SCIENTIFIC SUPPORT PLAN FOR A SUSTAINABLE DEVELOPMENT POLICY

SPSD II

INSTRUMENTS AND INSTITUTIONS TO DEVELOP LOCAL FOOD SYSTEMS

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PART 1

SUSTAINABLE PRODUCTION AND CONSUMPTION PATTERNS

GENERAL ISSUES

AGRO-FOOD

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SCIENTIFIC SUPPORT PLAN FOR A SUSTAINABLE DEVELOPMENT POLICY
(SPSD II)

Part 1:
Sustainable production and consumption patterns

FINAL REPORT

INSTRUMENTS AND INSTITUTIONS
TO DEVELOP LOCAL FOOD SYSTEMS

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INTRODUCTION

Context

Local food systems (LFS) are systems in which consumers prefer to buy their food from local sources for both social and environmental reasons. Often, but not necessarily, such systems are based on direct contact between producers and consumers. The role of intermediary institutions, both governmental and non-governmental, is often a prerequisite for the establishment and sustainability of local food systems.

Since the 1990s, there is increasing interest from consumers in local food systems. Key to local food systems is that consumers purchase their food from predominantly local sources. A host of marketing channels is used for this: on-farm sales, farmers’ markets, community-supported agriculture, farmer cooperatives, box schemes and various other ways. But also institutions such as food banks, school lunch programmes, local nutrition education and food policy councils can be part of local food systems. As the central theme of local food systems is that the distance from producer to consumer is as short as possible, they are often denoted as short supply chains.

Local food systems are also argued to be a key component to promote the sustainability of agriculture. A particular concept describing LFS is the foodshed that consists of “self-reliant, locally or regionally based food systems comprised of diversified farms using sustainable practices to supply fresher, more nutritious foodstuffs to small-scale processors and consumers to whom producers are linked by the bonds of community as well as economy” (Kloppenburg et al., 1996). The term foodshed, borrowed from the concept of a watershed, was coined as early as 1929 to describe the flow of food from the area where it is grown into the place where it is consumed. Recently, the term has been revived as a way of looking at and thinking about local, sustainable food systems.

The establishment of local food systems is based on a combination of supply-driven, demand-driven and institutional factors. The most crucial factor in the emergence of local food systems is the consumer. Research has confirmed the importance of consumer concern for food safety, animal welfare, environmental effects, regional development and the interest in better quality and fresher food (Nygard and Storstad, 1998; Hinrichs, 2000; Vannoppen et al., 2001; La Trobe, 2001; Weatherell et al., 2003). Part of the reason can be found on the supply side. Farmers turn to direct marketing practices as a key strategy for survival. However, to establish local food systems substantial transaction costs need to be overcome. Cooperation is crucial in saving on such transaction costs (Verhaegen and Van Huylenbroeck, 2001). Finally, various governmental and non-governmental institutions can facilitate the emergence of local food systems.
In Belgium, current local food systems find their origin in farmers’ markets in the beginning of the 1980s. Later, also vegetable box schemes were established following Dutch examples. Food teams have been established since 1996. Presently, efforts to stimulate local food consumption are predominantly organic produce.

Pretty (2002) argues that local food systems or foodsheds have two aims: (1) to eliminate some of the negative transport externalities by shortening the supply chain, and (2) to help build trust between producers and consumers, ensuring that more of the money spent on food actually gets back to farmers.

With respect to the environmental impact of local food systems, a small number of studies have emerged in the literature in recent years. Some studies are limited to relatively qualitative assessments of the impact on the environment. Most quantitative studies focus on the negative transport externalities characterizing different food supply chains like food miles (e.g., Halweil, 2002), life cycle assessment (Carlsson-Kanyama et al., 2003), carbon dioxide emissions (Jones, 2002) and the ecological footprint (Wackernagel and Rees, 1996; Gerbens-Leenens et al., 2002).

Objectives and expected outcomes

The aim of this project is to investigate whether LFS can contribute to more sustainable production and consumption patterns and how the development of such systems can be stimulated.

The objectives and expected outcomes of the project as originally laid out are:

1. to make an inventory of indicators and instruments used to increase citizens' awareness of the environmental, economic and social impact of different food systems (chapter 1),

2. to develop a scientifically sound set of indicators for Flanders after analysing their validity and to introduce these indicators as instruments to be used by institutions dealing with these issues (chapter 2),

3. to make an inventory of existing LFS in Flanders and of the institutions that facilitate their establishment and working (chapter 3),

4. to investigate the potential to expand LFS by both institutions already active in this field and other institutions and to facilitate the implementation of this potential (chapter 4),

5. to synthesize and disseminate these results by the establishment of a website, the publication of a book and other material targeted at a wide audience and the production of scientific publications (chapter 5).

CHAPTER 1

INVENTORY OF INDICATORS AND INSTRUMENTS CHARACTERIZING LOCAL FOOD SYSTEMS

1.1. Definition, characterisation and typology

Local food systems (LFS), as we define them, include the entire chain of producing, processing, selling and consuming food. They are systems which allow a direct contact between consumers and producers, and/or in which consumers and producers enter into a long-term contractual relation with one another. The distance between the different actors should remain limited (geographically as well as for the number of links in the chain). In this project the focus is specifically on LFS with a 'network character'. This means that food systems that are also local, but more on an individual basis, like on-farm sale, are not included here. We are aware of the limited selection we make, but many conclusions are also applicable to local food systems without a network nature, especially the economic and ecological ones. Therefore, throughout the further text LFS will mean 'LFS with a network character' unless specified differently.

Within the network approach, each business is active in an internal and in an external network of connections to buyers, sellers, partners and government agencies. The internal network includes the mutual links between the actors concerned (consumers, producers, relevant authorities,...), whereas the external network refers to relations with parties who are not involved in the network in the first place. For instance, consumers and producers from the mainstream food circuit belong to such an external network. We see MFS as the marketing system resulting in one-stop shopping market points where consumers enter freely and are offered a wide range of products on almost every moment of the week.

Cooperation in a chain implies certain competences. These are the technologies and skills the chain partners obtain through their mutual relations. When small-scale processing industry and shops are taken into account in the local food networks, it is clear that these stakeholders have a weaker position as concerns policy practice, in comparison to their colleagues in the mainstream food circuit (Vergunst, 2001). At this level, networking can unite and reinforce the voices of these small-scale initiatives.

The concept of 'food sheds' (analogous to the concept of water sheds) is being referred to in order to offer a framework for the origin of our food and the way it reaches us. In that sense, the concept is an additional framework of ideas for the description of LFS. Getz (1991) defines the 'food shed' as the area characterized by a well defined structure of food supply, taking into account the following principles:

- The principle of a moral economy: food production is less and less aimed at feeding people, but it mostly serves some profit objective of the various parties involved. When structures within food sheds are examined, social standards (like human liberties, pleausure,…) and ecological standards also count, apart from economic standards;

- The principle of the 'commensal community': people who eat together, thus create sustainable relationships and reinforce again the connection between human beings and land. These relationships pave the path towards a less harmful food production;

- A tactic of self-defence by the farmers, withdrawing from the dominating systems and offering alternatives for them. That way, the globalization is softly undermined, not by fighting it but by offering alternatives;

- Proximity as a foundation for a food shed: local and regional. Thus the dependence on other places is being reduced and economic values and jobs are maintained. An increase in local and intra-regional food production, processing and distribution serves the local economy: it means job creation on the one hand, and income for the local community on the other;

- Nature as a measure for the limitations that have to be respected.

Within the food shed concept, food is central as a model in which relations are being built that are beyond the mainstream market: relations between people, social groups and institutions. Such relations have been weakening during the past years, under the influence of increasing globalization and individualization.

1.2. Factors influencing the development of LFS

Local food systems can develop, among other settings, where the mainstream food system does not respond to some aspirations of consumers, producers and even society at large. In this case, they react upon a number of sensitive points:

- LFS offer an alternative to the consumer in search of sustainability, for instance, with reference to the origin of a food product (this can be identified by the distance covered by the product). Furthermore, LFS rather tend to test and follow alternative production methods;

- When a producer opts for an LFS, capital does not seem to be the most important aspect. Factors such as management and time are more important.

- Participation in alternative food systems builds towards/upon links of trust with and between producers and consumers, embedded in communities.

Throughout history, many examples can be found where the prevailing food system no longer fulfils the demands of all consumers. The recent food crises can be kept in mind as a big example. For example, when the rise of farmers' markets is being studied, these crises appear to be an important factor in their development.

The competitive advantages of local marketing are manifold (Halweil, 2002). They concern among others the freshness, the supply of less known products, detailed information about food production methods and the possibility to reinforce the social ties with the client. In the case of more global food systems, the relations between producers and consumers can be considered distanced and anonymous, whereas these relations in a local, direct market are rather direct, personal and embedded in a shared environment (Hinrichs, 2000).

In the following sections, we distinguish three main groups of factors influencing the development of LFS. A number of factors can be filled in or underlined from the producers' side or from the consumers' side. A third group of aspects goes beyond this division between producers and consumers, and in fact concerns the entire society.

1.2.1. Community level factors

1.2.1.1. Revalorisation of the local aspects in the globalisation

Globalisation

Is it desirable to bring together the populations of the entire world in one global economy? This is a very heavy question, certainly within the food world, all the more if we know that more than half of the world population (especially in the south), is depending on local economies to foresee in its basic needs. Apart from that, some claim that in the Western society food reaches us through a food system which is destructive for natural and social communities. Globalisation caused among other things that food today travels a distance 50% longer than compared to 1979. An important cause of this fact is the increasing separation between the people and the land they live on (Pretty, 2004).

An increase in the scale of production and a concentration of the power in the food chain are some other important consequences of this separation. Only some (rather large-scale and strongly specialized) farmers are able to survive. They stay in touch with a relatively limited number of food processes in a strongly vertically integrated system. The different stakeholders (raw material producers, processing industries and distribution channels) are more and more interwoven and become increasingly controlled by only a few large actors. Large-scale, industrial agriculture is very rarely organized in order to supply local markets. Most consumers therefore depend on food that has been produced elsewhere. Agricultural products evolve to being chemical components for the production of an enormous range of processed food products whereby the consumer is ignorant about origin and composition.

Localisation

Localisation is a counter-reaction to this globalisation. It does not mean that every community should be self-sufficient, but it does imply the search for an equilibrium between global trade and local production. Diversification of economic activity and reducing the distance between producer and consumer are important factors considered (Norberg-Hodge et al., 2002). The habits of long distance food are slowly being weakened under the influence of a world-wide 'local food' movement. The 'Slow Food Movement' is the largest international, organised movement against culinary imperialism. It strives, among other things, towards maintaining the social value of good food, by bringing persons together (Halweil, 2003).

The concept of food sovereignty

A number of consumers appear to feel more connected to local products. Factors such as tradition, conviction, pride, habit and ecological consciousness are part of the selection process. In this sense, the concept of food sovereignty includes the right of peoples, societies and regions to decide autonomously about how they will provide in their food (security). The own production of (basic) food seems to increase the autonomy (e.g. that way, food does not become a trading token in other negotiations). Economists however argue that long distance trade in food may be efficient because of the low production costs, the important scale advantages and the increasing specialisation. In the resulting agricultural systems, self-sufficiency and the right of the community to take its own decisions often disappear.

The real price of food

Apart from the production costs of food, also costs and benefits concerning the environment, rural scenery and farming communities should be taken into account (Halweil, 2002) (positive and negative externalities). Subsidised transport for one thing (roads, airplanes, ships) plays an important role in LFS. These costs are usually not taken into account while setting a product's price, as they are financed by subsidising. That means the overview about the real price of the food product is actually lost. Modern agriculture may seem to be very successful when, as is often the case, these costly side effects are not considered. That way, the large-scale trade in food products appears to be the best adapted to a global, centralised market. Within the evolution toward LFS, however, there is a growing group of people that thinks a correct price, in which externalities are included in the price setting and the farmers receive a fair pay for their labour, is important.

Support from the community

Local alternatives can be supported from within the community. Taking care of the agricultural base is essential in this matter. Furthermore, infrastructure and expertise can help to compete through the local market against a strongly concentrated food system. It is remarkable that also many supermarkets see local food as the next important development in the food distribution. In Great Britain, there is growing consciousness that local food is not only less susceptible for corruption, but also cheaper, tastier and nicer (Halweil, 2002).

1.2.1.2. Social capital

Local food systems are in part based on the mutual confidence between producers on the one hand, and between producers and consumers on the other hand. Thus, the producer trusts the consumer to keep his promises about buying crops that are planned and planted with the consumer's contribution. The consumer on the other hand trusts that the quality and freshness of the products offered will be good (Réviron et al., 2004). The mutual trust between producers is equally essential. For instance, crop agreements are made which can, if not complied with, cause an important (financial) loss. When consumers gather to buy produce directly (as happens, for instance, within food teams), there are always persons who accept a certain responsibility and dislike to harm the trust placed upon them by the rest of the group. This trust is an important aspect of the social capital built within LFS.

At micro-level, social capital is defined as the possibility of an individual to mobilise resources from the social networks (s)he belongs to (Komter et al., 2000). In analogy, Meadows et al. (1972) define social capital as a stock of characteristics (knowledge, trust, efficiency, honesty,...) that do not belong to the individual alone but to the human collective. Bourdieu (1992) mentions that this social capital comes forth from a more or less institutionalised network of relations of mutual trust and gratitude, which offers the backup of collective capital property to each one of its members. Social capital allows for an individual effort towards the collective. Knowledge sharing is a means to build social capital (Carayannis et al., 2000). Finally, Bourdieu mentions that social capital is also closely linked to cultural capital (such as knowledge, degrees,...). Also, social obligations (relations) can under certain conditions be exchanged to become economic capital. Cultural capital in its turn can facilitate the access to certain networks, while certain social networks can also lead to the accumulation of new knowledge and skills.

Within the development of social capital theories, two schools can be distinguished. The first one sees social capital as a community resource which groups or societies can recur to for collective action. The second one views social capital as a production means fed by the social relations in a community or group, which the members of a society or group can own (Dessein et al., 2004). Both interpretations are important when looking at the social sustainability of networks. Indeed, the importance for the network as a whole as well as for the different individuals can thus be taken into account.

1.2.1.3. Ethical and sustainable consumption, incl. support for the local economy

Within local food systems, the producers see selling rather as building a long term relationship with the client. Selling then becomes a beneficial exchange for both producer and client. In local systems, the client for example buys his/her organic products not in the first place because of the procedures followed, but because of the trust placed upon the persons who grow the products.

The shift from "Gemeinschaft" (community) to "Gesellschaft" (company/ society) is parallel to the current modernisation process in which persons become alienated from their own local environment and start leading a more individual, more rational life. This is mainly so for social relations, but also for the relationship of the human beings with ecosystems and nature. The tendency to maximize economic benefits becomes dominant over the social and ecological benefits (Borgström Hansson and Wackernagel, 1999). It is this tendency to which the evolution towards a more ethical and sustainable consumption wishes to react.

Halweil (2002) considers that the most important loss caused by the globalisation of markets is reflected by the fact that capital no longer circulates locally. It can be argued that a local food system benefits in the first place the rich consumers of a community. This is when one thinks that mainly niche products will be marketed, products which are enjoyed by the more well-off classes. However, poorer people also can enjoy the benefits that local food systems bring along: basic products are often available on local markets at better prices. As it is, producers who are committed to local markets are searching alternatives for common wholesalers, and search in these initiatives a distribution channel for their basic products as well as for processed products. It has been mentioned in several occasions that the money spent locally leads to twice as much income for the local economy compared to the money that arrives in the global food circuit (Sacks, 2002). However, it appears to be very difficult to develop a clear and all-embracing method to measure these local investments.

When the aspect of ethical production is considered, it appears that a group of consumers thinks that only organic produce can be marketed through LFS. However, when a farmers' market (for example) is meant to support the local economy and the countryside, then it should be open for all local food producers and not only focus on organically grown food. Nor does the discourse for local markets advocate a unilaterally local food production. It is recognised that a certain degree of food trade is important and favourable for the community.

1.2.2. Factors at consumer level

1.2.2.1. Authenticity and quality of food products

From the consumers' side there is an increasing demand for 'original' and real products (Tregear et al., 1998). The typical answer from the industry concerning the desires of those consumers who demand authenticity and quality, is to standardize the supply and always draw the attention to a specific aspect of the food, like the way it is prepared, the ingredients or the environment it is offered in. However, some specific consumer groups have quite a different opinion concerning authenticity and quality. From this point of view, standardizing has little point. According to Brunsø et al (2002), food quality has four important dimensions from the consumer's point of view: taste and appearance, health, convenience (being the aspects with the most increasing importance) and processing. Apart from that, also extrinsic characteristics such as respect for environment and for animal well-being and social contacts (relations with the producer) can play an important role for a group of consumers.

Research has shown that taste and looks are the most important aspects for choosing food. In this, the consumers' expectations are formed by the information available at the time of purchase. When comparing LFS with mainstream sales channels, one can notice that the information given with the products is importantly different for both systems. Producers within the LFS indicate that the direct contact with the consumer allows them to give the information along with the products orally. In this way, sensitivities concerning a specific product (for instance determined by weather circumstances) can be explained and the appearance is no longer the main drive to choose a certain product. It is logical that for one consumer the above mentioned dimensions are more important than for the other. For instance, there is on one side the unconcerned consumer (rather directed towards convenience), and on the other side the rational or the adventurous consumer (who would rather look at health and processing of the products). Every consumer has to be addressed in a different way in order to come to a more sustainable food consumption. Marketing strategies, but also e.g. the Slow Food movement, are eager to attend to this.

1.2.2.2. Consumer motivation

It is slowly becoming clear that individual consumer decisions make a difference for the entire community (Libby, 2004), in the financial, ecological and social field. It is therefore important to pay attention to the consumer philosophy.

Various studies have been carried out to examine the motivation of consumers to use certain products. It seems that not only the own well-being is important, but that the consumer also takes into account other social aims (O'Hara and Stagl, 2002). Subjects such as equity and dignity in social relations do play a role in consumer preferences. For example, the principal objective of the local network of 'Community Supported Agriculture' (CSA) is to provide consumers with healthy, locally grown food. Apart from that, other important aspects are the local food economy, local food security, the protection of the environment and the maintenance of small-scale family farms that produce food. Through this CSA, the consumer is made conscious about regional food systems. A continuous and direct contact between the various actors is crucial to bring about the cooperation.

A continuously growing group of consumers questions the origin of food, the way it is produced and who it is produced by (Hendrickson and Hefferman, 2002). These consumers usually choose alternatives for the food that is being produced on a large scale, and base themselves on social and economic justice, as well as on the ecological impact of industrialised food systems and the concern for small farmers and rural communities. For Whatmore (1995), the rejection by certain consumers of industrial food production is an important basis for new cooperative associations and networks between consumers and farmers.

To conclude the subject of consumer motivation, one can say that consumers choose certain products based on a combination of personal desires and the options of the product to fulfil these desires. Earlier research (Vackier et al., 2003) indicates three important motivation structures in consumers' choice, in favour of sustainable food products:

- health and the security that a product is not damaging from an individual health perspective, are a primary motivation;
- in the second place, one can notice a hedonistic cluster of factors: the value of enjoying a meal;
- a third cluster comprises a number of values that favour the entire community. One can say that the foundation thereof is the longing for a group feeling. This third cluster seems, compared to the other two, to come more to the surface when one is searching a common denominator of different initiatives.

The consumer seems to behave in a rather automatic way once his/her needs are fulfilled (Vackier et al., 2003). However, when (s)he remains "hungry" in certain fields, (s)he invests more (effort/time/money/...) in the decision process for his/her food purchases.

1.2.2.3. The importance of food safety

When considering the safety of food, one has to take into account that consumers and scientists interpret this concept in a very different way. For the consumer, it is about experiencing safety, which is – provided they fulfill his demands – translated into the willingness to pay a higher price. Also, these perceptions are strongly different according to the background of the consumer or the product considered.

On the one hand, institutions such as the Belgian Federal Agency for Food Security (FAVV) estimate and manage risks based on the technical and scientific knowledge built up by experts. On the other hand, some food consumers tend to have lost their confidence in agriculture and the techno-science that surrounds it, due to various successive crises. However, they lost confidence not only in agriculture (science), but just as well in the established (political) institutions like the Federal Agency for Food Security, the Belgian Federal government, the Flemish government or the European Commission and their measures (Wynne, 2004). As a result, part of those consumers confides more in shorter circuits for their food. The loss in confidence after food crises often fades away after a while, and with this also the consumption in shorter food circuits.

