than they are legally required to do: in Rennes, an additional document on agriculture in the metropolitan development, including SFCs, has been added to the compulsory documents.
4. Although priority expectations and concerns are few, they still seem difficult to integrate in the overall policies of Metropolitan areas. By contrast to conventional agro-food chains, SFCs are not a delimited practice with its own representation and staff. This issue has to deal with various influences: delegate and staff responsible for agriculture, but also environment, urbanism, energy, economy. The comparative analysis shows that only on the long run interactions between all the persons in charge can build and integrated and unified vision to run a policy on SFCs instead on thematic policies on them. The comparison showed that the longer the topic is dealt with, the most shared and unified the policy is. Key actors are necessary, and they settle the take off of those policies from local concerns to policies integrating global environmental impact, such as energy of greenhouse gas emissions.

The interactions between the 3 different lines of study still need an analysis. But they can surely be used in a comparative way. Just to give and example: line 3 (authorities) show that metropolitan areas expect SFCs to be a vector for change in agricultural practices, on local issues for the newest ones and then global issues ; line 1 (farmers) shows that there is a priority target group for local policies, and suggest that the discourse on environmental practice should integrate the economic conditions and consequences ; line 2 (consumption and global environmental factors) tells that the main source of pollution is the production system, but that there are still much improvement to expect in logistics.

Local authorities have a role to play to facilitate improvements. First, because their strategic options for agriculture and food contribute to building local norms. Social rejection of an innovative project becomes harder when it is defined as desirable by local authority, even more so when this support does not depend on a specific political party. Secondly, because most projects push the local

authorities, for example, to organize a market, to find a local to distribute boxes, to get some advertising in the local newspaper. Authorities have the opportunity to express directly their will about environment and agriculture to the project holders. Finally, because some local authorities have understood that their bargaining and economic power can be stronger when they link environment with short chains. This position is clear when they use public catering to stimulate organic agricultural practices. Local authorities in France have limited power overn agriculture, both for legal and financial reasons. But they recently discovered that they can motivate ecological agriculture with modest extra budgets, by using already existing expenses for food.

Our objectives and their achievement

[Original objectives are shown in italics.]

To carry out co-operative research on the environmental effects of local agro-food networks, as compared to mainstream supply chains, especially through a case study of Brittany.

The activity can really be called co-operative research, even though FRCIVAM as the leader is not a formal research institution. Our experience of field work makes it possible to translate research findings into accessible language for other stakeholders.

The question we raised was not initially an easy one for many partners. We have faced some reactions of mis-understanding on what we were studying and why. But the expansion of organic food catering and the *Grenelle de l'environnement* helped us. We can now rely on a network of research and action.

To identify and explain the main environment effects, especially those which are locally seen as important, when farmers get involved in a local agro-food network.

We identified 2 main sectors

- There can be major changes in the environmental management of the farm when farmers get involved in a local food scheme. We identified at least 2 profiles of farmers that evolve gradually or quickly towards better environmental practice when they adopt local commercialisation. But there is also another category (less numerous) of farmers who keep a sharp distinction between production and sales practices. For this category, local networks will hardly help.
- Greenhouse gas emissions in transport are, in average, lower for locally produced and sold food than in long chains. But there is no general rule, and we observed a very high dispersion in the results. It means that there exists an important space for bettering practices. From the qualitative point of view, we observed a growing attention of the farmers and producers involved in local sales for transport ecological cost. But we also observed that there is a lack of methods or data to build strategies.

To identify available methodologies and tools to assess those environmental effects.

There has been very active discussions on methodological tools during this first year of programme.