Whereas the official institutions and the scientists wish to mend the trust through elements such as traceability, the shorter chains consider risk in a more holistic way: elements of local development, animal wellbeing, care for the environment. When inquiring with consumers, this strong control possibility over the food they eat appears to play an important part in the choice for local food. This can be concluded among other things from the rise of farmers' markets as local food systems, as a consequence of for instance the dioxin crisis. The perceived control concerning food security can be limited to a consumer idea, without effectively increasing the security compared to the usual trade. The above-mentioned confidence between consumers and producers is therefore extremely important. A producer of Herve cheese notices (Nieuwsblad, 25.09.2004) that the existence of the Slow Food movement is a good thing to make consumers more conscious of everything. He regrets that traditional food and artisan products are often discouraged by the government under the mask of food safety. Extremely forced measures in the field of hygiene would undermine the natural defense system rather than to contribute to it, he claims.

1.2.2.4. The importance of food security

In less wealthy communities that are rather unattractive for the large food companies, local food remains the best hope for a healthy, balanced food. In the first place, this local food production remains ideal to fulfill the food needs of the population. On the other hand, a diet based on local food supplies is historically optimal for those who live in this environment, and has generally been healthy for the people living in the area (this however was not the case when there was not enough food for all or where there is a general deficiency of certain micronutrients) (Halweil, 2002). Food specialists argue that an important part of the increase in obesity and related diseases around the world can be attributed to the spread of a distinctly non-local diet, that is the fast-food diet that originates in the United States and is defined by large amounts of meat, fired food, sugar and highly processed items.

1.2.2.5. Ethnocentrism

Ethnocentrism is a complex of attitudes whereby a positive attitude towards the in-group is linked to a negative attitude towards out-groups. It arises when indigineous and foreign groups compete for scarce goods (Jacobs et al., 2001). For example, Vandermersch and Mathijs (2004) demonstrate that consumers do not mention the origin as an explicit reason for purchase, but that consumers with ethnocentric motives are more inclined to buy local apple varieties.

1.2.3. Factors at producer level

Farmers already active in LFS advise their colleague farmers to contact their colleague growers because everyone can learn a lot from the experiences of the others, on the growth-technical field as well as on the marketing field (Innovation support point for agriculture and rural regions – Innovatiesteunpunt voor landbouw en platteland, 2003, p. 14). It appears from here that among other things the exchange of knowledge at producers’ level can be an important stimulus to participate in a food network. LFS can further offer common solutions to their members concerning cost of investments, and concerning legislation.

1.2.3.1. Transaction costs

Transaction costs are defined as the costs linked to the organisation of the exchange between different partners (Verhaegen and Van Huylenbroeck, 2001). They concern the information costs linked to building knowledge, needed for the production and marketing of a specific product. Furthermore, also the interaction costs, needed to reach an agreement with a specific partner, are part of the transaction costs. A third cost item to be taken into account concerns the control of living up to agreements made. Innovation in the field of organisation forms is also possible, provided the private transaction costs can be sufficiently reduced that way. When a common action is undertaken, these costs can be carried in group and individual transaction costs seem to decrease. The search for new and trustworthy partners within the conventional market system for instance, brings along important costs (Réviron et al., 2004). Here too, trust is an important factor. An investment in hybrid organisations leads to mutual dependence. Hybride organisations emerge because partners see that they can profit from joint investements. By accepting these, they also accept this mutual dependence. Such confidence in the colleagues who work in a similar way offers extra space for the participating players to invest in other activities.

1.2.3.2. Product differentiation as a reaction to market liberalisation

Farmers in the West are more and more in a situation of increasing production costs in their own country on the one hand, and decreasing world market prices on the other hand. There are enough reasons to question the production for this world market. Studies have demonstrated that diversified, ecological farms are less dependent upon purchased inputs, and that they use ecological processes on the field, have less maintenance costs and use land, nutrients, energy and other inputs in a more efficient way than the chemical, intensive monocultures (Halweil, 2003). That way, product differentiation can go along with an evolution towards sustainable consumption.

1.3. The impact of LFS

In order to assess the impact of LFS, and also to make a comparison between LFS and mainstream food systems (MFS), indicators exist that verify the sustainability of these systems at the social, economic and ecological level. On the social level, these indicators are rather of a qualitative kind, whereas at the economic and certainly the ecological level, hard figures can be reproduced, and compared, more easily. In the next we give a list of the indicators appearing in the literature.

1.3.1. Social impact

Although economic aspects are usually the most important incentive to enter into an LFS, social aspects seem to be more important in the further motivation once one is convinced of the economic necessity (Janzen and de Vlieger, 1999). Communication aspects are very important in order to play on the economic and/or social impulse of the consumer.

In research concerning the social impact of LFS, one can work with a number of existing indicators, which have been previously described. However, it is important to spot the ideas and suggestions that are passed, consciously or not, by the members of an LFS. In this case, it may concern elements that can be found in several LFS, but just as well a single element that is important for a specific player from a specific LFS. This isolated element is equally important when social sustainability of an initiative is assessed, precisely because of the social aspect which is anchored at the individual level as well as at community level.

Just like the factors that are important for the development of LFS have been split up into factors at community, consumer and producer level, the social impact can be split up in an analogous way.

1.3.1.1. Social impact at community level

<u>Description of the network</u>
The presence of a network can raise a certain group feeling within (part of a) community and lead to embedding of its members. Such a coherent community demands a certain dedication from the persons concerned but it also brings along a few delights. The

density of a network can be expressed as the number of relations in a network, possibly also the number of hours per week spent in participating in the organisation of the community. Not a single one of these parameters can be considered separately because the intensity (and not only the duration) of the relations can be important. The dedication shown by the different members of a community should therefore also be described in a differentiated way. An example of a return is the experience of social cohesion by which is meant, among other things, the feeling to be able to fall back on other members of the community.

Impact on the local economy

Studies that measure the impact on the local economy are very limited. For instance, the British 'Retail Planning Form' has calculated that about 276 jobs are lost for every large supermarket opening its doors. When these supermarkets are established outside the centre, the impact on employment is said to be visible in a range of up to 15 km. LFS on the one hand are more inclined to use raw materials and production means from the local markets, and on the other hand they find more labour forces at local level (Sacks, 2002). However, these results cannot be generalized to other contexts.

1.3.1.2. Social impact at consumer level

IFOAM (International Federation of Organic Agriculture Movements) mentions that consumers associate social justice with the organic movement. It concerns an ethical subject, through which means are searched so that all participants in the trade chain can enjoy the benefits. In this sense, the theory is no longer limited to organic agriculture, but the entire food production can be considered. It is clear that the transparency of the food chain is supported to a large extent in LFS.

1.3.1.3. Social impact at producer level

Job satisfaction

When one talks with the producers of an LFS, their participation in a network seems to bring back in a certain way the satisfaction of a job well done, which was considered to have been lost in the agriculture. The producer in an LFS knows who (s)he is growing the crops for, and also takes the desires of the clients into account in production. This can happen at the level of production of raw materials (e.g. more spinach and less turnip in the vegetable box), but also at the processing level (for instance: can we make simple pizzas that most children would like to eat?).

Knowledge and the transfer of knowledge

As soon as there is a certain stability within a network, an exchange of knowledge is possible. It is not only about the knowledge that comes from social and democratic management, but also about the access to this knowledge, and about the possibility to develop this knowledge further (knowledge development not only requires stability, but also a certain form of instability). In this way, the background present in various businesses is in fact common to the network (it is in fact the social capital of the network), and this means for every business separately an extension of its own knowledge (Flora, 1995).

1.3.2. Economic impact

At the economic level, one can also investigate different effects of local food systems. Again, the above-quoted division (community/consumer/ producer) is followed. In general, one can state that the link which is closest to the consumer decides the price setting. When food products are marketed through mainstream systems, this link is usually the retailer. However, when a number of producers take an initiative, they are the last link in the chain, they decide on the price to be set and they receive the added value. Another important aspect of collective initiatives is the saving in development and research costs. For instance, the parent organization of Fruitnet has built knowledge concerning integrated growing methods, and this knowledge is transferred to the members. In this way, farmers have a easier access to information (Verhaegen and Van Huylenbroeck, 2001).

1.3.2.1. Economic impact at community level

In the same way as employment has been mentioned for the social aspect, LFS also contribute to community income in an economic context. This happens through the tax payer on the one hand and through the purchase of local raw materials and production means on the other hand. The fact that money circulates longer locally, is equally important.

Multiplier effect

The local-multiplier-3-effect (LM3) measures money expenditure, describing where the money goes to at the same time. It is local because it is for local, micro-economic use. Three stands for the first three rounds of spending being measured. First, the initial incomes are measured, then how this income is spent, and in round three one measures how much of the local spending is re-spent locally. Summing the money from all three rounds, and dividing it by the initial income then makes up the LM3. The resulting LM3 will then offer a general understanding of how a variable aspect of the local economy is working. It is thus an instrument to measure the impact of 'spending money' and to verify where the money goes to (Sacks, 2002).

Impact on employment

Because of its social character, the impact on employment has already been mentioned with the social impact, but it is obvious that it also has an economic resultant. The accent is specifically on "local employment". One can wonder whether in local networks also more persons from the direct environment need to be given employment. Indeed, local employment offers a number of advantages (Sacks, 2002):

- for the community: a lower degree of unemployment, less pollution of the environment and less traffic jams due to less (or less long) transportation of persons,...;

- for the employee: a shorter distance between home and work, such that more use can be made of public transportation means and bicycles, and that traffic jams can be avoided;

- for the employer: possibly more flexible employees, who would be prepared to work temporarily more, or less, during peak respectively less busy periods, and who could possibly reach a helping hand at the last moment.

In order to measure the impact on employment, the number of full-time equivalents employed by the various systems, related to the added value they create, can be compared.

Real price of food
The real price of the food we buy implies a correct price for the farmer and deducts the above mentioned energy consumption and the environmental impacts that are caused by transport, packaging and waste treatment. The food we consume at present is artificially cheap because these aspects of the food supply chain are not being considered in the price.
(www.mcspotlight.org/media/reports/foodmiles.html)

A recharge of the real price of the products could be a possibility to solve, among other things, the problem of growing road transport. At present, many costs are being externalised. That means they are being transferred to public infrastructures and to the environment. The costs are paid by both the present and the future society. However, an adequate use of scarce production resources can only be achieved if we take into account the full costs, and if these are also all recharged in the price. As this is not occurring now, and the prices approach the real costs less and less, the environmental and social impacts increase and the inefficiency of the present system is often hushed up (Böge, 1995).

1.3.2.2. Economic impact at consumer level

For the consumer the value of an agricultural product (including landscape and environment) (s)he buys is unclear. The consumer buys packaging, processing, transport and publicity in products like meat, milk, cheese, vegetables,... A report of the 'agrarian' value (the part that goes to the farmer on the countryside) of the product, apart from the 'industrial' value (processing), 'transport' (logistics), 'commercial' value (promotion, publicity) and 'fiscal' value (VAT, taxes...) and the costs for control in the chain or the different links could offer the producer and the consumer more insight in the life cycle and the price setting of food.

1.3.2.3. Economic impact at producer level

Depending on the kind of LFS (direct sales, network sale with contact, network sale with information, anonymous sale), the producer is more or less intensely concerned in the sales of what (s)he produces. A more direct sale can imply extra costs as well as extra income. There are for instance investment costs for the producer, new sales systems (e.g. a market stall, and also the time investment of the persons who man the stall), or in distributing information in the case of network sales. On the other hand the producer can obtain a better share from the income the product generates, through direct sales. The growth of the added value for the producers is depending on the scale and the quality of the production, but also of the inventiveness and the professionalism of the farmers to build a shorter link with the consumer. Indicators that can be used to measure this economic impact are for instance the multiplier effect and the impact on the employment as described before.

1.3.3. Environmental impact

Finally, all environmental impacts within the food chain, caused by the human beings, can be reduced to patterns of human consumption (Carlsson-Kanyama et al., 2003). Food consumption within the household is therefore seen as one of the most polluting or the most resource consuming activities (Carlsson-Kanyama, 1998).

1.3.3.1. Energy consumption for transportation: food kilometres or miles

Under 'food kilometres' we understand the total distance covered by the food from the field to the consumers' plate. Or: simply the distance between the producer and the consumer (Jones, 2001). Especially the staggering in space and the intensity with which products are presently traded has increased considerably, rather than the quantity traded (Böge, 1995). The number of food kilometres has increased in the past years mainly because of the increase of the international trade, the increase of distribution by road, and the increase of the number of consumers who go shopping by car (as well as an increase of the distance to the place of purchase) (Jones, 2001).

One of the main causes of the increase of international trade has been the relatively cheap fuel price (www.mcspotlight.org/media/reports/ foodmiles.html). The prices of fossil fuels do not reflect the complete costs caused by the consumption of these fuels. The construction of roads and vehicles, the environmental damage caused, the costs of developing alternative energy sources for the future... are not included in the price (see also real food price).

Food kilometres give a clear image of the globalization of the mainstream (Western) food system: how far (and how often) is our food transported before it arrives on our dish? Also, an easy conversion of the use of fossil fuels and the corresponding emission of greenhouse gases caused by this transport can be made.

When calculating food kilometres, only the energy consumption of the transport of the food is taken into consideration. So, many other things are not included, such as: the "hidden" kilometres that lie behind it, for instance those of the packaging material separately before it is used as packaging; the harvesting and planting by tractor, fertilizing and the use of pesticides, heating of greenhouses, cooling during transport, conservation and storage, etc.

For instance, Carlsson-Kanyama et al. (2003) demonstrate that in Sweden, less energy is needed for the import of tomatoes from the Canary Island than for tomatoes grown in Sweden in heated greenhouses. Therefore, it is indicated to also make a complete analysis of the energy consumption throughout the life cycle of a product, in order to be able to make a real environmental comparison between the various chains that bring the producer close to the consumer. This is placed under the denominator "life cycle analysis" (LCA).

1.3.3.2. Life cycle analysis (LCA) or life cycle energy consumption

In LCA, all energy inputs needed during the entire life cycle of a product are taken into account as completely as possible. In this way, one obtains a general image of the energy consumption necessary to produce a given food product and to bring it ready-to-eat on the dish of the consumer.

For example, for agricultural products Carlsson-Kanyama et al. (2003) include: the agricultural production containing agricultural inputs, the drying of the crops, the processing, stocking and transportation to the retailer, as well as the stocking and the processing in the households. Packaging materials, waste treatment, capital goods such as machines and the transport from the retailer to the consumer are not taken into account. Life cycle energy inputs of food are calculated per kg food that is ready to eat. These are then used in order to calculate the energy inputs per portion, which can then be added together to meals (Carlsson-Kanyama et al., 2003).

This method provides a very complete image of the energy needed in the entire cycle of a food product. Studies using these methods are therefore often the foundation of strategies for energy reduction in the food chain (Gerbens-Leenes et al., 2003). Also, based on the LCA, various products can be compared in an objective way.

Energy inputs are not always exactly definable. For instance because the quantity of energy consumed has to be divided between various (side) products, or because the transport is a combination of collecting and delivery of various products at various places (personal communication Dirk Hebben). This is certainly the case for smaller, less specialized businesses.

1.3.3.3. Energy ratio

The energy ratio is the relation between the energy output of the end product and the sum of the different energy inputs (Jones, 2001). The energy output is the energy contents of a food product (in calories). The energy inputs contain all energy consumed in the production, processing, packaging and distribution of the product, in short the LCA (Jones, 2001). In this way, one can check whether more energy has been used during production, processing, transportation, preparation,... of the product than the energetic value it supplies when being consumed.

1.3.3.4. Life cycle greenhouse gas emission

The principle when calculating the 'emission of greenhouse gases during the life cycle' is pretty much analogous to the principle used for calculating the 'energy consumption during the life cycle' (LCA): the emissions of the different greenhouse gases in the different stages of the entire life cycle of a product are accounted for as meticulously as possible. The emissions of the different greenhouse gases can then be summed by making use of the 'Global Warming Potentials' of these gases and this is then expressed in grammes of CO2-equivalent (data from the Intergovernmental Panel on Climate Change (IPCC), 2001 of www.eia.doe.gov/oiaf/1605/gwp.html). The most important emission stages can then be identified for the different food products.

In general, the environmental problems caused by the intensive energy consumption remain very important. This is mainly because of the emission of greenhouse gases from burning fossil fuels, which is at present the most widely used source of energy in the world. At the economic level, there is also the problem of exhaustion of these fuels in time, even though there are still large oil reserves known right now (Pervanchon et al., 2002).

The emission of the most important greenhouse gases, like CO_2, CH_4, N_2O and halogenised gases, are strongly related to food production and consumption, mainly because of the many human induced activities during the life cycle of these products. Not only these gases, but also CO, NO_x, benzene, photochemical smog, ... cause greenhouse effects (Jones, 2001). N_2O is mainly liberated in the production of nitrogen fertilisers and cattle breeding produces large quantities of methane (CH_4) (Carlsson-Kanyama, 1998). Then again, NO_x is involved in causing more acidity in the ecosystem, eutrophication and the origination of ozone in the troposphere. The burning of fossil fuels causes mainly emission of CO_2 (Pervanchon et al., 2002).

An efficient use of energy in production, processing, transport, conservation etc. of food is therefore one of the conditions for more sustainable food systems, and it will also be crucial to not exhaust the fossile sources of energy and to stabilise the concentrations of CO_2 and other detrimental gases in the atmosphere (Carlsson-Kanyama et al., 2003).

A comparison between the LCA and the life cycle emission shows that important stages are being underestimated if only the use of energy is taken into account. This could for instance lead to adopting suboptimal policy measures. Therefore, it is important that the life cycle emissions are also considered (Carlsson-Kanyama, 1998).

Here also, there is the problem of the exact quantification of a number of emissions, such as the definition of energy consumptions for the LCA.

1.3.3.5. Ecological footprint (EFP)

According to Wackernagel and Rees (1996), the formal definition of the ecological footprint (EFP) is as follows: the EFP of a specific population or economy measures the claim or the ecological impact of humans upon nature. It is a measure for the quantity of land (and water) that is needed to maintain a population of any size. The EFP is therefore measured as the quantity of biologically productive land (and water) needed to continuously maintain a population's consumption level on a given moment in time (Anderson and Lindroth, 2001; www.gdrc.org/uem/footprints/what-is-ef.html).

The EFP is one of the few instruments that do not express the value "nature" in monetary terms. As the total value of 'the utilities/services the ecosystem offers us' can be seen as endlessly large, because life without it would be impossible (Borgström Hansson and Wackernagel, 1999). The impact of the human being on a global scale comes forth from three processes: (1) an increase of the CO_2 concentration in the atmosphere because of the consumption of fossil fuels, (2) an increase of the fixation of nitrogen by the production of industrial fertilisers and (3) a change in the use and coverage of land.

The EFP succeeds in reducing these three processes to one primary cause, which is the human consumption of biologically productive land. For instance, the increase of CO_2 in the atmosphere by burning fossil fuels is converted into the 'area of wood to be planted' needed to absorb this CO_2 (Borgström Hansson and Wackernagel, 1999). The unit of the EFP is the amount of productive land (and water) that must provide enough energy and material sources for consumption and be able to absorb the waste produced. This EFP can be measured at an individual level, but also for a city, a region, a land or the entire planet (Wackernagel and Rees, 1996; Anderson and Lindroth, 2001; www.gdrc.org/uem/footprints/what-is-ef.html).

This method allows to make a comparison between the EFP and the available capacity. If the EFP of a population is higher than the biophysical capacity of its territory, then extra capacity should be imported from other territories, or the own ecological capacity will be eroded and the pressure on the remaining bio-productive space will increase (Anderson & Lindroth, 2001; Wackernagel et al. 1999; Borgström Hansson and Wackernagel, 1999).

Some also use the term 'ecological debt' in this context. Its definition is usually presented as 'the cumulative responsibility the industrialized countries have, because of human exploitation, robbery of raw materials and minerals, pollution and cultural dominance towards the developing countries'. This ecological debt can be calculated by the average 'EFP per capita' of a specific region, to be compared with the 'capacity of the land per capita'. If this EFP is larger than the capacity, one says there is ecological debt because we have to compensate over-consumption by import from the South and because many countries in the south have an EFP per capita that is below the capacity per capita.
(www.vodo.be/documenten/Peccei%20lectures.htm,
www.vodo.be/html/themas/index.htm)

Even though the EFP is a useful instrument to make a rough estimate of the ecological impact of the life style of a certain population, the EFP has also certain limitations. A number of impacts are left aside, such as the emission of highly toxic waste and the use of non-renewable raw materials, insofar as they do not put a claim on the land for their production or distribution and processing. That implies that the EFP underestimates the ecological impact. However, it does describe the actual use of the biophysical production capacity of the Earth, as well as the measure to which the human beings are "over-consuming" nature (Anderson and Lindroth, 2001).

1.4. Conclusions

Based on our literature review we define local food systems as follows: "Local food systems encompass the entire chain of producing, processing, selling and consuming food They are collective systems in which there is direct contact between producer and consumer and/or in which they engage is a long-term contractual relationship. The distance between the different actors should be minimal (both geographically and with respect to the number of intermediates in the chain)."

To measure the economic and ecological impact of local food systems, various indicators exist that allow a quantitative assessment. Balancing advantages and disadvantages we opt to experiment with the LM3 and the impact on employment as economic indicators and the life cycle energy use and CO_2 emission as ecological indicators. In addition, we will also look at the absolute price difference at producer and consumer level. To measure the social impact of LFS is far less straightforward given the difficulty of quantifying impacts in the social sphere and the importance of context. We will look at networking, social capital and job satisfaction as social indicator.

CHAPTER 2

MEASURING THE IMPACT OF LOCAL FOOD SYSTEMS

2.1. Introduction

Due to a growing concern about personal health and the sustainability of the current marketing system of food and agricultural products and the related side effects, there is an increasing interest from consumers in local food systems (LFS). The key to LFS is that consumers prefer to purchase their food from predominantly local sources for both social and environmental reasons. Often, but not necessarily, such systems are based on direct contact between producers and consumers. Therefore, a variety of marketing channels are used: on-farm sales, farmers' markets, community-supported agriculture, farmer cooperatives, box schemes and various other ways. However, while a substantial share of consumers would prefer to buy locally, in reality only a small share is actually engaged in LFS.

The objective of this chapter is to investigate whether LFS can contribute to more sustainable production and consumption patterns. To measure the impact of local food systems compared to mainstream food systems (MFS), we limit ourselves to the marketing phase of the supply chain, that is, from the point the product leaves the farm to the point of purchase by the end-consumer. Food systems are defined as systems which include the whole chain of production, processing, selling and consumption of food. LFS are collective systems with a direct link between consumer and producer, possibly involving a long-term contractual agreement. The distance amongst different actors needs to be restrained, both geographically as concerning the number of links in the chain. We see MFS as the marketing system resulting in one-stop shopping market points where consumers enter freely and are offered a wide range of products on almost every moment of the week.

2.2. Material and methods

To enable a comparison between LFS and MFS we proceeded in five steps: (1) defining system boundaries, (2) selecting indicators, (3) selecting case studies, (4) collecting data and (5) calculating the indicators for the cases.

First, we define boundaries of the systems to be analyzed from the farm gate to the consumers' house, as our focus is on what is happening in between among the different steps.
Second, based on the literature review presented in chapter 1, we selected three economic, three social and two ecological indicators. They describe effects on the society as a whole as well as effects on consumers and producers more specifically. We

refer to the literature review in chapter 1 and the results sections of this chapter for more details on these indicators.

Third, we constructed scenarios of LFS by selecting a basket of typical products and by selecting a limited number of cases from the LFS inventory (chapter 3).

We made a selection of typical products based on a combination of available consumption statistics from the GfK services and the availability of the food items in both local and the mainstream food system. This selection consists of beef, Gouda cheese, tomatoes, lettuce, carrots, potatoes and apples. By combining these products we get a typical Belgian meal, namely: beef with potatoes and a salad of lettuce, tomatoes, carrots and Gouda cheese cubes and for dessert an apple.

A thorough inventory on local food systems in Flanders (see chapter 3) preceded the selection of four LFS case studies. While selecting case studies, we took into account the following aspects: representation of the different types of LFS in Flanders, a balance between criteria such as organic and conventional production, size of the network, age of the initiative and product groups. This resulted in the following four cases:

- Case 1: Cooperation amongst organic vegetable farms. Case A involves three vegetable farms working together to exchange products amongst one-another, each of them selling the major part of their produce through a vegetable box scheme to the consumer. Their focus however is not only on the exchange of products. The exchange of knowledge and ideas, talking about their personal philosophies and looking continuously for the surplus value (on different levels) of their cooperation are essential within the cooperation;

- Case 2: Cooperative association of livestock breeders. Case B is a cooperative of 5 farmers, created to market their meat products directly to consumers individually or through food teams. A great variety in production systems, size and philosophy characterizes the five partners (a normal size double purpose (milk and meat) cattle farm, a normal size pig farm with spacious stables, a mid-time small size sheep farmer in a nature reserve, an organic poultry farm in combination with fruits and a farm with social care selling chicken and rabbits through the cooperative;

- Case 3: Cooperative association of cheese producers. Case C is a cooperative association of individuals, producing organic cheese prepared according to traditional methods and marketing this cheese in their own store, via delis and in a selection of supermarkets. The organic milk farms that deliver the milk are also part of the cooperative association, as the milk quality for their cheeses in an unprocessed form is highly valued. At the other side of the chain, they are in close contact with vendors as special care is addressed to the state in which the cheese is sold;

- Case 4: Fruit growers on farmers markets. In Case D, the focus is on fruit growers selling apples at farmers markets. Farmers markets in Flanders date from the eighties, when special interest went to an action year on local villages. Different farmers markets have different histories: either they are governed by a local action group, connected to the village whereas in other cases farmers themselves rule the market. Part of them is really strict on selling only own produce, while in other cases, the difference with a conventional market is hardly noticeable. Classic farmers markets give producers the opportunity to sell directly to the consumer without any middlemen, being in direct contact with consumers and other producers. We selected three fruit producers, selling altogether on eight different markets, representative for the different present properties on farmers markets.

Fourth, to get data from LFS, we choose for a multiple case study approach, combining in-depth interviews and questionnaires. The list of interview questions was composed in relation to the selected parameters. In a team of two researchers, in-depth interviews where done on location. Throughout those interviews, a space of trust evolved: a resulting open dialogue provided additional information. As the addressed individuals were given free space to talk, the generated information has been handled as essential in the data processing, especially with regard to social impacts. Additionally, network mapping was performed with all members of the different case studies.

Besides the four cases of LFS, an MFS was addressed to enable the comparison of indicators between both systems. Within the MFS, we had contacts with the responsible persons at supermarket level and we could track some of the producers for meat, vegetables and fruits thanks to information given at auction level and knowledge of the producers in Flanders. Data and assumptions on price and income values, energy uses and carbon dioxide emissions, transportation distances and other parameters were besides those interviews collected from an additional variety of sources: suppliers of food transport and storage techniques, literature, internet, experts, etc.

Fifth, through calculations for the different studied food systems, the selected indicators have been tested on their validity and practicability. In the discussion we address issues on data collection and on the calculation of the different impact indicators in relation to their practical use. For the case studies we also address the observed differences and similarities between LFS and MFS.

2.3. Economic indicators

2.3.1. Economic indicator I: the local multiplier 3 effect

Sacks (2002) states that local spending strengthens rural economies by increasing their resilience to external shocks, diversifying their income basis and increasing internal economic linkages. The local multiplier 3 (LM3) effect measures money expenditure, describing where the money goes to at the same time. It is local because it is for local, microeconomic use. Three stands for the first three rounds of spending being measured. First, the initial incomes are measured, then how this income is spent, and in round 3 one measures how much of the local spending is re-spent locally. Summing the amount of money from all three rounds, and dividing it by the initial income then makes up the

LM3. It offers a general understanding of how a variable aspect of the local economy (e.g. a food system) is working.

Focussing on food systems, information is needed on spending behaviour of an initial amount of money and on the further spending of the part of this money being spent locally. As we only take the marketing phase of the product into account, the pattern of spending on inputs involves packaging material, transportation means and selling equipment at one hand and possibly outsourcing of specialised services at the other hand. As for the first group of inputs, both in the LFS and in the MFS, the same suppliers are relevant (own findings) and they hardly ever tend to be local on community level. Some quotes taken from the case studies motivate those findings:

> MFS: "Fresh products are mainly delivered in reusable EPS-crates and transported in non-cooled carts. Other produce arrives in different packaging modes, are centrally repackaged and are sent to the individual shops."
>
> MFS: "Products like dairy, frozen products and others are transported in own reusable crates and in cooled carts."
>
> LFS: "We use our own reusable crates for the vegetable baskets."
>
> LFS: "We use vacuum bags in different sizes, labels and bags which we order in big amounts a few times a year. The goods on order are collected in our own reusable crates."

Locality may be situated on country level, but most inputs are traded in a global market. The difference between LFS and MFS then is the size of vendors and of traded amounts being involved. This results predominantly in an impact on local employment as addressed in the second indicator.

The situation is slightly different for specialised services (e.g. bookkeeping): due to the scale of the MFS, most likely an employee for the job of those specialised services is hired (own findings), and thus the money stays within the community when it concerns local employees. LFS tend to hire a specialist for this job, who might reside in the neighbouring area or can originate in a more distanced place, as bookkeeping advice is often provided by agricultural organisations, being organised on a national level. Our case study approach does not provide us with enough information to come up with statistically correct assumptions. This is why the mentioned information is restriced to a descriptive level. In his research, Sacks (2002) shows that high skilled staff in general come from outside the region. However, in a Flemish context one should put the concept of regionality into perspective. We suppose that seldomly those jobs are taken by foreign (from neighbouring countries) people, but since no information on this topic was at our disposal for MFS, we have not carried out the comparison.

In conclusion, the calculation of the LM3-effect was not performed on the basis of our case studies. At one hand, given the high population density, and the regional level of Flanders as a whole, the local multiplier effect seems less relevant here compared to sparsely populated areas where locality is to be seen on community level. Secondly, as the information retrieved from MFS was limited, the situation in Flanders could not be examined on the hypothesis whether high skilled staff is predominantly originating in an other region. Both for the MFS and for the LFS it has shown to be difficult to get hold of the exact information when local spending has a whole is considered.

To get a meaningful value of the effect of local spending, we suggest researchers to make a selection of spending channels on which they can test the local multiplier effect in a precise way, based on the information which can be collected from the MFS as well as from the LFS. One could select a restricted number of spending posts on both direct inputs at one hand an specialised services at the other hand. The results then should not be addressed as a complete image of the local spending behaviour, but they can give a numerical indication on possible differences amongst LFS and MFS. Those numerical data then should in our opinion be combined with a descriptive over-all view of spending behaviour to give a complete image of the local impacts.

2.3.2. Economic indicator II: the impact on local employment

The potential impact on local employment was chosen as a second indicator. One can question whether in local food systems more people from the region are employed since local employment would mean a lower unemployment rate, less environmental impacts and economic costs due to proximity, and possibly more flexible employees at crucial moments (Sacks, 2002). The impact on employment can be measured by counting the number of full-time equivalents related to the added value created in the firm, while describing the origin of the employees.

Information on employment was gathered throughout in-depth interviews both with farmers in the LFS and with farmers within the MFS. Two main levels of employment have to be taken into account. The first is the production level, which is for both food systems located on farm level. The second is the marketing level, which is located within distribution centra and selling points in the MFS, whereas for LFS, this part is also addressed on farm level, possibly in cooperation with other farms. As we focus on raw materials being traded, no processing level is included.

On production level, for both LFS and MFS, the information on employment differed more between the different studied sub-sectors compared to the difference between both marketing systems. In both fruit and vegetable production seasonal workers are employed. In husbandry however, a more continuous employment is the case. On all our visited farms (with equal representation in MFS and LFS), employment was limited. When an external aid is present on the farm, it often concerns a neighbouring interested kid or an elder person who likes to stay in contact with farming activities. Covering different production sectors, the numeric impact on local employment was found to be comparable on production level for both marketing systems (in descriptive terms). This information however needs to be completed with the following remark: for the vegetable production, the farmers connected to an MFS which we could identify were organic farmers, who generally work on a smaller scale compared to traditional farmers. The farmers studied in the LFS were also organic farmers, and so, the comparison does count for our case studies. However, no generalisation for the total vegetable production in Belgium is possible on the basis of the collected information.

When at the other hand, a farm employs people, both in LFS and MFS, the same group within society is addressed. Farms often function as a location of social employment: one thinks of social care of the older generation, employment of physically or mentally disabled people. Within the organic farming circuit, farms employ students in organic farming through an internship system. This is then the case for both farms involved in LFS and MFS, and is as well possible on conventional farms, however the farmers we addressed did confirm this only in limited amount. Both socially addressed groups are not necessarily locally based. Farm sites then provide a social function on top of employment and in doing so not necessarily address local employees

> LFS: "X en Y work together about 20 to 22 hours a day for the farm, sometimes after school a student helps a bit."

> MFS: "Z works alone on the farm. Sometimes his father helps, or a number of neighbours when something special is on."

> LFS: "In the picking season 4 people help for 15 days: 2 students and 2 socially employed workers. When it is possible, we prefer people who can come by bike, but most of the time we have to take who comes since not that many people are interested. We are too small, so we need people who want to work at our place only once in a while."

> LFS: "We do work with students, socially employed workers and internships."

Since one of two main reasons why the effect on local employment has not been described in numerical terms is a lack of tracking method on producer level, a uniform, simple and clear tool to keep track of time and job-investment related to different activities on place would be of great help. Not in the least for farmers themselves to value and evaluate their time investment. Obviously, the importance of such a tool reaches further then only the description of the impact on employment.

On marketing level, for producers within LFS the marketing phase is included in this same system, and counts up for a additional employment. This amount was similarly addressed in a descriptive way. More work that needs to be done then not necessarily means that more people are employed but rather that the same amount of people work more.

> LFS: "In the season, X works 2 full-times a week. Throughout the rest of the year, it's about 12 to 13 hours a day, 7 days a week."

> LFS: "Since on the market, you sell in direct contact to the consumer, less red apples are easily tolerated. The fruit needs less treatment compared to those for the auction. This also means that less work is needed to prepare for the market."

> MFS-LFS: "When you take the sold amounts into account: 80% is sold on the market, while only 20% is sold through the auction. However, when you look at the work investment, 60% of the work goes to the markets, while 40% is invested in the auction."

Since only limited information was available for the MFS and only a rough idea on employment on farm level due to marketing activities within the LFS was formed and no numerical comparison of the effect on employment was concluded upon. In this regard, there is a noticeable request on producer-level to provide a uniform, simple and clear tool to keep track of time and job-investment related to different activities on place.

In the mainstream supply chain, those activities are not conducted on farm level, but are taken up by processing and distribution bodies. In the latter case, employment tends to be centralised in limited regions, withdrawing employment from the locality. Only limited information was available for the MFS. Combined with the rough idea on employment on farm level due to marketing activities within the LFS, no numerical comparison of the effect on employment was concluded upon.

One could use statistical data (as opposed to our case study approach) in order to quantify the comparison. However, statistics do not exist for LFS, in part because of the former mentioned lack of a uniform system for data gathering. However, also when these data are available, a descriptive analysis of employment, especially for the comparison on farm level remains valuable, both to stress differences and similarities, and to underline the meaning of different aspects of farm employment.

For further research on the impact of employment of food systems (and other economic activities) we want to suggest always to integrate a descriptive analysis of the employment effect in combination with numerical data. The basic underlying reason is the different involved aspects: social employment, flexible employment, education tasks: they can be described in a structured way to provide a basis for comparison of different systems.

2.3.3. Economic indicator III: Absolute price differences on producer and consumer level

A third economic indicator is the absolute differences in actual prices received by the producer at the one hand and paid by the consumer at the other hand compared for different food systems. The price a producer receives optimally covers production costs while allowing the producer to earn a living with it. The underlying hypothesis when we compare the prices to producers in both LFS and MFS is that there is a possible difference in this prices between the studied systems. Prices to the consumer optimally cover the production costs, complemented with processing and marketing costs, which include a profit share of each involved party. Also here the hypthesis is that those prices differ between LFS and MFS.

The comparisons in our study are based on data provided by the producers (in both chains) at one hand, and both producers (in the LFS) and own observation of supermarket prices in June 2005 and September 2005 (due to a lack of data availability in the MFS). The observed supermarket prices are combined with statistical (GfK) data on product prices. Figure 1 and 2 show the absolute differences for LFS and MFS in price to producer at one hand and price to consumer at the other hand, per selected food item.

Based on a first overview, the price to producer is lower for all six products in the MFS compared to the LFS. At the other hand, the price to consumers is higher in five out of six products (the exception being carrots) in the MFS compared to the LFS. Those two findings combined, gives a resulting bigger absolute share for the involved parties in between, on top of a less favourable situation for both producer and consumer in the MFS compared to the LFS.

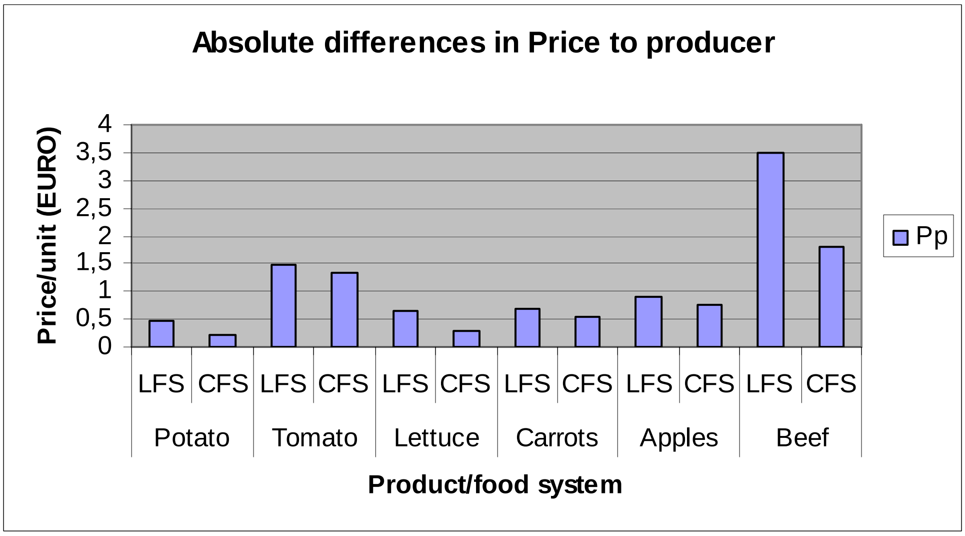


Figure 1: Absolute differences in price to producer (LFS = local food system, CFS = conventional or mainstream food system)

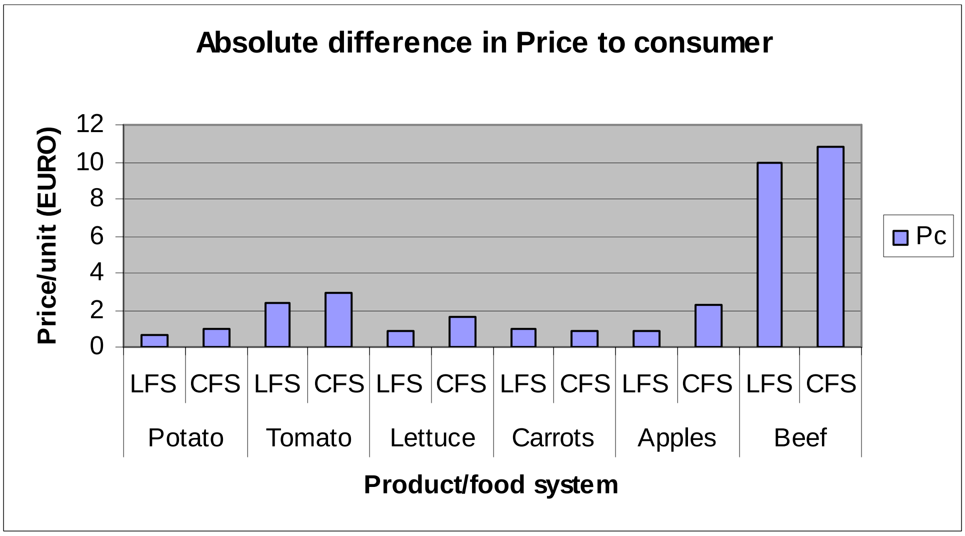


Figure 2: Absolute differences in price to consumer (LFS = local food system, CFS = conventional or mainstream food system)

A price comparison is an easy indicator to involve in a general comparison of different systems. Special attention should be addressed to the products compared, since different systems might work with different breeds or strains at one hand, and with different production methods, causing different production scales, a.o. When all those aspects are carefully dealt with during measurements at one hand, and explained when the results are published at the other hand, this indicator is a fairly simple and useful tool in both measurement and communication.