- On environment and short chains at the farm level, the failure of our first attempt to use quantitative data (that did not exist) caused a very interesting inter-disciplinary debate to choose an alternative methods. We were glad to observe that the disciplinary researchers accepted a debate where concrete objectives did drive the choice we had to make. Finally, a sociological approach was chosen, although there was no sociologist in the first group of researchers that participated in the project.
- On transport, we observed that available methodologies were based on hypothetical figures and chains. Our approach used the results of the greenhouse gas emissions obtained by other projects, but applied it to real food chains, integrating the diversity of "details" that deeply alter the outputs. Till now, there is a very polemical debate on the comparison of emission by short chains and long chains. Our micro-geographical approach, focused on practices, explains (at least partially) this polemical debate. The diversity of efficiency within every group of artificially (for that purpose) grouped practices is higher than the difference in average results. It shows that it is always possible to draw apparently correct conclusions from a model, with advantage either for short or long chains. But this model does not resist to the observation of concrete practices, and every situation is far from this model.

To analyse how government policies (EU, national, local) facilitate or impede environmental improvements through local alternative agro-food networks.

For improving the environmental practices of farmers, the second group we identify in our study is a major target, given that the first group would be difficult to change, and the third one already implements environmentally-friendly methods. For the second group, the environment is initially seen

as an externality that can provide the farming system with free resources. Later this environmental care turns into a commercial argument and is thus maintained. This pragmatic basis has great potential for expansion to more farmers. It illustrates the development of Agricultural Knowledge Systems (AKS), as highlighted by the SCAR expert report:

> AKSs for instance would focus on ways to reduce the length of food chains, encourage local and regional markets, give more scope for development and marketing of seeds of indigenous crop varieties and foodstuffs, and restore the diversity of within-field genetic material, as well as of farming systems and landscape mosaics (SCAR CEG, 2008: 42).

As understood in the practitioners' discourse, short food-supply chains are a way to link local and global challenges. Those arguments are clear among the most committed groups of consumers – e.g. AMAPs, or collective shops of farmers. Through local sales, they aim both to improve the local environment (e.g. water quality, better agricultural practices, organic agriculture, landscape) and to lower pressures on global environmental resources (e.g. energy, ozone, global warming).

Likewise for local authorities, short food chains can help to link local challenges with global threats, and then to reconsider environmental issues in a more systemic way. According to our interviews with local authority representatives, they discover extra environmental advantages when promoting short food chains on their territory. At first they pursue local improvements: quality of water, landscape, biodiversity, soil fertility. Those aims are quite different, because people who deal with food chains have different functions: environment, agriculture, planning, and economy.

Then those practitioners gradually expand their scope and routes, which frequently intersect in global issues, especially GHG emissions. Local authorities can use innovative economic tools to improve the environmental friendliness of agro-food chains on their territory. Through public procurement policy, for example, they can deliver signals to the most pragmatic farmers in order to help them reconsider their economic vision and environmental impact.

Therefore further improvements need transversal awareness of environment, agriculture and their interactions. A systemic viewpoint is needed to understand the links between the factors, going beyond specialised knowledge on each one. New relations are established by consumers, producers and authorities linking local and global challenges on environmental issues, especially to reduce GHG emissions.

In wider discussions over reducing GHG emissions from agriculture, this aim has become a rationale to invest in scientific research towards technological innovation which could use resources more efficiently. Although such efforts may be worthwhile, they ignore or even marginalise farmers' organisational innovations which significantly reduce GHG emissions. Already available, such solutions could be implemented rapidly and at low cost. The main obstacles are farmers' and institutions' mindsets, which therefore warrant research towards overcoming them.

To help promote such improvements, we identified two main questions that need research:

- Evaluation of the efficiency of diverse food chains regarding global environmental issues (e.g. global warming, carbon emissions, energy consumption). As we show above, the broad range of results impedes actors from having a clear view of what can be done. At the same time, there are potentially high improvements to be gained.
- Relations between local and global issues on environment. It has been frequently declared that aiming to improve water quality helps to lower GHG emissions. It sounds interesting as an awareness-raising tool, in a way that links local and global purposes, but there are few scientific studies to inform the debate.

To inform debate on EU policy for agricultural research, sustainable development and innovation.