2.4. Social indicators

A social sustainable community is said to have the ability to maintain and build on its own resources and have the resilience to prevent and/or address problems in the future (Gates and Lee, 2005). Within this scope, social capital is defined as the possibility of an individual to mobilise resources from social networks in which he takes part (Komter et al., 2000), and it is seen as a production mean, fed by social relationships within a community or a group, to be used by individual members (Dessein et al., 2004). There is the need to assess how local ecologies and social relationships are or become implicated in existing or emerging production systems and whether stakeholders in different food systems have access to social capital in a different way. Research questions are:

- Are farmers differently embedded in (parts of) society depending on the food system they choose? (= networking), and what does this imply?

- Do farmers have different access to resources to be found in networks? (= social capital)

- Do farmers experience satisfaction in their work and do they feel appreciation for their knowledge and skills? (= job satisfaction)

Social sustainability was addressed in its aspects where producers are involved. Within the MFS, data gathering on consumer level would have implied a totally different research design which was impossible within the scope of our research. Since for the economical and ecological indicators, we decided upon a case study approach on producer level, also the information for the social indicators was collected in this way. As primary producers, farmers remain key persons in the importance of food markets described to rural society (e.g., Moehler, 1996; Marsden et al., 2000), this is another motivation to focus on the aspects where farmers are involved is also motivated in this scope.

2.4.1. Social indicator I: networking

Since social capital results from the social networks in which an individual takes part, it is interesting as a start to describe the networks an individual takes part in. The social networks farmers are involved in can be called upon threefold. At one side farmers function in relation to their colleague-farmers. Furthermore, farmers sell their produce, resulting in more or less networking to middlemen, consumers and others. A third aspect in networking then is the contacts with other external bodies as there are knowledge institutions, service providers and input suppliers.

By means of network drawings and a common analysis of those networks with a limited number of farmers in both LFS and MFS, we identified crucial aspects in the individual networks and we found differences as well as similarities in networks and in the effects on individual farmers. Within both types of food systems, links in different fields were identified as being crucial, each of them given their own condition(s) for a successful relationship, with a connected meaning for the individual. Those links and their meanings are listed in order of priority for the farmers in table 1.

Table 1: Network links, their preconditions and their meanings

link to	precondition for success	meaning when successful
family members		- support
colleague farmers	- trust - motivation - shared values	- efficiency - embeddedness - knowledge - inspiration
consumers	- information sharing - stalwart clientele - shared values	- support - motivation - job satisfaction
external parties - advisors/knowledge	- trust - shared values - advising rather then teaching	- knowledge
- service institutions		- support - crucial services

The table can be read and interpreted as follows.

Farmers operate within society, which implies a number of contacts to different actors within this society. Those links are clearly personally determined and differ when a different group of farmers is taken into account. However, one can identify a number of actors a farmer generally is in contact with. We define them, according to our findings from the network drawings, in four major groups. It must however be clear that this classification is not exclusive towards other parties, the more given the unique character of every single relation:

- Family members. As farming originates first as a society based and then as a family based activity (depending on local cultures), links to different family members most often are the central pillars within a farm unit. However, the importance addressed to them is not alike on different farms: both strong family bonds (either within the proper family or also including other relatives) and more weak ones are at the outer ends of the spectrum. Family bonds do influence the way a farmer feels supported in what he does, in a different intensity depending on the socialisation of the farmer. Socialisation in this sense describes the way one is brought up and evolves as a result of education and interaction with different elements of ones surroundings.

- Colleague farmers. Colleague farmers are a logical party within LFS since a LFS often implies a cooperation amongst different farmer colleagues for many possible reasons. This contact may be determined by a tight structure, but might as well be embedded within loose, informal contacts, possibly with similar results. Also within MFS, colleague farmers are an important group of contacts. Those farmers can function within the same sector, but not necessarily do so.

- Consumers. Any farm works with one or more marketing systems. Such a system might result in a close contact to the end consumer. In other cases, products are sold to middlemen, resulting in similar (to an LFS) or very different relations for the producer. Farmers may choose for just one system, or they might find their satisfaction in a combination of different systems. Farmers operating as suppliers for the food industry do not necessarily have the choice, given the contracts they sign with the industry.

- External parties. All farmers look for advice and/or knowledge in different ways. Specific advisors or knowledge institutions, as well as colleague farmers and periodicals are their main sources of information. Advisors and/or knowledge institutions either function in an independent way, or are connected to suppliers of raw materials. The farmers' background influences the way they handle, use and share the knowledge. Different service institutions come into the picture for a starting and/or functioning farming unit. Bank, bookkeeper, contractors are drawn on in different intensity.

"Preconditions for success"

Before one experiences a return from a relationship, certain (personally determined and depending on the nature of the relationship) preconditions must be fulfilled:

- Trust. Trust is in general a key component for a successful relationship. It is defined as the way one feels to be able to count on the other. Does one feel safe depending on the other for certain matters? In their relationships, own survival mechanisms might both enhance or hinder trustful contacts amongst farmers.

- Motivation. A relationship is not just a given fact, but is the result of efforts of all parties. The motivation one feels invested in a certain relation influences those efforts. Motivation has different inspirations: survival mechanisms, exchange of experiences, trust, business reasons, etc.

- Shared values. Whether ideas, expectations and motivation sprout within the same value field influences the basis for a relationship. A number of shared values does possibly enhance the interactions, but is no singular precondition for success, as it is one of different success factors.

- Information sharing. For example in the contact between producer and consumer, decisions are made on the basis of information one receives. A consumer seeks for information on price, freshness, health, origin,... before a decision is made. The producer on the other hand needs information on the expectations of the consumer or the middlemen, in order to meet them in his farming practices.

- Stalwart clientele. In a producer-consumer relation decisions for both parties are simplified when there is certainty concerning the future. Development on the farm or within the food system then moves beyond a sometimes turbulent search for markets.

- Advising rather then teaching (concerning advisors). Knowledge a farmer looks for with external parties might become more useful for him with time. This is when the external advisor makes himself unnecessary after a while: the farmer then becomes the expert himself and relies on his own capacities to deal with problems. In order to reach this goal, farmer and advisor can work together (opposing to a teacher-pupil relationship) on the given problems or questions, and in doing so, both parties enrich their knowledge.

"Meaning when successful"

When preconditions are fulfilled, one can describe the results of different contacts. What is described in the next relates to the farming networks. Many other meanings can be described for those relations:

- Support is part of the basis and the ground a farmer feels under his feet in doing what he does. Does he feel a symbolic push in his back during his daily activities?

- Efficiency. How does one receive the best possible effect given a certain input, investment,...?

- Embeddedness for farmers means support for personal ideas and beliefs, and a common feeling of importance within society. As farmers look for one another, they find shared vision and ideas, and experience to be part of a bigger entity, pointing at the importance of supporting each other as a necessity.

- Knowledge is part of the basis one uses to manage the daily activities on a farm. It enables the farmer to react on situations on the basis of past experiences and collected information.

- Inspiration brings about new ideas which might result in (minor) changes with (great) consequences. Most importantly, inspiration prevents boredom and keeps the motivation up and is necessary to react upon ever present changes.

- Motivation in any form is crucial for some to keep an activity running. It is the strength which makes you belief that day after day, the farm is worthwhile working for.

- Job satisfaction in relation to different marketing systems involves mainly the appreciation one experiences with relation to the performed job. When this appreciation answers the needs of the involved person, this contributes to job satisfaction.

- Crucial services. Within the described context, crucial services are there to answer e.g. the administrative needs of a farmer. Those needs might be specific to the farm, or specific to the farming activity and the according legislation.

We now discuss points of differences and similarities between LFS and MFS.

A first major point of difference between LFS and MFS is the link with colleague farmers: within an LFS they are part of the same system. Farmers within MFS obviously also function in relation to colleague farmers, possibly within the same system. In both LFS and MFS, farmers are in contact with colleague farmers from the same and from different sectors. Focussing on this aspect of networking, one can question whether the resulting effects for the farmer, namely efficiency, embeddedness, knowledge and inspiration are different for farmers who do and others who do not take part in LFS. Our research points at the relative indifferences between both food systems, as farmers who are in the possibility to choose for a system take part in either one of them according to their own interest and values. We found that producers tend to search for those marketing channels, where consumers or middlemen express appreciation for their produce (and in some cases for their role in society) which can motivate them in their daily activities. It then is the individual motivation and the whole of expectances which determine the choice and the success of a relationship. When colleague farmers decide to work together in an LFS, the preconditions for success are more present in comparison to less intense relationships, which do not serve a marketing challenge.

Subject to sector differences, farmers within LFS and MFS are more or less integrated in sector groups. However, besides those differences in sector groups, there are important personal differences. Social embeddedness should thus not be seen as a function of supply chain properties. Rather, it is the general non-cooperative attitude which makes traditional farmers end up solely on their farmyard whereas others (within or outside LFS) find their fellow partners around them, providing for their own social capital.

Efficiency within the LFS is realised in cooperation with other farmers for processing and marketing, performed by the members of the LFS, while in MFS, farmers do not identify with those tasks, and trust in specialised bodies, which for them are the most efficient solution for the task to be done.

The exchange of knowledge is another important motivation to take part in networks. Farmers active within LFS advice their colleagues to contact others because one can learn a lot from one another, both on the technical and on the marketing level. The exchange of knowledge on producer level can form an important stimulus to participate in a food network (Innovatiesteunpunt land en tuinbouw, 2003). This knowledge exchange is closely linked to social embeddedness. As mentioned there, important differences between sectors determine the contacts between farmers. These sector differences are similar within LFS and MFS (e.g. vegetable and fruit farmers have more contacts compared to livestock farmers). The access to knowledge is most determined by sector differences and the personal attitude of the farmer.

A second important point of difference between LFS and MFS is the contact with the consumer. We refer to consumer contact as a source of support and motivation, when we discuss our third social indicator that is related to job satisfaction. But already here, we can formulate a similar conclusion as for the exchange of knowledge, namely the importance of the personal attitude of a farmer in relation to the experienced satisfaction within a certain system.

As for the contacts to external parties, both within LFS and MFS trust, shared values and an advising role rather then a teaching role for the advisor determines the returns from a relationship to an advisor or a service institution. As for the access to knowledge, we see that groups develop within the different sectors addressing different knowledge institutions. Those groupings happen independent of the nature of the food system a farmers take part in. Cooperation with colleague farmers remains an important source of knowledge. Within both the LFS and the MFS it seems more easy to exchange knowledge with farmers further away, when competition plays less. When a group works together within an LFS however, it is clear that this competition is less present compared to farmers competing for the same consumer groups.
To conclude, our research suggests that networking is important in all food systems and differences are more sector determined and less by the food system. One then could focus on these sector differences and identify where the different sectors could cross-pollinate one another, in order to strengthen the independencies of individual or grouped farmers.

2.4.2. Social indicator II: social capital

Social capital, defined as the possibility of an individual to mobilise resources from social networks in which he takes part (Komter et al. 2000), is seen as a production mean, fed by social relationships within a community or a group. Do farmers within LFS entitle a different amount or a different form of social capital compared to farmers in MFS? The most important aspects of social capital involve access to: knowledge, production means and support when needed.

The exchange of knowledge has already been described in the scope of networking, where the link to social embeddedness has been explained. This counts in a similar way for the access to production means and support. Where social networks are present, collective efforts towards service companies and towards input providers possibly result in more favourable prices because of scale economies. The presence of a network also stimulates social support when an individual is in need (e.g. when physical limitations occur). Here again, the aspects of social capital are connected to the presence of networks, whether or not they are local is only of secondary importance.

We conclude that if one wants to support the social capital of farmers in general, it is more important to stimulate cooperation and exchange amongst farmers within any chain, rather than to focus on the LFS. In this light, the pioneering work of LFS towards the MFS can be compared to the pioneering role of organic agriculture towards conventional agriculture: asking for more appreciation for the farming sector as a whole through elaborated forms of communication and cooperation without the loss of positive efficiency effects existing in the MFS.

2.4.3. Social indicator III: Job satisfaction

Job satisfaction in relation to different marketing systems involves mainly the appreciation one experiences with relation to the performed job. When this appreciation answers the needs of the involved person, this contributes to job satisfaction.

Farmers and consumers tend to look for the lost or forgotten social aspects of both their beings. Farmers, as any other working people, look for appreciation in their work, where consumers trust in a direct relationship with the farmer to ensure the quality of their produce. As local food networks provide all involved parties with elaborated contact, can one conclude that farmers within LFS feel greater job satisfaction?

The contact between producer and consumer in a LFS becomes a contact between producer and middle-man as consumer in the MFS. As already mentioned, participation in any supply chain is determined by personal attitude, background and abilities. Farmers participating in LFS have a strong preference for having direct contact with the consumer, which provides them the appreciation for their agricultural activities. Our interviews with MFS farmers show that these farmers look for a similar form of appreciation. Either their contact with a small group of consumers feeds their motivation, or they depend on the appreciation from their customer, the middle-men. Whether this is ssatisfiable for them depends greatly on the personal attitude. Farmers who have the possibility and the empowerment to choose the chain where they feel most comfortable do confirm upon the appreciation they receive and the importance for their job satisfaction.

Based on our research, we stipulate that it is not the nature of the supply chain that causes the amount of appreciation a farmer receives for his products, but the nature of the farmer himself, who addresses those chains where he feels comfortable and appreciated. Within this scope it is desirable to support farmers in making their own choices according to their own expectations. At one side, this means choices should be open and reachable for as many farmers as possible. This requires not only a policy shift, supporting individual activities rather then monopolistic dominance, but also a shift in the present ideology concerning entrepeneurship (bigger is better). However, we do recognise that this evolution is determined by many different factors and is not to be expected at once. At the other hand, we wish to stress the importance of individual entrepeneurship, based on own ideas and expectations, supported in its singular character. In this scope it is important to stimulate farmers to 'take their future into their own hands', supporting any kind of innovation, specialisation, change or preservation as an answer to generalisation and globalisation.

2.5. Ecological indicators

2.5.1. Introduction

To compare LFS with the mainstream food system, we calculate the energy required during the life cycle of a selected number of food items sourced by different food supply systems (farmers' market, food teams, on-location sales and box schemes versus supermarket) and their resulting carbon dioxide emissions. For this we limit ourselves to analyze total energy consumption and CO_2 emission only in the marketing section (mainly transport, processing and storage) of the life cycle of these food items. In other words, we compare the various paths of a given set of food items off farm.

Therefore we first have to define the system boundaries used in these calculations more accurately. We define the boundaries of the systems to be analyzed from the farm gate to the consumers' house this specifically for the full summer season, when all agricultural products can be produced locally in open air (see figure 3). Hence, we are not taking into account the preparation of food at the consumers' home, nor the production method, as our focus is on what is happening in between. In our simulation products in the local food systems go from the farm to a collecting point where the consumer can pick them up. Products that need specific processing, like meat and cheese, go first from the farmer to the processor and then to the collecting point.

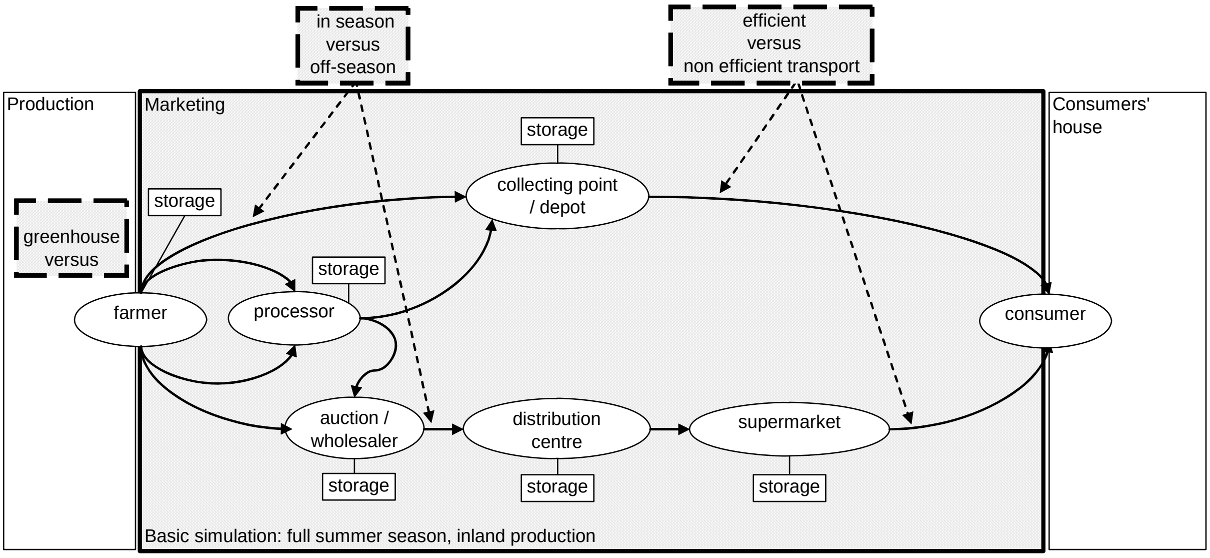


Figure 3: Boundaries of the systems to be analyzed: from the farm gate to the consumers' house

For the MFS we simulated that the products left the same farms as in the local systems but traveled through the whole mainstream chain and ended up in the supermarket as we lacked more specific data from the supermarket chain that cooperated. This means that the products go from the farmer to the auction or to the processor. From the auction the products go to the distribution centre of the supermarket, whereas from the processor products go to the wholesaler and then to the distribution centre (or in some cases they go straight to the distribution centre). From the distribution centre the products go to the individual supermarkets where the consumer can buy them.

Next to these transport streams, almost every step in the LFS as well as in the MFS has its own storage facility, mainly for cooling the products. In some cases, mostly in local food systems, the farmer is also the processor (e.g. on-farm sales) which means that there is one step less in the food chain.

Third, we constructed scenarios of LFS by selecting a basket of typical products and by selecting a limited number of cases from the LFS inventory (chapter 3).

Every product we select is also given an specific portion weight so by combining the portions of the food items we can calculate the energy use and the carbon dioxide emission for a general meal. In this meal the different weights given to each of the products are: one portion of potatoes consists of 200 g, vegetables count for 70 g each, apples for 125 g, beef for 120 g and Gouda cheese for 15 g per portion (Carlsson-Kanyama et al., 2003; VIG, 2005).

Given the fact that the focus of this study is on the marketing section, the results should be combined with more specific figures on production, households' preparing and cooking of food and processing of waste, in order to carry out complete life cycle analyses for certain combinations of production and consumption methods. E.g. differences between conventional, organic and integrated crop production could have a large influence on the total energy and emission bill on the production side, whereas on the consumption side cooking on a gas or an electric stove or with a micro-wave oven could have very different influences.

As some effects outside these system boundaries of the basic simulation, in the production phase as well as in the marketing phase itself, can have a very large influence on the total energy or emission bill, we compare our results to three additional calculations from literature. First, we consider the production in heated and ventilated greenhouses versus the production in open air. The same could be done for breeding cattle in heated and ventilated stables versus in open air. Second, we consider seasonal differences, linked to ways of import form abroad, each with their own (in)efficiency, as well as the above mentioned production in greenhouses. Third, we take into account the efficiency of transport from the outlet to the home of the consumer.

This methodology is based on other scientific studies that calculate the total energy consumption in the life cycle of specific products. For example, Jones (2002) compared the total energy consumption and the resulting carbon dioxide emissions in the life cycle of fresh apples in the UK for different food supply systems, that is, different marketing outlets (supermarket, street market, home delivery box scheme, farm shop) and different sources (imported, UK, local, homegrown). The most extensive assessment is by Carlsson-Kanyama et al. (2003) who calculated the total energy input for 150 food items available in Sweden.