This objective depends on the latter one. The production of conclusions will probably occur with the implementation of measures drawn from the mid-term health check of the CAP. It is waited that part of the funding of the first pillar will be injected in the second one. The environment dimension in the first pillar is mainly pursued through cross-compliance. The results observed in Brittany are very poor. Better results through EAFRD are a challenging objective. Environmental quality is goal of the 2nd axis of EAFRD. The tools that have been implemented till now are classical: subsidies for environment friendly practices. But the stimulation of better environmental practice through government purchase is now growing in every country: in Brittany, it is used by cities, counties and region. The national government also promotes such a policy. Environmental policies led by local authorities have proven efficient to solve environmental problems: the city of München has bettered the quality of water through direct contracts with local farmers. We question that arises is the feasibility of such policies using public and private demand for food instead of contracts, whose administrative costs are very high. Axis 3 of the EAFRD could feed initiatives.

A French researcher has proposed a total revision of the CAP in this way. Part of the CAP funding could be transferred to local authorities in order to let them have an important budget for catering and

promoting local food networks. This proposal has be criticized from financial and political points of view. Our results will bring new arguments to discuss it from an environmental efficiency perspective.

4 Relevance to Overall Project:

4.1 Cooperative Research aspects

All FRCIVAM employees are basically extension agents, not full-time researchers. But our common culture has led research to become the major training tool for extension agents. They directly participate in research activities, as well as presenting the results.

The CIVAM intervention method is traditionally based on *education populaire* (popular education). Those methods, adopted by the CIVAM movement since the late 1950s, consider knowledge exchanges as the basis for developing new knowledge and skills. It is used for farmers' training. Peer groups focus on identifying, analysing and improving the best know-how inside the group, with external help from experts, such as academics. Those experts often comment that these sessions are also a training period for them, because many farmers are experts or field researchers through their experimentation and innovation.

In many ways, our way of carrying out the CRÊPE project is similar to the one we have applied in farmers' training sessions. But it took us more than one year to discover this similarity. In our CRÊPE meetings:

- The "peer group" is composed of extension agents, aiming to improve their skills in rural development, and in the case of CRÊPE, on short food-supply chains ;
- The "external experts" are the formal researchers who help the group to consider new methods or new references or new links with other issues;
- The boundary between "external" and "internal" participants is quickly eliminated through co-operative tasks in which everyone is alternatively expert and student;
- The function remains the same as in training sessions and could be named "capacity building" or "empowerment". But it focuses on new theoretical abilities through research, instead of new concrete skills through experiment.

When combining all participants in a single meeting, the whole group did not encounter serious problems. For us "serious" problems are the ones that remain unsolved or without a method and an agenda to solve them at the end of a meeting. Regarding this lack of serious problems, we had f the following hypotheses:

- CRÊPE gathers researchers and non-researchers who are used to work with each other and have a common culture ;
- Most participants in CRÊPE are hybrid workers who have lived a part of their professional life both in research and in extension, or have overlapped with the other "culture" in a professional way (researchers as experts to associations or authorities, extension agents who published recognized scientific papers);
- Field work and joint responsibility with trainees helped develop co-operative tasks and approaches inside the group, and close connections inside pairs of orientators ;
- The issues that were addressed are still poorly documented.
- The discussions were not undermined by power or finance conflicts that happen when an issue gets very competitive in institutional ways.

We now come to a very simple hypothesis: The CRÊPE co-operative research has been successful in our case because of the influence and know-how developed through popular education, in particular:

- by direct contact as a professional tool for non-professional researchers ;
- by indirect reference, through participatory methods or territorial dialogue, for researchers.

This conclusion leads us back to the "common culture" hypothesis – no longer as a vague impression, but rather as an interpretation that came to light through many observations.