2.5.2. Results

Table 2 shows the calculated levels of energy inputs respectively per kg and per portion of the selected food items up to the collecting point of the consumer (the collecting point for the local or the mainstream system), subdivided in transport energy use, and processing (only for cheese and meat, since the other products are fresh fruits and vegetables) and storage energy use. Table 3 shows the emitted greenhouse gasses in g CO_2 per kg and per portion according with these energy uses.

Within local food systems total energy uses per kg (table 2) range from 1.34 MJ/kg for apples up to 37.17 MJ/kg for cheese. These high values for cheese are partly because 9.5 liters of milk are transported from the farm to the cooperative to produce one kg of cheese. This energy use for milk transport would be zero for on-farm processing of cheese. Also the energy use of the cheese-making process and especially the distribution of this cheese to deli shops all around Flanders by van make the total energy bill high. This case study covers the largest territory of the four local food systems we investigated. The low energy consumption of apples sold on farmers' markets is essentially due to the short transport distances in combination with a high enough trade volume per market. When looking at the energy use per portion, a parallel trend is seen, although less obvious because of the different weights of the food items. Potatoes are one of the three most energy consuming ingredients of the total meal, even with no storage energy uses and below-average transport energy uses. This is because potatoes represent a larger part of the meal in terms of weight (30% of the total weight of the meal).

In the mainstream system the lowest total energy use per kilogram was found for potatoes and apples (respectively 1.07 and 1.08 MJ/kg) and the highest for cheese (33.46 MJ/kg). The low energy use for beef, compared to the LFS, is due to the short geographical distance between the different steps in the food supply chain and because of economics of scale: the slaughtering and processing of the cattle happens on the same location because of the sufficient volumes. For transport, the energy bill of cheese is about one fourth of that of the LFS despite the longer distance traveled to the collecting point of the consumer. This is due to a difference in transport mode: bigger trucks with a higher load factor result in less energy use per kg of transported product. As mentioned before, it should be said that the cheese making cooperative in our case study uses more energy for transport up to the collecting point of the consumer than LFS that make cheese on farm. This is because in the latter case there is only transport involved in distribution of the cheese and not for milk transport to the cheese manufactory. On the other side our case study is located in the city centre of one of Flanders' largest cities, which will probably lead to easier access on foot, by bicycle or by public transport than an on-farm shop in the countryside (see transport efficiency of the consumer).

When comparing the averages of the total calculated energy use per kilogram for the different food items between LFS and the mainstream food system, the energy use is smaller in the mainstream system but is in the same order of magnitude. The total energy use of a locally obtained meal is double that of one sourced through the mainstream.

In a similar way, we calculated the carbon dioxide emissions (see table 3) for the different food items, resulting in comparable trends as seen in the energy results: in local food systems the highest total values are for cheese (2399 g CO_2/kg), the lowest for apples (77 g CO_2/kg) and in-between values for vegetables and beef. In the mainstream system all figures are lower, but with also the highest value for cheese (1833 g CO_2/kg), the lowest for apples (67 g CO_2/kg).

When looking at the total carbon dioxide emission per portion, cheese has the highest emission rates for both the local and the mainstream system, even though cheese accounts for a portion of only 15 g, compared to e.g. 200 g for potatoes.

When comparing transport energy uses and CO_2 emissions per kilogram on the one side to processing and storage energy uses and CO_2 emissions per kilogram on the other side (table 2 and table 3), almost all data for processing and storage are lower than for transport, except apples, both locally sold and through the mainstream system, and cheese in the mainstream system. Apple storage uses more energy and emits more CO_2 both in the local and the mainstream food systems because of the long storage period (up to 10 months in ULO-refrigeration). Cheese in the MFS consumes more energy and emits more carbon dioxide during storage than in LFS, as the production process in this study is the same for local and mainstream food systems. This is mainly because of the longer total storage time due to longer storage at each step in the mainstream food chain.

2.5.3. Discussion

We are aware of the sensitivity of our results to assumptions (see annex), as a lot of the data are difficult to obtain in exact figures and as this study is based on a small number of specific case studies. Although by using the same methodology for the local and the mainstream food systems, this sensitivity to assumptions can be largely reduced by comparing the relative differences between these two food systems. In addition, there can be large differences between similar LFS and there are some side effects outside these system boundaries of the basic simulation (full summer and inland production) presented in the results that have a non negligible impact on the total energy consumptions and on the total carbon dioxide emissions of a specific food item. These side effects are: the transport efficiency of the consumers' purchase of food, the transport efficiency of the transport mode for imports from abroad, and production in greenhouses versus in open air. Finally, it is also complicated to compare the absolute levels of energy uses and carbon dioxide emissions of this study with other studies because of the differences in system boundaries, calculating methods etc.

Variation between existing food systems

Even though the selected case studies are representative for the present LFS in Flanders, there can still be a large variation between LFS of the same kind. For instance there is a relative difference in energy use for transport of 1 over 9 between two investigated farmers selling their apples through farmers markets and of 1 over 13 for the energy uses of storage of two other farmers. Probably these differences are also to be found in other systems such as box schemes. The main causes for these large differences are

1. variations in the distance farmers/processor travel to deposit their products at consumers collecting points;

2. the diversity in the load factor of the transport up to the collecting point of the consumer: the volume transported by the farmer/processor per trip, resulting in almost the same total energy use or CO_2 emissions for the vehicle, but resulting in much different data when expressed per kg of transported food items;

3. the used transport mode: e.g. energy use in MJ/tonne of a van is much higher than of a large truck, when considering all other variables like the loading factor constant;

4. the efficiency of the storage facilities, e.g.: size, age, etc. of the refrigeration unit and the type of refrigeration: regular refrigeration or ULO-refrigeration (the latter only for apples and pears). Large producers or auctions and distribution centers have again the advantage of economy of scale, and often have more opportunities to buy newer, more efficient storage facilities.

Other technical determinants of transport that (can) have a large influence on the energy use and emission rates are differences in the combustion process in the transport mode itself, the fuel used, the after-treatment of emissions of the transport mode, the age of the transport mode, the drive mechanism, the air and road resistance, the weight of the vehicle, maximum speed and driving style, the used measuring methods and evaporation and leaking from air-conditioning systems (van den Brink et al., 1997; Van Essen, 2003).

Transport efficiency of the consumer

The transport efficiency of the consumer collecting his food through a local or a mainstream food system can have a high impact on the total energy consumption bill or the total amount of carbon dioxide emitted from the farm gate to the consumers' house (see table 4). In an extreme case a consumer driving 15 km by car (single trip) specifically to purchase only one kilogram of food, uses 164 MJ, an amount of energy ranging from 4 times (for Gouda cheese in the local systems) up to 153 times (for potatoes in the mainstream system) the amount of the energy already consumed from the farm gate up to the collecting point of this consumer for transport, processing and storage together. A consumer purchasing his food on foot or by bicycle results in no extra energy use or CO_2 emission at all, independent of the amount purchased. An in-between situation is for instance a consumer, combining his shopping with other activities, driving 5 km (single trip) to purchase 25 kg of food products, resulting in 1.37 MJ or 100.87 g CO_2 per kilogram collected products. This is the same amount of energy as transport, storage and processing jointly use, from the farm gate up to the collecting point of the consumer for one kilogram of each of the food items in the mainstream chain except for cheese, and for apples sourced by farmers markets.

Transport efficiency of transport modes for import from abroad

Another large factor in the total energy and emission bill of food products is the transport efficiency of import from abroad. Import occurs when domestic products are not available or products are not homegrown at all, e.g. tropical fruits. But also in-season there are a lot of food products imported that can also be homegrown. Table 5 shows the calculated levels of energy uses and carbon dioxide emissions for the most used transport modes over longer distances. For each transport mode the average load capacity (ALC) is given. Two parameters play the most important role: (1) the traveled distances: 400 km or import from neighbouring countries, 1500 km or continental transport and 6000 km or intercontinental transport, and (2) the transport mode used: transport by truck, by vessel, by train or by aircraft.

Combining these two, for short distances (400 km) bulk transport by vessel seems to be the most sustainable on energy and emission basis (0.41 MJ/kg and 29.77 g CO_2/kg), although a lot of food products are difficult to transport in bulk. All other transportation modes are two to three times more energy consuming or emit two to three times more greenhouse gasses. The highest value is for non-bulk transport by inland vessel (1.08 MJ/kg and 79.72 g CO_2/kg). For continental transport (1500 km) sea vessels use less energy (0.69 MJ/kg) and emit less CO_2 than trucks, electric trains and freight aircrafts (respectively 2.80, 3.88 and 29.43 MJ/kg). Transport by aircraft results in CO2 emissions that are more than 40 times those of trucks. Intercontinental transport results in even higher energy consumption and CO_2 emission with 2.75 MJ/kg for sea vessels and 103.33 MJ/kg for freight aircrafts.

These calculations are based on averages from literature, so there can be quite large differences when taking into account real loading factors, productive rides, flights in different stages, etc. It also has to be stressed that transport to and from loading points are not included in this study.

Production in heated greenhouses versus in open air

Differences in energy use for production in greenhouses versus in open air can also make a large variation in total energy consumption. Assuming that most energy is consumed by the heating installations of these greenhouses, we only take into account the energy used for this heating, excluding electricity consumption for e.g. lighting. Of the food items considered in this study only tomatoes and cabbage lettuce are produced both in greenhouses and in open air in Flanders. Based on Maertens and Van Lierde (2003) and Georges et al. (2003) we calculated that the heating of greenhouses uses on average 26.73 MJ/kg tomatoes and 22.90 MJ/kg cabbage lettuce or 1459.41 g CO2/kg tomatoes and 1250.21 g CO_2/kg cabbage lettuce. This means that respectively for LFS and MFS for the heating of greenhouses in Flanders, 10 and 18 times more energy is consumed for tomatoes and 9 and 21 times for cabbage lettuce than for non heated production in open air. These figures are yearly averages meaning that for production in winter/off season these ratios are a lot higher and for production in summer/full season these ratios are close to zero.

Combining the previous factors

When combining the above mentioned factors like transport efficiency of the consumers' purchase and of the transport mode for import from abroad and production in heated greenhouses versus in open air, the original energy uses and CO_2 emissions from the basic simulation for local and mainstream systems can vary a lot.

Consider, for example, the following four scenarios where all factors come together in one final energy figure: (1) inland tomatoes produced in open air, marketed through an LFS, and delivered at a collecting point on walking distance of the consumers house, (2) inland tomatoes produced in open air, marketed through an LFS, and purchased by the consumer 10 km away from his home, by car in a combined shopping trip, (3) inland tomatoes produced in a heated greenhouse, marketed through a supermarket and collected by a consumer by bicycle and finally (4) tomatoes produced in open air in Spain, transported by truck over 1500 km, marketed through a supermarket at 5 km of the consumers house and purchased by this consumer by car in a specific shopping trip. We assume for scenario (2) and (4) that the consumer buys in total 10 kg of products in one shopping trip. This results in:

- Scenario (1): 2.83 MJ/kg for buying through an LFS, 0.00 MJ/kg for production in open air, 0.00 MJ/kg for inland production and 0.00 MJ/kg for the consumers' purchase on foot. This results in a total amount of 2.83 MJ/kg.

- Scenario (2): 2.83 MJ/kg for buying through a LFS, 0.00 MJ/kg for production in open air, 0.00 MJ/kg for inland production and 6.83 MJ/kg for the consumers' purchase by car. This results in a total amount of 9.66 MJ/kg

- Scenario (3): 1.17 MJ/kg for buying in the supermarket, 26.73 MJ/kg for production in a greenhouse, 0.00 MJ/kg for inland production and 0.00 MJ/kg for the consumers' purchase by bicycle. This results in a total amount of 27.90 MJ/kg

- Scenario (4): 1.17 MJ/kg for buying in the supermarket, 0.00 MJ/kg for production in open air and 5.47 MJ/kg for the consumers' purchase by car, 2.80 MJ/kg for the transport from Spain. This results in a total amount of 9.44 MJ/kg.

If we take into account some more extreme scenarios, the differences are even larger. Consider the following two scenarios: (5) tomatoes produced in heated greenhouses in France, transported by truck over 400 km, marketed through a LFS and purchased by a consumer through a 10 km shopping trip specifically for shopping and (6) tomatoes produced in Kenya in open air and imported by aircraft over 6000 km, marketed through a supermarket and purchased by a consumer 15 km away from his home, by car in a combined shopping trip. We then compare these two scenarios with the scenario that has the smallest energy use possible in this study, being (7) inland tomatoes produced in open air, marketed through a supermarket and delivered at a collecting point on walking or cycling distance of the consumers' house. We assume again that for scenario (5) and (6) the consumer buys in total 10 kg of products in one shopping trip. This results in:

- Scenario (5): 2.83 MJ/kg for buying through an LFS, 26.73 MJ/kg for production in heated greenhouses, 0.75 MJ/kg for import from France by truck and 10.93 MJ/kg for the consumers' purchase by car. This results in a total amount of 39.58 MJ/kg.

- Scenario (6): 1.17 MJ/kg for buying through a supermarket, 0.00 MJ/kg for production in open air, 103.33 MJ/kg for import from Kenya by aircraft and 10.25 MJ/kg for the consumers' purchase by car. This results in a total amount of 114.75 MJ/kg.

- Scenario (7): 1.17 MJ/kg for buying through a supermarket, 0.00 MJ/kg for production in open air, 0.00 MJ/kg for inland production and 0.00 MJ/kg for the consumers' purchase on food or by bicycle. This results in a total amount of 1.17 MJ/kg.

These scenarios show that all the above mentioned factors play an important part in the final energy bill. Therefore, it is best to use a combination of all these factors in calculations before judging the situation.

2.4.5. Conclusions

In this paper we investigated the claim that LFS use less energy than MFS, such as supermarkets. For this we have calculated the energy required during the life cycle of a selected number of food items sourced by different food supply systems (farmers' markets, on-location sales, food teams, and a box scheme versus a supermarket) and their resulting carbon dioxide emissions. Being aware of the large variations that exist between different local and mainstream food systems due to variations in transport distances, transport modes and their loading factors, storage facilities, etc., our results show that energy use and carbon dioxide emissions in the basic simulation of this study (full summer, inland production) are almost always higher in the LFS compared to the MFS, though these variations are in the same order of magnitude. Larger differences occur when we take into account the side effects of the basic simulation, like the consumers purchase, production in heated greenhouses and import from abroad. Therefore, we try to formulate our conclusions in recommendations that can make local as well as mainstream food systems less energy consuming and CO_2-emitting:

- Local food systems can be much more sustainable when they are efficient enough in optimizing their transport and storage through diminishing the transport distance and storage time to a strict minimum or by increasing the stored and traded quantities to a full storage room and a full loaded transport mode.

- Supermarkets can exploit economies of scale, but could be a lot more efficient by diminishing the transport distance and storage time.

- The consumers' purchasing by car can have a large impact on the total energy and emission bill, depending on the amount purchased per trip. This contribution can be bigger than all other transport, storage and processing energy uses and emissions of the marketing section together. Purchasing on foot or by bicycle adds no extra energy use or emission to the final energy bill and is as a consequence more sustainable.

- By choosing food products that are in-season and can thus grow in open air or non heated greenhouses and are not imported from abroad energy uses and resulting CO_2 emissions can be reduced even more. Products from heated greenhouses consume on average 9 to 21 times more energy than products cultivated in open air when keeping all other parameters constant. Depending on the transport mode and transport distance, import from abroad can consume from 0.01 up to 97 times more energy than homegrown products, with the highest values for intercontinental aircraft transport.

Finally we would like to point out that it should be taken into account that a lot of LFS dó sell food products that are in-season, are grown in open air and are produced locally, so not imported, this has a considerable effect on the final energy bill of their products (as shown in the different scenarios above). In addition many LFS like box schemes and food teams deliver their products to collecting points just on walking or cycling distance of the consumers' house, work or children's schools, resulting in an external (extra) energy use of zero to purchase these food items through these systems. Furthermore products that are sources by local food systems are often traveling very fast from the field to the consumers home what results in less energy uses and emissions due to storage.

Table 2: Comparison of energy use in MJ per kilogram of food item for local food systems and mainstream food systems

	Local food systems			Mainstream food systems		
Food item	Transport	processing & storage	total	Transport	processing & storage	total
	MJ/kg	MJ/kg	MJ/kg	MJ/kg	MJ/kg	MJ/kg
Beef	3.90	0.99	4.89	0.34	0.99	1.33
Potatoes	2.74	0.00	2.74	1.07	negligible	1.07
Cabbage lettuce	2.43	0.45	2.88	1.07	0.46	1.53
Tomatoes	2.72	0.11	2.83	1.07	0.10	1.17
Carrots	3.19	0.23	3.42	1.07	0.21	1.28
Apples	0.50	0.84	1.34	0.54	0.56	1.08
Gouda cheese	21.27	15.90	37.17	6.06	27.40	33.46
Average	5.25	2.65	7.90	1.60	4.25	5.85

	Local food systems			Mainstream food systems		
Food item	Transport	processing & storage	total	Transport	processing & storage	total
	MJ/port	MJ/port	MJ/port	MJ/port	MJ/port	MJ/port
Beef	0.468	0.119	0.587	0.041	0.119	0.160
Potatoes	0.548	0.000	0.548	0.214	negligible	0.214
Cabbage lettuce	0.170	0.032	0.202	0.075	0.032	0.107
Tomatoes	0.190	0.008	0.198	0.75	0.007	0.082
Carrots	0.223	0.016	0.239	0.075	0.015	0.090
Apples	0.063	0.105	0.168	0.068	0.070	0.138
Gouda cheese	0.319	0.239	0.558	0.091	0.411	0.502
Total meal	1.981	0.518	2.499	0.638	0.654	1.292

Notes table 1:

- The refining of fossil fuels and the production of electricity in power plans are included in these calculations. These data are mainly based on personal communication with the food systems and van Essen et al. (2003) for transport calculations and Verlinden (2002) for storage calculations; see also annex 1.
- For processing and storage of beef only literature figures were available and the same figures are used for LFS and MFS (Carlsson-Kanyama and Faist, 2000), for storage no data were available.
- Portions: 120 g beef, 200 g potatoes, 70 g cabbage lettuce, 70 g tomatoes, 70 g carrots, 125 g apples and 15 g Gouda cheese.

Table 3: Comparison of CO_2 emissions in g CO_2 per kilogram of food item for local food systems and mainstream food systems.

	Local food systems			Mainstream food systems		
Food item	Transport	processing & storage	total	Transport	processing & storage	Total
	g CO_2/kg	g CO_2/kg	g CO_2/kg	g CO_2/kg	g CO_2/kg	g CO_2/kg
Beef	285.73	56.74	342.47	25.01	56.74	81.75
Potatoes	200.05	0.00	200.05	78.53	negligible	78.53
Cabbage lettuce	177.33	21.79	199.12	78.53	22.08	100.61
Tomatoes	198.70	5.19	203.89	78.53	4.73	83.26
Carrots	233.40	11.33	244.73	78.53	10.09	88.62
Apples	36.69	40.72	77.41	39.77	27.02	66.79
Gouda cheese	1557.14	841.71	2398.85	443.56	1389.10	1832.66
Average	384.15	139.64	523.79	117.49	215.68	333.17

	Local food systems			Mainstream food systems		
Food item	Transport	processing & storage	total	Transport	processing & storage	Total
	g CO_2/port	g CO_2/port	g CO_2/port	g CO_2/port	g CO_2/port	g CO_2/port
Beef	34.288	6.809	41.096	3.001	6.809	9.810
Potatoes	40.010	0.000	40.010	15.706	negligible	15.706
Cabbage lettuce	12.413	1.525	13.938	5.497	1.546	7.043
Tomatoes	13.909	0.363	14.272	5.497	0.331	5.828
Carrots	16.338	0.793	17.131	5.497	0.706	6.203
Apples	4.586	5.090	9.676	4.971	3.378	8.349
Gouda cheese	23.357	12.626	35.983	6.653	20.837	27.490
Total meal	144.901	27.206	172.107	46.823	33.606	80.429

Notes table 2:

- The refining of fossil fuels and the production of electricity in power plans are included in these calculations. These data are mainly based on personal communication with the food systems and van Essen et al. (2003) for transport calculations and Verlinden (2002) for storage calculations; see also annex 1.
- For processing and storage of beef only literature figures were available and the same figures are used for LFS and MFS (Carlsson-Kanyama and Faist, 2000), for storage no data were available.
- Portions: 120 g beef, 200 g potatoes, 70 g cabbage lettuce, 70 g tomatoes, 70 g carrots, 125 g apples and 15 g Gouda cheese.