Popular education has been the core of the CIVAM movement since the 1950s. It had first been used to promote farmers' participation in the "modernization" movement that afterwards led to productivist agriculture. It was the first farmers' organization in France that clearly and officially highlighted the environmental (pollution, loss of biodiversity) and social (concentration of land, ever-decreasing number of rural inhabitants) damage of mainstream agriculture. It thus kept the political and philosophical core of popular education, but was updated through three major influences:

- Environmental care is a concept that was adopted years before the word "sustainable development" appeared. This environmental care was a way of thinking that can complement economic efficiency or social health.
- *Territoire* is a way of thinking about farming and its local functions. In French this word integrates both physical and social characteristics of a geographical area, which is mainly

described through its inhabitants' common feeling of belonging. Often it can be best translated in English by "community". This way of "thinking agriculture" had been progressively forgotten under the domination of *filières*, chains that aggregate all practitioners in a single product (for example there is a milk or a pork *filière*). This approach led to an over-estimation of technical specialized skills and knowledge, given that territorial approaches need inter-disciplinary methods.
- *Économie sociale et solidaire* had been used by CIVAM groups since the movement was launched, through small co-ops or collective equipment. But it has been formalized afterwards and gave a name to existing practices.

We thus conclude:
- that co-operative research is highly dependent on its social context, and
- that national or regional peculiarities, extraneous to the research field, strongly shape the context and progress of its performance and results.

4.2 Agri-environmental sustainability issues

Sustainability: To analyse diverse accounts of sustainability arise in agri-production systems (including accounts of environment, innovation and alternatives).

Our results are highly specific to the Breton context. To summarize the situation:
- There is a strong domination of long food-supply chains, specialized in animal husbandry (55% of pork meat in France, 40% of poultry, 25% of the milk) and some vegetables, cultivated in monoculture (artichoke, cauliflower) ;
- Competitiveness is focused on large quantities and low prices, which has led farmers to produce and market basic commodities, with a low added value ;
- Technical excellence and production skills are considered the "one best way" to compete ;
- Huge co-operative organizations have appeared, providing the stakeholders with inputs and commercial services, and making them feel strangers to the commercialisation system that is led by supermarkets chains ;
- Farmers' professional skills in technical and production management are over-estimated, while their commercial capacities are devalued.

In this context of agro-industrial practices, the environment is considered something external to the farm. Most productivist farms follow the *hors sol (*"out of ground") scheme, where natural spaces mainly serve as pollution sinks, whilst the production system becomes highly artificial, dependent upon chemical inputs. The environment is seen as a "*charge*" (meaning a burden and expense) that is mainly used by authorities to impose tasks and taxes upon farmers.

Our research has shown that re-integrating the farmers' responsibility for their own commercialisation scheme, through short supply chains, leads to a new vision of the environment: It becomes an internal resource that can provide the whole farm system with free inputs and ecosystem services. In this way, the route is no longer to shape environment according to technical external rules, but rather to adapt the whole agricultural system to potentials of the farm territory. The environment becomes a benefit, both for the farmer's (and his family's) needs and pleasure and the whole society.

From our study of how farmers develop short food-supply chains, we identified three distinct routes. The first is followed by farmers who use short chains for only a small proportion of their turnover, as a complementary means to enhance profitability. They continue the conventional model, seeking technical excellence in production and high apparent productivity through large-scale commodity production. The second route is followed by farmers who progressively shifted more of their production through local sales, while also changing their vision of added value. Discovering that they could gain higher prices, they tried to improve their economic efficiency by reducing their input costs (e.g. fertilizers, pesticides). Through this pragmatic approach, a lower environmental impact becomes an extra gain, although it is not pursued for itself. The third group is composed of farmers who have a social and environmental commitment as activists. They always aimed to implement an environment-friendly system, e.g. through organic or low-input production methods.

For improving the environmental practices of farmers, the second group is a major target, given that the first group would be difficult to change and the third one already implements environmentally-friendly methods. For the second group, the environment is initially seen as an externality that can provide the farming system with free resources. Later this environmental care turns into a commercial argument and is thus maintained. This pragmatic basis has great potential for expansion to more farmers.

Expanding SFCs illustrates the development of Agricultural Knowledge Systems (AKS), as highlighted by the SCAR expert report:

> AKSs for instance would focus on ways to reduce the length of food chains, encourage local and regional markets, give more scope for development and marketing of seeds of indigenous crop varieties and foodstuffs, and restore the diversity of within-field genetic material, as well as of farming systems and landscape mosaics (SCAR CEG, 2008: 42).