Table 4: Comparison between transport modes and transport distances of the consumer in energy use in MJ per trip and in CO_2 emissions in g CO_2 per trip

Transport mode and transport distance	MJ/trip	g CO_2/trip
Consumer on foot	0.00	0.00
Consumer by bicycle	0.00	0.00
Consumer by car, specifically for shopping[1]		
5 km single trip	54.67	4034.87
10 km single trip	109.33	8069.73
15 km single trip	164.00	12104.60
Consumer by car, combining shopping with other activities[2]		
5 km single trip	34.17	2521.79
10 km single trip	68.33	5043.58
15 km single trip	102.50	7565.38

Note: Based on van Essen et al. (2003).
[1]: Taken 50% productive rides, meaning that only half of the car trip is actually used to transport goods and/or persons to or from specific places.
[2]: Taken 80% productive rides, meaning that 80% of the car trip is used to transport goods and/or persons to or from specific places.

Table 5: Comparison between transport modes and transport distances for products imported from abroad in energy use in MJ per kilogram of food item and in CO_2 emissions in g CO_2 per kilogram of food item

Transport mode and transport distance	MJ/kg	g CO_2/kg
Short distance (400 km)		
Truck (ALC 27 ton)	0.75	54.66
Electric freight train (ALC 1705 ton)	1.03	69.15
Inland vessel (ALC 1250 ton)		
Bulk	0.41	29.77
Non-bulk	1.08	79.72
Continental transport (1500 km)		
Truck (ALC 27 ton)	2.80	204.98
Electric freight train (ALC 1705 ton)	3.88	259.32
Freight aircraft (ALC 83.3 ton)	29.43	2149.20
Sea vessel (ALC 16000 ton, containers)	0.69	51.64
Intercontinental transport (6000 km)		
Freight aircraft (ALC 83.3)	103.33	8509.68
Sea vessel (ALC 16000 ton, containers)	2.75	206.55

Note: Based on van Essen et al. (2003).
Transport to and from loading points not included.

Annex: Methods and assumptions used in the calculations of the ecological impact

In general

- Transport energy and emission calculations are based on figures of van Essen et al. (2003).

- Indirect emissions and energy uses caused by production, maintenance and dissembling of the vehicles and infrastructure are not included in the energy and emission factors.

- Traffic jams are also not included, because their effect on the total emissions of road transport appears to be limited (van Essen et al., 2003).

- No other contributions to the greenhouse gas effect than CO_2 emissions are included. Although there are a lot of other gasses, like methane, that have a high greenhouse gas effect.

- Manipulation energy uses and emissions like loading and unloading with fork-lift trucks, etc. are not calculated as these are complex to ascribe to a specific amount of a specific food item.

- The transport energy use is the energy use per ton-kilometer, summed with the energy use of refinery, multiplied by the distance traveled and divided by 1000 to get the final data in MJ/kg food item (van Essen et al. (2003)). The energy use of refinery is the energy use per ton-kilometer multiplied by the energy ratio for refining. This energy ratio varies along different kinds of fuel and different oil fields. Here we have set it on 9% for all fuels, based on a comparison of Edwards et al. (2003), Meul et al. (2005) and van den Brink et al. (1997).

- For transport CO_2 emissions a comparable procedure is followed: the energy use per ton-kilometer is multiplied by the CO_2 emission factor of that vehicle, summed with the CO_2 emissions of refinery and then multiplied by the distance traveled and divided by 1000 to get data in g CO_2/kg food item transported.

- For these transport energy and CO_2 emission calculations, some estimations had to be made on transported loads in tons per vehicle, on load factors and on percentage of productive rides. For most cases averages of these figures are known or standards are used (Van Essen et al., 2003).

- Precise effects of transport to and from loading points are not known. For this we used the default energy and emission estimations of Van Essen et al. (2003) in the calculations.

- All distances are counted double as most rides are back and forth. Exceptions to these are pick-up and drop-off rounds, these are counted single and as if half of the whole load is transported during the whole round.

- Storage energy and emission calculations of fruit and vegetables are based on calculation tables from the Flanders Centre of Postharvest Technology (FCPT) for the cool storage in auctions (Verlinden, 2002). Storage energy and emission calculations of Gouda cheese are based on energy consumption figures of the cooperative association producing this cheese.

- Processing energy and emission calculations are only calculated for Gouda cheese and beef. For Gouda cheese these are based on energy consumption figures of the cooperative association producing this cheese, for beef these are based on Carlsson-Kanyama et al. (2000).

Specifically for cheese

- Data from the studied cooperative association producing organic cheese were very accurate, based on the production of 2004, but most of these data are in general, for all the different varieties of produced cheese and with one figure for the expenditure of energy for processing, storing and the own shop on location.

- For the mainstream system 90% of the total energy and emission bill of production and storage of the LFS is taken into account, assuming that 10% of the energy in the LFS was used specifically for their own shop. All deli’s selling the cheese of this cooperation are assumed to have the same energy use for their shops as the cooperation itself.

- Separate energy uses and CO_2 emissions for cooling during transport were not available and are thus not included.

- For storage in the supermarket in the mainstream food system, the average of the storage energy uses and carbon dioxide emissions for fruit and vegetables was taken as the best match to reality, due to a lack of more specific data.

Specifically for beef

- No data were available from the abattoirs, not for the one used by the LVS, neither for the one in the mainstream food system studied. Therefore we use figures of Carlsson-Kanyama et al. (2000). Separate energy uses and CO_2 emissions for cooling during transport were also not available and are thus not included.

- Assumptions are made for the percentage of boned meat obtained from the living weight of a cow (Belgian White-Blue double purpose cows). These are based on personal communication with the cattle breeders in our case study and on literature (UNEP, 2000) and set on 46%.

Specifically for apples

- For the local food systems three farmers selling their apples on different farmers’ markets were interviewed. Energy uses and emissions are calculated per farmer and then the average is taken.

- Storage energy uses and CO_2 emissions are respectively calculated base on calculation tables of the FCPT (Verlinden, 2002) and on the electricity production figures in van Essen et.al. (2003), both in combination with data specific to the studied food systems e.g.: type of cold store, storage time, etc.

- The average storage time and type of cold store (regular cooling or ULO-cooling) that the farmers indicated during these interviews is used to calculate the storage energy use and CO_2 emission. No energy is used to cool the apples on the way to the farmers' markets and on the market itself, except on very hot days, but this extra cooling is not included in the calculations.

- For the mainstream food system the storage period used in calculations is the same as in the LFS, but all apples are assumed to be stored in ULO-cool stores. Extra cooling in the different stages after the ULO-storage (at the auction, in the distribution centre and the supermarket) is considered as regular cooling and comparable to the cooling used at the auction, with a total cooling period of 7 days.

Specifically for vegetables and potatoes

- For transport energy use and CO_2 emission in the LFS, data are based of the amounts of cabbage lettuce, tomatoes, carrots and potatoes that were put in the box schemes during the year 2004, taking into account the number of times a specific food item was put in the box and thus transported. Products in these box scheme are mainly own production (1), but also from associate farmers (2) and in some cases from a biological wholesaler (3) dropping off these product at the farm in a drop-off round. Percentages of each of the three ways of obtaining the products are calculated and multiplied by the matching energy uses and CO_2 emissions to get a result as close to reality as possible.

- The average weight of a medium vegetable box is estimated to be between 3 and 4 kg. In reality there are large seasonal differences and also small, medium and large vegetable boxes and separate potato boxes in the LFS studied.

- Storage energy use is also calculated base on calculation tables of the FCPT (Verlinden, 2002), in combination with data specific to the studied food systems e.g. storage time.

- For the local food systems, the average storage time that the farmers indicated in the interviews was 1 to 1.5 days. Because of unavailable data on small cool stores, the figures from the FCPT (Verlinden, 2002) are used and multiplied by a factor 1.5 in the calculations of storage energy use and CO_2 emissions. This factor 1.5 is utilized based on personal communication with experts from the FCPT. No energy is used to cool the vegetables on the way to the consumers collecting point and at the collecting point itself.

- For the mainstream food system the total storage period (on farm, at the auction, in the distribution centre and the supermarket) used in calculations is considered as one storage period of 7 days in cold stores all comparable to storage system used at the auction.

- For potatoes in the mainstream system, no storage data were available. These data are considered to be negligible due to the fact that potatoes can be well kept for a long time in cool, dry and dark storage places with minimum external inputs.

2.6. Integration and communication of results

The next step involved translating the results from the various indicators into a format that can be used by institutions dealing supporting local food systems towards the consumer. For this, we developed a poster and a folder for a single case study product, the tomato. In this section, we provide the contents of the folder. These folders were sent to a organisations that are active in the field of stimulating the consumption of sustainable food stuff, including consumer organizations, producer organisations, NGOs fostering sustainable development, government agencies, student restaurants, etc. As several have indicated to use the folder in their communication towards consumer, we have printed 15,000 copies.

Box 1: Contents of tomato poster

Introduction

As a consumer, you can order a vegetable box (as well as a fruit and a potato box) on a regular basis. The main principles behind box schemes are the following:

- At fixed moments (e.g. every Monday) you let a selection of fresh products surprise you. These vegetables are mainly grown by the producer himself and are preferably in season and from the region. This means that in winter you will not find tomatoes in your vegetable box but more or less familiar Belgian vegetables like parsnip, leek, chicory and carrots. While in summer you will get tomatoes as well as beans, peas and salads.
- The boxes are dropped off close to your home at a fixed time, at a delivery point, so you can easily fetch your box on foot or by bicycle.
- You order your box in a size that fits your consumption pattern.
- When you're on holidays, you let your producer know so he can postpone your vegetable box for that week.

Social impact

Vegetable box schemes often contain a newsletter with details about the farm and recipes for less common vegetables. Costumers can react and are in this way closer connected with the farm where their products come from. These contacts create job satisfaction for the farmer and his family.

This contrasts with the anonymity and the strictly business relation between producers and auctions in the long chain: products are delivered at the auction, their quality is inspected and then a 'clock' determines the price the farmer gets for his products. Sometimes arrangements within the auction are made with buyers like supermarkets and wholesalers, about quantities, quality and price. Farmers choose this channel because their production volume is to large to market it through smaller, local channels and/or to invest less work in marketing their products themselves.

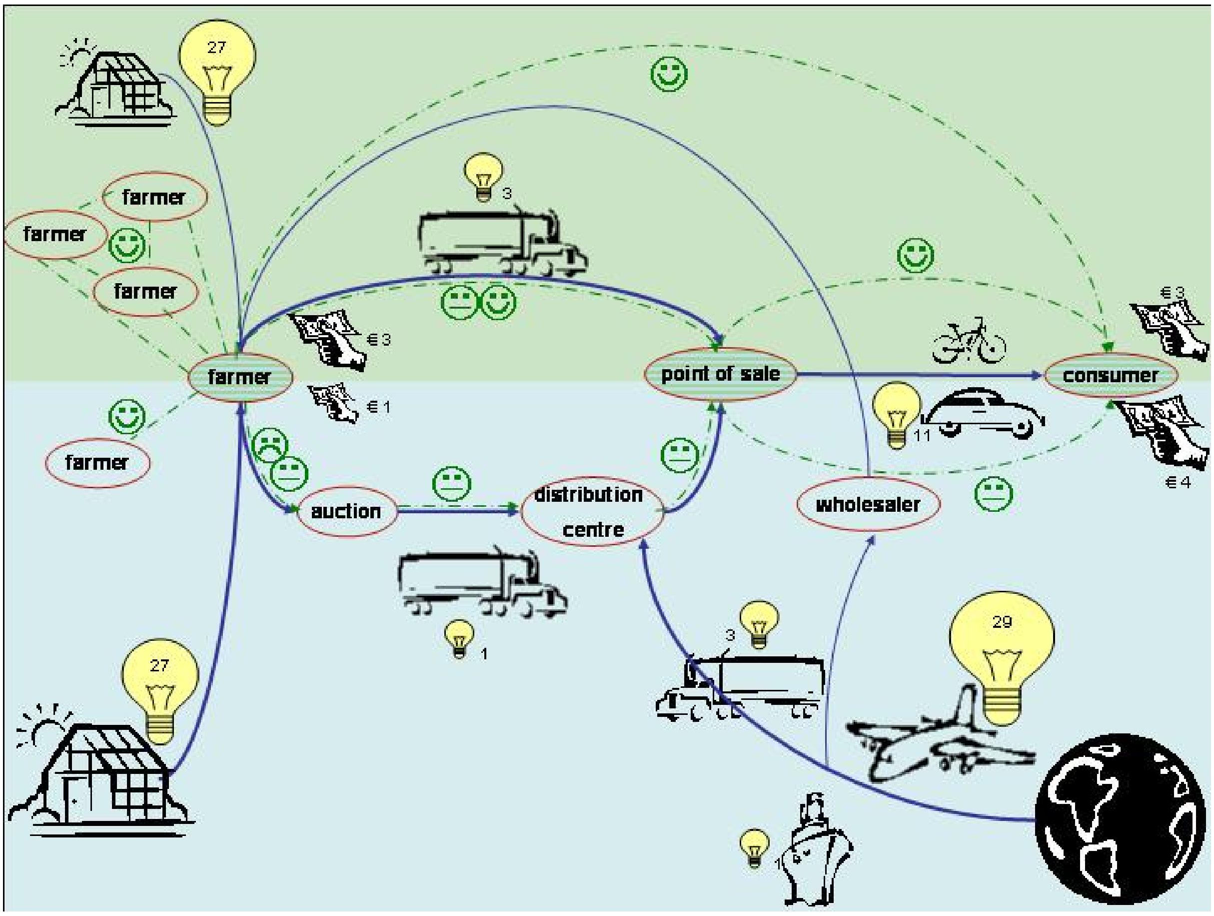
Box 1 (continued)

Economic impact
Here the price difference was investigated: price to producer versus price to consumer, without conversion of this price to the work and time invested.

Ecological impact
On an ecological level, different factors have an influence: you can buy your food in the supermarket or locally. But a lot of food products are only available in a specific season in our climate, unless they are grown in heated greenhouses or are imported from abroad. Next to these things the way the consumer purchases his products (on foot, by bicycle, by car, etc.) has an important influence on the total energy bill or the total amount of emission of carbon dioxide.

As you can notice you can make a large difference as a consumer by shopping in a more conscious way, through local as well as through conventional food chains. You can for instance shop by bicycle or on foot and buy products that are in season from your own region and that have been grown in open air.

Generalization
The data that are presented here are based on a comparison of tomatoes bought through a box scheme or in a supermarket. Of course there are various other channels in both chains. Farmers can sell their products locally e.g. on a farmers' market or through on-farm sale. Ecologically this will cause different energy uses and CO_2-emissions. But also other factors have an influence on energy uses and CO_2-emissions, like refrigeration and the manufacturing of production inputs like pesticides. Socially a lot depends on the attitude of the farmer and the consumer themselves. In general it can be said that there is more direct contact in the short food chain what leads to a relationship of mutual trust between farmers and consumers, satisfaction and appreciation. Economically farmers often get better value for their products while consumers often pay less compared to in the long supply chain.



Legend
The color of the arrow shows the kind of sustainability:
Ecological: The path that products travel from the farmer to the consumer

- Production in heated greenhouses
- Import from abroad (average taken here: 1500 km)

Social: The relations between the different steps in the food chain

- Good relations, satisfaction and/or intense contact
- Neutral and/or strictly business relations
- Dissatisfying relations, little trust or involvement

Economic: The price that the farmer gets for his product and/or the consumer pays for the same product in €/kg tomatoes

Figure 4: Comparison of local versus mainstream food systems for tomatoes

2.7. Conclusions

We described and tested eight indicators that capture the economic, social and ecological impacts of different food systems. In general, it is very difficult to obtain the data that are needed for the calculation of these indicators. This is due to the small size of the local food system sector, but also the disaggregated nature of the required data what makes it very time consuming for respondents to retrieve such data.

As the importance of LFS compared to MFS is small, one should be in search of a mean to introduce the benefits of the LFS in the MFS, without losing the values of the LFS. No point is made when both systems are only competing one another, while they are grounded in different philosophies, both with their sympathizers. The differences in LM3, product value in the consumer price and absolute price differences both to producer and consumer all point the conclusions in favour for the LFS, when results in relative values are taken into account. However, when one includes the market share of both systems, the absolute conclusions on country level turn out differently. This grounds the following remark: the real challenge is not necessarily to be found in a way to turn the entire food market in LFS, but an even bigger challenge is to find the way to introduce the positive values and impacts of the LFS in the MFS and vice versa. A very important aspect in the latter is communication on product-properties, including producer, processor and price information.

On a social level, the modalities of social networks may on the one hand influence the amount and the nature of appreciation a farmer gets. However, on the other hand the difference between long and short supply chain farmers is not necessarily reflected in their surrounding social networks where knowledge is exchanged, communities are built, problems are shared and farmers back up for one another. In this respect it is more important to support personal attitude from farmers towards any network, rather then exclusively support local networks.

CHAPTER 3

INVENTORY OF LOCAL FOOD SYSTEMS

A twofold inventory is made consisting of (1) all LFS with a network character in Flanders, and (2) the institutions that facilitate the establishment and working of the LFS. For the first inventory on LFS in Flanders we started from the existing inventory by Jan Vannoppen and Pierre Stassart on short food chains in Belgium. This inventory was put together in 1999, in the framework of the DWTC programme on future-prospected socio-economic research 'Is the state to intervene, and can it intervene in developing a social economy?'. The existing inventory was updated and completed. The expanded inventory on LFS is based on criteria of social, economic, environmental and institutional performance, as mentioned in chapter 1.

The first inventory is based on the working definition of LFS, developed in chapter 1. Individual farms with on-farm sales are not included because there is already an inventory of on-farm sales, made by the Vlaams Agrarisch Centrum (VAC) under the authority of the Administratie Land- en Tuinbouw (ALT). Members of the LFS in our inventory where interviewed by phone to collect information such as: contact information, product category, percentage purchased products, production method, nature of the interaction with the client, selling system, learning points of the system (positive and negative), start up year, motivation, etc.

The second inventory contains the institutions that facilitate the establishment and working of local food systems. This inventory is composed through information received from the LFS that were interviewed and through searching on the internet. The inventory on LFS was made based on the working definition developed in chapter 1. The list contains LFS of the following kind:

- box schemes
- producer cooperatives
- marketing cooperatives
- farmers' markets
- home sales
- catering.

The inventory on institutions that facilitate the establishment and working of LFS contains a number of organisations (governmental and non-governmental) classified in six types:

- policy advice through research within the sector
- communication and promotion
- fiscal advice for farmers
- knowledge and training
- financing
- rural development.

The inventories have been continuously updated during the project, with input from case studies and relevant contacts.

The accompanying committee strongly adviced against the project spending too much resources to the development of an interactive website featuring the inventory of local food systems and a number of communications targeted at the final consumer. The committee sees this as the responsibility of end users of our research results.

For further details, the inventories and the describing documents on the analysis, can be consulted at Vredeseilanden.

CHAPTER 4

INVESTIGATION OF THE POTENTIAL TO DEVELOP LOCAL FOOD SYSTEMS

4.1. Introduction

The appeal of food that is locally produced and sold directly to the consumer is increasing in response to globalisation and food crises. Farmers convert to quality food production and establish niche markets. However, such conversion involves costs, changing policies and new competences. Previous research has primarily focused on the policy and market environment (e.g., Tregear et al., 1998), on the social aspects of local food systems (e.g., Hinrichs, 2000; Nordstrom and Ljung, 2005) and on the switching costs for farmers (e.g. Verhaegen and Van Huylenbroeck, 2001). Research on the development of local food systems (LFS) with a network character and particularly on the competences needed for their establishment and development is virtually absent. This chapter addresses the question which competences are needed for developing such local food systems.