Sustainable agriculture has been evaluated in France through diverse methods and schema. But most studies focus on technical factors. Dealing with direct sales makes farmers consider that sustainability of the production system is not enough to guarantee an overall sustainability of the farm. The commercial scheme is more clearly perceived as a core factor of sustainability by those that have had the opportunity to think about it, in particular when they do sales through short chains. As another option for farmers, they can reconsider commercial strategies as a key factor of environmental sustainability when a crisis erupts. That has happened in 2009 in Brittany with the milk crisis, due to low farm-gate prices.

By re-integrating SFCs in farm management, farmers reconsider their relation to the environment and their definition of sustainable agriculture.

The second main finding deals with the relation established by consumers, producers and authorities linking local and global challenges on environmental issues. The research on greenhouse gas emissions showed diverse field practices with a very broad range of results regarding global environmental factors. Given that diversity within short supply chains, average data make no sense for a particular initiative. From that perspective, controversy over energy costs and carbon emissions – generally contrasting long versus short supply chains – over-generalise about those categories, thus downplaying their diversity.

When analysing the practitioners' discourse, it appeared that short food-supply chains are a way to link local and global challenges. Those arguments are clear in the most committed groups of consumers – AMAPs, or collective shops of farmers. Through local sales they aim both to improve the local environment (e.g. water quality, better agricultural practices, organic agriculture, landscape) and to lower pressures on global environmental resources (e.g. energy, ozone, global warming).

The third main finding confirmed this approach in a radically different context. Our research carried out long interviews with local authority representatives and employees to explore their expectations for environmental benefits when they promote short food chains on their territory. The results are very clear. At first they pursue local improvements: quality of water, landscape, biodiversity, fertility. Those aims are diverse because people who deal with food chains have different functions: environment, agriculture, planning, and economy. But those practitioners gradually expand their scope and routes, which frequently intersect in global issues: in particular, climate change is an issue that affects everyone, independently of one's political or administrative function.

Short food chains are a way of linking local challenges to global threats, and then to reconsider environmental issues in a more systemic way.

4.3 Priority-setting

Priority-setting: To relate research more closely to societal needs, as a means to inform policy debate and research priorities for Europe as a 'Knowledge-Based Society'.

As the previous sections show, no single knowledge field is especially relevant for environmental issues. All our studies showed that research priorities depend on territorialized analysis and context. More than specialized knowledge, what is needed is transversal awareness of environment, agriculture and their interactions. A systemic viewpoint is needed to understand the links between the factors. In the Breton context, such a strategy is not easy to develop. Most of the practitioners are still highly committed to short supply chains development, and according to a personal priority, e.g. climate change, quality of water, health and food. Putting in perspective those individual core motives is sometimes perceived by farmers as aggressive.

Nevertheless, we identified two main questions that remain poorly documented and so need more research:

- Efficiency of diverse food chains regarding global environmental issues (global warming, carbon emissions, energy consumption). We showed that the broad range of results impedes actors from having a clear view of what can be done. At the same time, an optimistic version sees potentially great improvements to be gained.
- Relations between local and global issues on environment. It has been frequently declared that choosing as an objective to improve the water quality influences lower emissions of greenhouse gases. It sounds interesting as an awareness-raising tool, in a way that does not oppose local and global purposes. But unfortunately there are few scientific studies to inform the debate.

4.4 Solutions

Solutions: To suggest alternative solutions related to different understandings of societal problems, agri-environmental issues and sustainable development

SFCs have analogies to fair trade. Both attempt to change daily consumption habits to address sustainability problems. The development of fair trade teaches that a once-idealistic concept can achieve a widely recognized status. Likewise there is a growing consumer consciousness about the environmental impacts of their food habits, and their shared responsibility on environment at local and global level. Short food supply chains (SFCs) build upon this growing awareness. Moreover, SFCs can implement tools which reduce the environmental impacts of both food production and distribution. It illustrates new societal directions where citizens (as producers and consumers) and local authorities build more participatory governance methods to address environmental questions. .