4.2. Method and research design

To answer the research questions we choose for an inductive case study approach. Yin (2003) defines a case study as empirical research that investigates a contemporary phenomenon in a real context that is used primarily when the borders between the phenomenon and its context are not evident. Case studies are specifically suited to build theories in an inductive way (Eisenhardt, 1989), which is the case in this project. For this, we base our approach by the principles of research design that are developed by Strauss (1987), Eisenhardt (1989), Miles and Huberman (1994) and Yin (2003). We choose for a multiple embedded case study design, as a single case does not allow to adequately answer the research questions and capture the variety of strategies in learning and innovation processes. In addition, a triangulation or combination of research methods and data sources is necessary to support the validity of the research (Eisenhardt, 1989; Yin, 2003).

We used various data sources and methods. This triangulation has the same rationale as in hypothesis testing research, that is, a stronger support of the constructs, the hypotheses and the theory. The following sources have been used: (1) documents (e.g., meeting reports, website), (2) interviews, (3) observations of meetings and (4) intervention. The case data are brought together and summarized through a methodology known in the literature as the learning history, a retrospective history of important events in the recent history of the case and of the ways members have learned and acted following these events. The researcher reports in the learning history how the actions of actors have led to certain results. The following steps have been taken:

- In a first step, researchers have observed meetings, conducted in-depth interviews with key informants and collected documents. Emphasis is put on events and actions that are important in the development of the local food system. The information is analyzed and written down in a case history. Critical points that form a pattern in the case are formulated in a number of dilemmas.

- In a second step, all the case members are confronted with the case history and analysis in a joint meeting. This validates the correctedness of the data and gives the possibility to adapt the case history. Further, the researchers propose an intervention based on their anaylis. The case members approve.

- In a third step, the intervention takes place in the form of a workshop led by the researchers and attended by all case members.

The construction of a theory is an iterative process, in which the researchers go back and forth between theory and data. Largely this process occurs in three phases. First, the constructs and relations are sharpened. The definition of the constructs is refined and evidence to support the constructs is supplied. Next, it is investigated whether the hypotheses or the relationships between constructs concur with the data in each of the cases. This process of verification is comparable to testing a hypothesis, but here the logic of replication is used. Second, the concepts, theories and hypotheses thus constructed are confronted with existing literature. Third, the validity and the usefulness of the results are tested in a workshop with relevant stakeholders (see chapter 5).

4.3. The cases and their dilemmas

We selected three cases in a way to capture different types of products being sold and different kinds of organizational arrangements.

4.3.1. Case A: Informal vegetable marketing cooperative

Case A is an informal cooperative between three farms selling organic vegetables mainly through box schemes and on-farm sales. The main reason for their collaboration has been to search for economies of scale in marketing, but the farmers also share a belief in anthroposophic principles as applied in bio-dynamic agriculture. The cooperative has been established in 2004 as a spin-off of a larger group of 10 farmers. The larger group has consequently been broken up, partly because of lack of a shared vision and lack of action. The three farmers of case A are now planning together their production and the composition of the vegetable boxes, but have not yet established further collaborative efforts, such as agreements on prices. We distinguished three sets of dilemmas in the development of case A.

The first recurrent dilemma is the quest to find a good balance between economics on the one side and sustainability and ideology on the other. The difficulty of the case members to reach agreements on production plans and joint prices is a good example of this dilemma. Is it possible that prices that are dictated by the market always cover production costs? How should the cost of a product be calculated? This problem is concretised in the weekly composition of the vegetable boxes, as consumers are still free to choose the producer they will buy from.

The second dilemma is the tension between the individual visions of the farmers and the shared vision of the cooperative. The cooperative's success depends on the degree to which these coincide. Similar tensions have led to a break out from the original group of farmers. But also in the current, smaller group there is no full understanding of each other's vision. This leads to underinvestment in the collective of both time and money, and a stagnation of the initiative. Hence, the degree to which the vision is shared will also determine the depth of the collaboration.

The third dilemma is the contradiction between fast and slow. Of course this is related to the previous dilemma, as a shared vision will speed up the action. Taking time in the beginning to build trust is necessary for building effective teams and a shared vision. However, when in meetings the social aspects tend to dominate, decisions are postponed leading to inaction.

4.3.2. Case B: Meat marketing cooperative

Case B is a cooperative of five farmers selling meat through box schemes and an internet shop. Individually, some of the farmers also use various other marketing channels. Five breeders (pigs, cattle, poultry, rabbits and sheep) using alternative methods to produce high quality meat established the cooperative in 2002 to market their niche products. The breeders were supported by an NGO that coordinated a box scheme. The cooperative collects orders, buys animals from the cooperative members, has them slaughtered, has the meat processed by a hired boucher and sells the meat directly to the consumer. The cooperative members contribute in the packaging of the meat and transportation of the animals and the meat. In 2004 the NGO and the cooperative jointly created a label and a webshop in the framework of the a government funded project. We distinguished four sets of dillemas for this cooperative.

The first dilemma is the tension between pioneers and followers. This dilemma is similar but not quite the same as the dilemma fast-slow in case A. To capture scale economies the cooperative needs to grow and take further steps. Different risk profiles of the members leads to different opinions with respect to development of the cooperative. But, the fact that pioneers invest more resources (money and time) in the cooperative without necessarily reaping the benefits of those resources leads to tension.

The second dilemma is the choice between a formal/strict approach versus an informal/ pragmatic one. Informal rules built in an environment of trust leads to more flexibility and thus potentially to more profit. However, the heterogeneity of the farms in terms of production practices and the introduction of newcomers may lead to tension and, as a result, to the introduction of formal rules or the formalisation of existing rules. Examples of this include labour input, cost sharing and profit allocation.

The third dilemma refers to the individual-collective paradox, as in case A. The confrontation of the self-interest of the individual farmers with the interest of the cooperatives is healthy in terms of continuously questionning the basis and rules for collaborating. In this case, how financial risk is shared is a particular source of tension.

The fourth dilemma is whether to outsource or do it yourself. The members hold the independence of the cooperative as very important. This was the very reason of its establishment: marketing quality food independent of the mainstream retail system. As a result, the cooperative has a tendency to outsource as little as possible and to be involved in every step of the supply chain. However, this often conflicts with available time, such that, in practice, some work has to be outsourced.

4.3.3. Case C: Associative economy shop

Case C is a shop working according to the principles of the associative economy since 1988: production and consumption are brought together directly by a mediator, thus avoiding unnecessary production, transport and stocks. The shop acts as a mediator between consumers and producers. Customers predict their demand twice a year. The shop then relays this information to its suppliers, such that the latter can adapt their production planning. Prices should cover the production costs of the suppliers and the mediating costs of the shop. The latter are covered by a fixed fee, paid monthly to the shop. As a result, there is a contractual arrangement between the consumer and the shop. Currently, there are contracts between the shop and its suppliers for only a limited number of products. Products are predominantly organic and even biodynamic. We have identified three sets of dilemmas for case C.

The first dilemma is grounded in the ideological (anthroposophic) nature of the shop that gives rise to a tension between the (mainstream) market and an ideology of sustainability, and thus similar to the first dilemma of case A that also strives to work according to anthroposophic principles. The dilemma is felt, for example, when suppliers are not willing to deliver when the requested quantities are too small.

The second dilemma is the dilemma of keeping the initiave 'intimate' or upscaling it to have a greater impact. With intimacy we mean having strong and trustworhty relationships with the consumer that shares the same ideology. However, as the number of consumers sharing the same ideology is rather small, the question rises whether more people can be reached by putting less emphasis on the ideological principles of the shop.

The third dilemma is the dilemma that is common for all cases: the tension between the individual and the collective. In this case, this is felt by the lack of balance of the collective. The initiative is highly focused on the shop and its relationships with a group of consumers sharing the same ideology, and less on its relationships with producers. In fact, there is no relationship whatsover between the consumers and the producers.

4.4. Interventions

The intervention took the form of a vision workshop in all three cases. This was because in all three cases the researchers diagnosed a lack of shared vision as the major stumbling block in the further development of the LFS. The time spent on the workshop was different for the three cases. The most elaborate workshop was done in case A. The workshop was organised in a place where the members and the researchers stayed overnight. It took almost two full days. In case B and C a full day was spent. Despite the different time allocation, all workshops were designed according to the same three-step framework: (1) in a first step the values and aspirations of all members is surfaced and shared, (2) then individual visions for the collective are elaborated and blended into a common vision, and (3) actions that put the vision into practice are identified and elaborated.

The interventions were carried out by three researchers (only two in case C). Each researcher had the responsibility to lead part of the workshop. This provides the other researchers the opportunity to observe and reflect. Most of the dialogues were centered around flip-charts to write down key elements. Learning points for the research involved answers to the following questions: How do the actors deal with the leverage points in their system? How do they interact? What is the quality of the conversation? Are the actors able to develop a truly shared vision and develop an action plan?

4.5. Towards a theory of LFS development

Using the data of the observations, the stories and particularly the interventions, we build up a theory of the development of LFS by exploring the conditions or leverage points that make it possible for the LFS to grow. For this, we proceed in two steps. First, we take an inward perspective by looking at the LFS in isolation of its environment. Second, we broaden our scope taking an outward look and looking at the dynamics in which the development of LFS is embedded.

4.5.1. An inward look at LFS: the importance of competences

Most of the dilemmas and much of the tensions observed during the interventions are related to differences in vision and decision making processes. We propose that members' individual and collective competences form a first set of conditions for LFS to succesfully develop themselves. More specifically, we formulate the following three propositions that relate to competences that need to be present in an LFS in order for it to successfully develop.

Proposition 1: To be succesful, an LFS needs managerial competences to support the ability to act.

With managerial competences we mean the skills to convert an idea into action. This competence is particularly present in case B, the meat marketing cooperative. Action is propelled here by the farmers that depend on the cooperative for most of their output. New initiatives, such as a webshop, are taken rather swiftly. However, the members still feel that they are acting too much 'reactively' and not enough 'proactively'. Case A, however, is characterized by much less managerial action and skills. This cooperative stays too much in the idea phase and turns to external advice to prepare possible actions, but as long as the advice is not well internalised and/or managerial competences are not developed, case A is bound to stay relative inactive. A meaningful moment in the intervention of case A was at the end of the workshop when all members took their diaries to fix dates for all the actions that were identified during the workshop.

Proposition 2: To be succesful, an LFS needs cognitive competences to support the ability to reflect upon its actions, to learn and to develop new ideas

The ability to learn from experience is essential for adapting actions and generating new ideas, and thus for further development. In addition, entrepreneurship entails being able to spot market opportunities. Case C, the associative economy shop, seems particularly able in reflection and learning. The shop organises reflection days with its consumers and sympathizers on a yearly basis. Also case B has a yearly reflection day during which they often invite an outsider for support. However, the strong influence of an ideological framework may well hinder higher order learning as information not concurrent with the framework may be rejected. Higher order learning is the ability to question and change one’s own mental models of the real world. Due to case A’s and C’s strong beliefs in the principles of bio-dynamic agriculture and anthroposophism, they may reject innovative ideas or discard some mental models as being irrelevant. Case B, however, seems less prone to reflection and more pragmatic, but there seems to be more openness for change and innovation and a more entrepreneurial spirit.

Proposition 3: To be succesful, an LFS needs relational competences to support the ability to share

Relational competences refer to the necessity to act and learn jointly. They aim at producing trust and shared meaning. It is essential as a basis for sustained joint action. This is more difficult to achieve between different organisations than within a single organisation. Entrepreneurial competences will fail if not supported by trust and shared vision. The members of case A seem very skilled in the art of dialogue. Despite this, our intervention showed that the members are not fully aware of each others complete visions. The intervention in case B was the first time a true dialogue among the members was held, that is, when there was full openness on the individual aspirations, but also assumptions. All members were surprised to find more common ground than expected. The intervention also created the necessary tension in order to go forward.

As a result, when one of these competences is lacking or ill-developed, LFS tend to stagnate in their development or to be highly dependent on external input. The latter is not sustainable as often depending on the possibility to receive government subsidies. Case A and B are stagnating in their development either due to a lack of managerial competences (case A) or relational competences (case B). Case C is a special case in the sense that ideology plays a dominant role with experimentation being more important than upscaling.

From a theoretical point of view, these propositions are closely connected to the literature on inter-firm collaborations. This is a subfield within the fields of management and organization studies. However, most of this literature takes a static view of strategic alliances between firms (Davis, 2005). Scholars studying the dynamics of collaborations focus on the formation, evolution and dissolution of alliances. In their seminal contribution, Ring and van de Ven (1994) were the first to develop an evolutionary model of inter-firm collaboration. They emphasized the importance of congruent sense making, personal relationships and the trade-off between trust and formality. Doz (1996) emphasized the importance of learning along several dimensions for the success of collaboration.

The importance of learning points to a second strand of literature that connect to our propositions, namely the field of organisational learning. Organisational learning is the study of learning processes of and within organisations. The idea that not only individuals but also organisations can learn was put forward first by Cyert and March (1963). They developed a model of decision making in which they emphasized how firms use rules, procedures and routines when they adapt to external shocks. An important contribution is further Argyris and Schön (1978) who showed the importance of organisational defence mechanisms against learning processes. The field was further developed in the 1980s by Hedberg (1981), Shrivastava (1983), Daft and Weick (1984) and Fiol and Lyles (1985). The concept of organisational learning—and particularly the learning organisation—has been further popularised by Senge (1990).

Organisational learning is based on the theory of individual learning processes in which information processing and decisionmaking are improved by individual learning. A famous model of individual learning is the experiental learnig cyclus of Kolb (1984). According to this model (figure 5) learning is stimulated when the individual experiences a discontinuity ('concrete experience'). The individual reacts by reflecting on this observation ('reflective observation') given previous experience. This may result in a change of understanding ('abstract conceptualization') which may lead to the implementation of new knowledge in practice ('active experimentation'). For teams all these steps occur collectively (see also Senge et al., 1994).

Kolb (1984) stresses that individuals have a natural preference for one or more phases in the cycle. Styles may be diverging (from experience to observation), assimilating (from observation to conceptualization), converging (from conceptualization to experimentation) and accommodating (from experimentation to experience). Strong teams or collaborations have all styles among them. Compared to these styles our concept of entrepreneurial competence concurs with the converging and accomodating styles, while our concept of cognitive competence concurs with the ability to diverge and assimilate. Our notion of relational competence refers to the collaborative aspect.

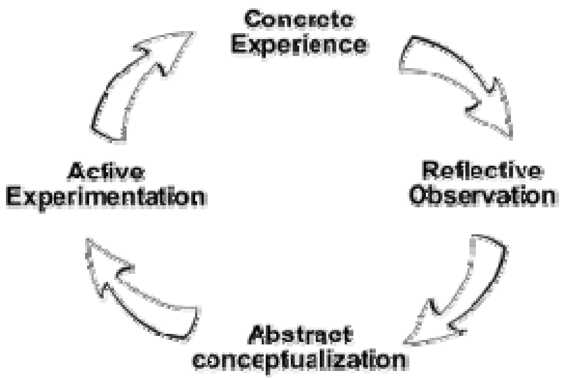


Figure 5: Kolb's Experiental Learning Cycle

4.5.2. An outward look at LFS: LFS as innovation niches in the transition towards a sustainable agricultural and food system

Under pressure of a manifold of driving forces, Western European agriculture is in transition from a supply-driven commodity-based system towards a demand-driven system bringing forth differentiated food of high quality, both with respect to product and to production process. According to Geels (2004) a transition from one system to another is a dynamic, multi-level process that can be described as follows:

- A sector is characterized by a set of socio-technical regimes, that is, the rules (formal and informal) by which production and consumption in the sector occur;
- Radical innovations occur in protected places or technological niches in which experimentation is possible;
- Developments in the wider landscape (e.g., climate change, cultural shifts) put pressures in the existing regimes which creates windows of opporuntiy for novelties;
- Different niches are gradually linked together, take advantage of the windows of opportunity and start competing with the existing regimes.
- The new technology takes over, defines a new socio-technical regime and influences the landscape.

However, system change is often hampered by the presence of system imperfections, which open the door for government intervention. Woolthuis et al. (2005) have categorized system failures as follows:

- Infrastructural failures: infrastructure refers both to the physical infrastructure (IT, telecom, roads, etc.) and the science and technology infrastructure;

- Institutional failures: institutions refer both to hard or formal institutions, such as rules, and soft or informal institutions, such as culture and values;

- Interaction failures: interaction refers to the linkages between actors that can be too strong resulting in myopia or too weak resulting in lack of cooperation and blind spots;

- Capabilities failures: this refers to a lack of competences or resources especially with small and medium-sized enterprises.

The last failure has been addressed in the previous section. Using our data to applying this theory to the development of LFS yields three additional propositions.

Proposition 5: To further develop LFS, the knowledge base that supports the development of competences and insights needs to be developed.

Universities, applied research stations and other science and technology actors are still geared towards the existing mainstream of commodity production. The development of knowledge relevant for the LFS niches occurs itself in niches within these actors. A typical problem is that LFS are not able to generate the necessary co-financing for applied research projects compared to mainstream sub-sectors.

Proposition 6: To further develop LFS, existing rules and institutions need to be adapted.

The rules governing the agricultural and food sector are based on the old system of strictly separated production stages. In LFS, however, production stages are reintegrated leading often to a conflict with the existing rules. This may refer to food safety regulation, transportation, retail, zoning regulations, etc.

Proposition 7: To further develop LFS, initiatives need largers networks.

When drawing the networks of our cases, it becomes immediately evident that these tend to be limited to a small group of people sharing the same assumptions and having established trust relationships. This refers both to other farmers, advisors and consumers. This may lead to myopia towards developments outside. This is also clear from the learning journeys to kindred initiatives and the invitation of experts who are part of the same inner circle. At the same time, weak ties with external partners outside the LFS sector are generally lacking.

4.6. Conclusions

The central question to this chapter was 'what is needed for farmers to successfully develop local food systems?'. For this, we conducted three case studies using a mix of observations, interviews and intervention research.

We propose that farmers need three sets of competences. First, managerial competences are needed to convert ideas into action. Second, cognitive competences are needed to observe and reflect on experience. Third, relational competences are important as local food systems involve close collaboration among farmers and in some cases also with other actors. We postulate that for LFS to successfully develop, they need all three competences. We think that some of these competences may be supplied by outside advisors, but the sustained success of the collaboration crucially depends on the degree to which these competences are internalized by the LFS. Therefore, in designing policies and/or consulting practice sufficient attention should be paid at all these competences. For example, subsidies should not only cover the making of a business plan, but also the building of a shared vision. Advice should aim at strengthening these competences, rather than just supplying them.

We further propose that for the development of LFS, three sets of system failures need to be addressed. First, LFS should get better access to the science and technology infrastructure. Government should rethink its research policy by enabling also high risk research that may lead to radical innovations (as is done in many other sectors already). Second, the many rules and regulations limiting the broadening and deepening of agriculture should be adapted and be made more flexible. Third, LFS networks should be broadened by stimulating LFS members to tie with actors outside their inner circle.

CHAPTER 5

SYNTHESIS AND DISSEMINATION

5.1. Introduction

For the dissemination of our results we used the following means: (1) a website with a description of the project and contact details (www.lokaalvoedsel.be), (2) a workshop at the end of the project (The Sustainability Cafe), (3) scientific publications and presentations, and (4) a toolkit with recommendations for various actors. The toolkit is developed in collaboration with the European project SUS-CHAIN and is not part of this final report.

5.2. The Sustainability Cafe

5.2.1. Aim

A joint workshop was organised in December 2005 at the yearly national agricultural fair (Agribex) in Brussels in collaboration with the Department of Agricultural Economics of the University of Ghent, that works together with Vredeseilanden on a European project on sustainable alternatives within the food chain (SUS-CHAIN). The aim of this workshop was to organise a dialogue and to use the knowledge and expertise of the participants. Using an interactive way of working, we not only wanted to validate our results and recommendations, but also to co-create recommendations with the stakeholders, such that they are disseminated more swiftly. In total, about 60 participants from a variety of backgrounds (academics, government, farmers organisations, intermediary organisations, individual farmers, NGOs, etc.) actively engaged in the workshop.

5.2.2. The Sustainability Café: an invitation for dialogue

The 'World Café' (Brown and Isaacs, 2005) starts from the assumption that people have the wisdom and creativity to tackle the most difficult challenges. Given the correct context and focus it is possible to access this deeper knowledge about what is important.

Participants are sitting at tables in groups of four or five in an informal café atmosphere (with coffee and biscuits freely available). A dialogue is held at each table concerning a central theme (by means of a centrally posed question), thoughts and findings are noted on the table cloth, grouped and structured. The input of each participant is meant as complementary: the aim is to listen rather than discuss. After 20-25 minutes the participants are invited to change tables. At each table one person remains as host for the newly arrived. The hosts summarizes what was said in the previous group using the notes and drawings on the table cloth, such that these can be used for the next dialogue.