In a short period, co-operative research has clearly shown its benefits

- The research questions that have been identified before our application where virtual in social debate. Joint discussions of CSOs and researchers have highlighted some common feelings that could be soon part of public debate. This emergence happened, at a level we did not expect, with the objectives of the *Grenelle de l'Environnement*. The conclusion is that *co-operative research helps raise prospective questions for social debate*.
- The overlap of CRÊPE with a regional co-operative research project SALT (Systemes Alimentaires Territorialisés) helped us identify research resources when we saw that our planned methodology to study farm-level interactions between environment and direct sales could not be used. Thus *co-operative research is quickly cumulative*: the more an institution is used to it, the more it is able to participate effectively in a new one. By contrast, we also got involved in another project, with untried stakeholders: six months after the launching of the project, we remain keep disappointed by the difficulties in co-operation.
- CRÊPE raised the level of credibility of our interventions as a CSO. FRCIVAM Brittany alone would have been unable, on the basis of its own argumentation, to convince local authorities to consider that the questions posed need attention. Research partners alone would have had the same problems, for other reasons. A double treatment of the same question, scientifically and practically, made it possible to launch partnerships with authorities (Rennes city council, Terres en Villes) on the relations between short food chains and environment. *Co-operative research is a source of credibility to put questions on the political agenda of local authorities*.

In wider discussions over reducing GHG emissions from agriculture, this aim has become a rationale to invest in scientific research towards technological innovation which could use resources more efficiently. Although such efforts may be worthwhile, they ignore or even marginalise farmers' organisational innovations which significantly reduce GHG emissions. Already available, such solutions could be implemented rapidly and at low cost. The main obstacles are farmers' and institutions' mindsets, as well as government policies, which therefore need more research towards overcoming them.

We have not yet identified overall solutions in order to improve the environmental effects of agricultural systems. As a conclusion from our research, there are no ready-made universal solutions. But tailor-made local policies can promote short supply chains as a tool to address environmental concerns; they can obtain a large benefit for a minimal investment. We have proposed how authorities can promote local food networks for several societal benefits.

Until recently, most public interventions on environmental issues have been based on law (new rules) or direct economic incentives (subsidies, grants). Alternative food networks have found little scope to gain support from public authorities, e.g. via policies on rural development or public procurement (*restauration collective*). As our research reveals, local authorities now use indirect incentives (e.g.

public procurement, creation of sales points, information on local products) for local sales to gain local environmental benefits that will also address global issues.

Indeed, our research has helped to persuade some local authorities to give such support through new policies. In the Brittany regional context, agro-food policy is still dominated by agri-industrial farming interests. Short food supply chains could not gain support through political lobbying, especially by criticising agri-industrial systems. As a different strategy, our research has highlighted environmental advantages of short food supply chains, especially in the wider policy context of climate change and food insecurity.

We propose a political route for realising those potential advantages through concrete policies:

i. formal identification of agriculture-related environmental issues on a territory and thus priorities;
ii. socio-anthropological exploration of farmers' mindsets on environmental and commercialisation issues, in order to evaluate their position on practical change;
iii. comparison of potential problems that could be tackled through short chains and the local political agenda, involving all stakeholders inside the local authority, in order to create a common culture and a shared vision;
iv. once the political context of a development programme is shared inside the local authority (elected representatives and staff), turn back to local actors in order to identify the means, resources and methods that are required.

In the case of Brittany, this apparently simple scheme is not easy to implement. The limits of local authorities make it difficult to find an administrative level that has the financial resources, the legal competence, the trained staff and the social legitimacy to implement such a policy. It seems that metropolitan authorities, such as members of the *Terres en Villes* project, concentrate those requirements.

However, the ability of those already-strong actors to intervene in this new field can undermine weaker institutions, especially rural communities, which lack the capacity to initiate such policies. These can become a tool to strengthen the cities' power over agriculture, and thus weaken the choices that can be made by rural practitioners themselves.

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