This procedure is repeated several times before coming to a moment of synthesis. For this, the participants take note of the conversations at the various tables and a final dialogue is held in plenary. After the café, the organisers process all results in a written document to be sent to all participants.

After two presentations with the main results and recommendations of the research projects, three rounds of dialogue were held with as central question: "How can sustainable food chains be strenghtened?". In the second round, a new question was introduced to focus on what is new ('What new things did you learn?'), while in the final round participants were asked to specifically search for elements needed for change ('What is needed to bring about change?'). In plenary conversation, every table was asked to think about what they think is the most important lever to strengthen sustainable food chains.

5.2.3. Levers to strengthen sustainable food chains

After the workshop, we clustered the reactions, ideas and what was written on the table cloths into the following four levers:

1. Consciousness of the consumer through responsibilisation. In this special attention is devoted to the clarity of the principles of sustainability and their dissemination in an innovative and creative way (particularly to access young people). Through consciousness, participants felt the need to work on the responsibility of the consumer, with his increased participation in sustainable food chains as a possible result. However, some draw attention to the choice and the voice of the consumer, who is not always willing or able to spend more money on buying food.

2. More sales by more creative marketing. Innovation should respond to social reality. One aspect that disserves more attention is the possible symbiosis between sustainability and scale economies, that is, to couple efficient distribution in mainstream supply chains with communication, fair prices and long-term relationships that characterise LFS. Both local and mainstream food systems may benefit from existing product image assets, such as price and quality as well as assets that yet need to be further developed, such as products' connectedness to the region and organic character.

3. Building competences by professionalisation and guidance. Guidance and support should be more oriented towards the development of skills and the further professionalisation of sustainable food chains. In that sense, the central question was reformulated as follows: 'How can sustainable food chains strengthem themselves?' Government should work out policies that are supportive and motivating and that creates (financial and legal) space for innovation. Support and guidance of supply chains should be more coherent by bundling the efforts of different institutions into a network.

4. Stimulating and facilitating government framwork. Government has an important stimulating and facilitating role in each of the aforementioned

levers. Moreover, government should create the legal framework that does not hinder development. Some see a more far-reaching role for government, by giving local products priority in getting subsdies in the framework of the Common Agricultural Policy.

5.2.4. Conclusions

Most participants found the innovative workshop method interesting and stimulating. Participants formulated the following suggestions:

- More input as starting point for the café, in the form of more detailed presentations at the beginning;

- More guidance throughout the dialogues. This refers both to the central theme of the dialogues and to the 'enforcement' of basic cafe priniciples, such as to listen rather than to convince.

From own observation, but also from some of the evaluations, we learned that an invitation to dialogue does not automatically lead to innovative insights and recommendations. Essential elements for a good dialogue include:

- A good balance between advocacy (convincing) and informing (listening). High stakes of participants often lead to a domination of advocacy;

- A diversity of perspectives. However, the further away people are from the problems discussed, the less their involvement. Nevertheless, diversity is necessary to really arrive at innovative insights and recommendations.

We believe that we reached the aim of bringing people around the table to maximise their participation and voice, stimulating at the same time interaction between people that do not know each other. For future dialogues, important challenges are to increase the diversity of the participants and better facilitate the dialogue.

5.3. Synthesis, conclusions and recommendations

This research project had as central question how to further develop local food systems. The first part of the project looked into the identification, measurement and communication of indicators of sustainability that would appeal to the consumer and that is hence directed at the demand side of LFS. The second part of the project investigated the interior and exterior conditions for LFS to develop from the supply side.

In our quest for a set of scientifically sound and practically usable indicators comparing the sustainability of local food systems with to mainstream food systems, we had to abandon our original plan to develop rich economic and ecological indicators. We did develop an ecological indicator depicting the energy use of different food systems taking a life cycle assessment approach. However, the calculation of economic indicators assessing the impact on employment and the multiplier effect of different systems has proven to be too difficult, primarily because of the heavy data requirements of these instruments and the lack of statistical data. In addition, following the advice of the accompanying committee, we refocused our attention to the social dimension of local food systems, as these were argued to be the most important asset of local food systems. However, the social dimension turned out to be even more difficult to grasp as it is not well developed in the literature.

Future research should focus more on the consumer as object of investigation. It is still unclear to what arguments consumers are prone to listen to. Our research suggests that for the social, economic and ecological dimensions, differences in performance between LFS and MFS are less related to the system itself, but more to the attitude and behaviour of various actors and the exploitation of scale efficiency in for example cooling and transportation. As a result, LFS and MFS can learn from each other.

We intensively studied three cases studies of LFS to find out what are the leverage points in their development. We distinguished between interior and exterior factors. We propose that managerial ability, reflection and trust are key elements and competences necessary for success in collaboration. When one element is absent or incomplete, the probability of survival or growth is small. These competences can be developed, a task for farmers organisations and government. However, so far most competences addressed by most programmes are of a rather technical nature only (e.g., bookkeeping, marketing).

A supporting R&D system, more flexible government regulations and broader networks are important external conditions for LFS to develop. Room for experimentation should be created to foster radical innovations also in the social or organisational realm. Our concluding workshop provided additional proof of how difficult it is to open-up the thinking of a relatively closed group of people that actually sees itself as being quite open-minded.

Future research should focus more on the learning ‘disabilities’ and system imperfections that hinder the further development of LFS. Success stories of cases that were able to counter these disabilities and imperfections can lead to improved advice and policies.

5.4. Presentations and papers

Coene, H., Van Hauwermeiren, A., Claes, C., Mathijs, E., The modalities of social networks in rural areas within Belgium, Contributed paper, XXIth Congress European Society for Rural Sociology, Keszthely, Hungary, 22-27 August 2005.

Van Hauwermeiren, A., Coene, H., Claes, C., Mathijs, E., Food and energy life cycle inputs: a comparison of local versus conventional food systems, Contributed paper, 11th Annual International Sustainable Development Research Conference, June 6-8, 2005, Finlandia Hall, Helsinki.

Van Hauwermeiren, A., Coene, H., Claes, C., Mathijs, E., Life cycle analysis and the choices in purchasing patterns, Paper presented at the Fruit and Vegetable Seminar.

Exploring the impact of the sector on the UK's greenhouse gas emissions and the options for achieving emissions reductions, Food Climate Research Network, University of Surrey, 1 December 2005. Manchester, UK.

Van Hauwermeiren, A., Coene, H., Claes, C., Mathijs, E., Energy Life Cycle Inputs in Food Systems: Comparison of Local versus Conventional systems, Paper presented at the Measuring Sustainability of the Food Supply Chain Seminar, BRASS: The centre for Business Relationships, Accountability, Sustainability & Society, Cardiff University, 27 October 2005, Cardiff, UK. (submitted to Journal of Environmental Policy and Planning)

REFERENCES

Adler, S., Fung, S., Huber, G., Young, L., 2003, Learning our way to a sustainable agri-food system. Three cases from Sweden: Stockholm Farmers Market, Ramsjö Community Supported Agriculture and Järna Initiative for Local Production, Ecological Production 38, Centre for Sustainable Agriculture, Swedish University of Agricultural Sciences, Uppsala.

Andersson, J.O., Lindroth, M., 2001. Ecologically unsustainable trade. Ecological Economics 37: 113-122.

Argyris, C., Schön, D., 1978. Organisational Learning: A Theory of Action Perspective. Addison Wesley, Reading, Mass.

Ariño, A., de la Torre, J., 1998, Learning from failure: Towards an evolutionary model of collaborative ventures. Organization Science 9(3): 306-325.

Böge, S., 1995. The well-travelled yogurt pot: lessons for new freight transport policies and regional production. World Transport Policy & Practice 1: 7-11.

Borgström Hansson, C., Wackernagel, M., 1999. Rediscovering place and accounting space: how to re-embed the human economy. Ecological Economics 29: 203-213.

Bourdieu, P., Wacquant, L., 1992. An invitation to reflexive sociology. University of Chicago Press, 348 p.

Brown, J., Isaacs, D., 2005. The World Café: Shaping Our Futures Through Conversations That Matter. Berrett-Koehler, San Francisco.

Brown, J.S., Duguid, P., 1991. Organizational learning and communities-of-practice: Toward a unified view of working, learning, and innovation. Organization Science 2(1): 40-57.

Brunsø, K., Fjord, T.A. Grunert, K.G., 2002. Consumers' food choice and quality perception. Working Paper.

Campbell, M.C., 2004. Building a common table: The role for planning in community food systems. Journal of Planning Education and Research 23(4): 341-355.

Carayannis, E.G., Alexander, J., Ioannidis A., 2000, Leveraging knowledge, learning and innovation in forming strategic government-university-industry R&D partnerships in the US, Germany and France. Technovation 20: 477-488.

Carlsson-Kanyama, A., 1998. Climate change and dietary choices. How can emissions of greenhouse gases from food consumption be reduced? Food Policy 23: 277-293.

Carlsson-Kanyama A., Ekstrom M. P., Shanahan H., 2003. Food and life cycle energy inputs: consequences of diet and ways to increase efficiency. Ecological Economics 44(2-3): 293-307.

Carlsson-Kanyama A., Faist M., 2000. Energy Use in the Food Sector: A data survey. AFR report 291. INFRA, Stockholm, Sweden. http://www.infra.kth.se/fms/pdf/energyuse.pdf and http://www.infra.kth.se/fms/pdf/energyuse_appendices.htm

Cerf, M., Gibbon, D., Hubert, B., Ison, R., Jiggins, J., Paine, M., Proost, J. en Röling, N. (eds.), 2000. Cow Up a Tree. Knowing and Learning for Change in Agriculture. Case Studies from Industrialised Countries. INRA, Paris.

Cyert, R., March, J., 1963. A Behavioral Theory of the Firm. Prentice Hall, Englewood Clifs, NJ.

Daft, R.L., Weick, K.L., 1984. Toward a model of organizations as interpretation systems. Academy of Management Review 9(2): 284-295.

Davis, J.P., 2005. How do organizations manage collaborative innovation? A proposal to study the organization of inter-firm collobaration networks, unpublished manuscript, Stanford University.

Dessein, J., Nevens, F., Mathijs, E., Van Huylenbroeck, G., 2004. Sociale aspecten van duurzame landbouw in Vlaanderen. Een verkennende analyse. Stedula-publicatie 8, Steunpunt Duuzame Landbouw, Gontrode, 61p.

Doz, Y., 1996, The evolution of cooperation in strategic alliances: Initial conditions or learning processes? Strategic Management Journal 17: 55-84.

Easterby-Smith, M., Lyles, M.A. (eds.), 2005. The Blackwell Handbook of Organizational Learning and Knowledge Management. Blackwell Publishing, United Kingdom.

Edwards R., Griesemann J-C., Larivé J-F., Mahieu V., 2003. Well-to-Wheels analysis of future automotive fuels and powertrains in the European context. WELL-TO-TANK Report, Version 1. http://ies.jrc.cec.eu.int/Download/eh/38.

Eisenhardt, K.M., 1989. Building theories from case study research. Academy of Management Review 14(4): 532-550.

Fiol, M.C., Lyles, M.A., 1985. Organizational learning. Academy of Management Review 10(4): 803-813.

Forsman, S., Paananen, J. 2004. Value creation in local food supply chains : market opportunities and challenges. In: 2004 IAMA World Food & Agribusiness Symposium Papers and Presentations, June 12-15, 2004, Montreux, Switzerland. 20 p.

Gates, R. and Lee, M. 2005. Policy report social development. City of Vancouver.

Geels, F.W., 2004. From sectoral systems of innovation to socio-technical systems. Insights about dynamics and change from sociology and institutional theory. Research Policy 33: 897-920.

Georges H., Van Lierde D., Verspecht A., 2003. De Vlaamse glastuinbouw en zijn concurrenten. Publicatie n° 1.09. Centrum voor Landbouweconomie, Belgium, 79 p.

Gerbens-Leenes, P.W., Moll, H.C., Schoot Uiterkamp, A.J.M., 2003. Design and development of a measuring method for environmental sustainability in food production systems. Ecological Economics 46: 231-248.

Gerbens-Leenes P.W., Nonhebel S., Ivens W.P.M.F., 2002. A method to determine land requirements relating to food consumption patterns. Agriculture, Ecosystems and Environment 90: 47-58.

Getz, A., 1991. Urban foodsheds. The Permaculture Activist 24: 26-27.

Glaser, B.G., Strauss, A.L., 1967. The Discovery of Grounded Theory: Strategies of Qualitative Research. Wiedenfield and Nicholson, London.

Gleirscher, N., Schermer, M., 2003. The use of Actor Network Theory to analyze the impact of organic marketing initiatives on regional development. Workshop of the EU thematic network project REGIONET, 'Evaluation of regional sustainable development – methods and tools' 11-13 Juni 2003, Manchester, UK.

Halweil, B., 2002. Home grown. The case for local food in a global market. World Watch Paper 163, November 2002.

Halweil, B., 2003. The argument for local food. At an unimposing diner in Vermont, a revolution is taking place. World Watch, Vol.16, May-June 2003.

Hedberg, B., 1981. How organizations learn and unlearn. In: Nystrom, P.C., Starbuck, W.H. (eds.), Handbook of Organzational Design. Cambridge University Press, London..

Hendrickson, M.K., Heffernan, W.D., 2002. Opening spaces through relocalization: locating potential resistance in the weaknesses of the global food system. Sociologia Ruralis 42: 347-369.

Hinrichs, C.C., 2000. Embeddedness and local food systems: notes on two types of direct agricultural market. Journal of Rural Studies 16: 295-303.

Inkpen, A.C., Currall, S.C., 2004, The coevolution of trust, control, and learning in joint ventures. Organization Science 15(5): 586-599.

Innovatiesteunpunt voor landbouw en platteland, 2003. Korte ketenvermarkting op uw biobedrijf. Een kennismaking voor boer en tuinder. Boerenbond, Leuven.

Jacobs, D., Abts, K., Phalet, K., Swyngedouw, M., 2001. Verklaringen voor etnocentrisme. De rol van sociaal kapitaal, sociaal economische onzekerheid, sociale integratie en gevoelens van discriminatie. Een verkenning. Vlaanderen gepeild! De Vlaamse overheid en burgeronderzoek, pp. 99-132.

Janzen, R., de Vlieger, J.J., 1999. Ketenonderzoek streekproducten. LEI, Den Haag, 106 p.

Jones A., 2002. An environmental assessment of food supply chains: a case study on dessert apples. Environmental Management 30(4): 560-576.

Jones, A., 2001. Eating Oil, Food Supply in a Changing Climate. Sustain/Elm Farm Research Centre, 200 p.

Kloppenburg, J., Hendrickson, J., Stevenson, G.W., 1996. Coming into the foodshed. Agriculture and Human Values 13(3): 33-42.

Kolb, D.A., 1984. Experiental Learning: Experience as the Source of Learning and Development. Prentice-Hall, Englewood Cliffs.

Komter, A., Burgers, J., Engbersen, G., 2000. Het cement van de samenleving. Een verkennende studie naar solidariteit en cohesie. Amsterdam University Press, Amsterdam.

La Trobe, H., 2001. Farmers' Markets: consuming local rural produce. International Journal of Consumer Studies 25: 181-192.

Leeuwis, C., 2004. Communication for Rural Innovation: Rethinking Agricultural Extension. Blackwell Science Ltd., Oxford.

Leeuwis, C., Pyburn, R. (eds.)., 2002. Wheelbarrows Full of Frogs. Social Learning in Rural Resource Management. Koninklijke Van Gorcum B.V., Assen, The Netherlands.

Libby, R., 2004. Food with a face, a place a taste. http://www.farmtotable.org/index.php.

Maertens A., Van Lierde D., 2003. Het energieverbruik in de Vlaamse land- en tuinbouw. Publicatie n° 1.01. Centrum voor Landbouweconomie, Belgium 68 p.

Marsden, T., Banks, J., Bristow, G., 2000. Food supply chain approaches: exploring their role in rural development. Sociologia Ruralis 40(4): 424-439.

Meadows, D.H., Meadows, D.L., Randers, J., Behrens III, W.W. 1972. The Limits to Growth. University Books, New York.

Meul M., Nevens F., Reheul D., Hofman G., 2005. Energieverbruik en –efficiëntie op Vlaamse melkvee-, akkerbouw- en varkensbedrijven. Stedula-publicatie 14. Steunpunt Duurzame Landbouw, Belgium, 67 p.

Miles, M., Huberman, A.M., 1994. Qualitative Data Analysis: An Expanded Sourcebook. Second Edition. Sage Publications, Beverly Hills CA.

Moehler, R. 1996. The role of agriculture in the economy. Paper presented at the Seminar on beliefs and values underlying agricultural policies, lake balaton, Hungary, September 19-23, 1996

Nooteboom, B., 2004. Inter-Firm Collaboration, Learning & Networks. An Integrated Approach. Routledge, London, New York.

Norberg-Hodge, H., Merrified, T., Gorelick, S., 2002, Bringing the Food Economy Home. Local alternatives to global agribusiness. Zed Books, UK, 48p.

Nordström Källström, H., Ljung, M., 2005. Social sustainability and collaborative learning, AMBIO 34(4): 376–382.

Nygard, B., Storstad, O., 1998. De-globalisation of food markets? Consumer perceptions of safe food: the case of Norway. Sociologia Ruralis 38: 36-53.

O'Hara, S.U., Stagl, S., 2002. Endogenous preferences and sustainable development. Journal of Socio-Economics 31: 511-527.

O'Reilly, S., Haines, M., 2004. Marketing quality food products - A comparison of two SME marketing networks. Acta Agriculturae Scandinavica, Section C – Economy 1(3): 137-150.

Pervanchon, F., Bockstaller, C., Girardin, P., 2002. Assessment of energy use in arable farming systems by means of an agro-ecological indicator: the energy indicator. Agricultural Systems 72: 149-172.

Pretty, J., 2002. Agri-culture. Reconnecting people, land and nature. Earthscan, London-Sterling VA.

Pretty, J., 2004. Agri-Culture. Lezing aan de Katholieke Universiteit Leuven, 03-03-04.

Renting, H., Marsden, T.K., Banks, J., 2003. Understanding alternative food networks: exploring the role of short food supply chains in rural development. Environment and Planning A 35: 393-411.

Réviron, S., Chappuis, J-M., Barjolle, D., 2004. Why economists need sociologists for analysing the organisational choices of food local collective initiatives. Paper for the XI World Congress of Rural Sociology, Trondheim, July 2004.

Ring, P.S., Van de Ven, A.H., 1994, Developmental processes of cooperative interorganizational relationships. Academy of Management Review 19: 90-118.

Rölling, N.G., Wagemakers, M.A.E. (eds.), 1998. Facilitating Sustainable Agriculture: Participatory Learning and Adaptive Management in Times of Environmental Uncertainty. Cambridge University Press, Cambridge.

Sacks, J., 2002. The money trail. Measuring your impact on the local economy. New Economics Foundation, December, 118 p.

Senge, P., 1990. The Fifth Discipline: The Art and Practice of the Learning Organization. Doubleday Currency, New York.

Senge, P., Kleiner, A, Roberts, C., Ross, R, Smith, B., 1994. The Fifth Discipline Fieldbook. Strategies and Tools for Building A Learning Organization. Doubleday/Currency, New York.

Shrivastava, P., 1983. A typology or organizational learning systems. Journal of Management Studies 20(1): 7-28.

Strauss, A., 1987. Qualitative Analysis for Social Scientists. Cambridge University Press, Cambridge.

Tregear, A., Kuznesof, S., Moxey, A., 1998. Policy initiatives for regional foods: some insights from consumer research. Food Policy, 23: 383-394.

Vackier, I., Vuylsteke, A., Verbeke, W., Van Huylenbroeck, G., 2003. Desk study on consumer behaviour towards sustainable food products: Belgian report. Preliminary report SUS-CHAIN Consumer, October 2003.

van den Brink R. M. M., van Wee G. P., 1997. Energiegebruik en emissies per vervoerwijze. RIVM-rapport nr. 773002 007, Bilthoven, The Netherlands, 95 p.

Van Essen H., Bello O., Dings J., van den Brink R., 2003. To shift or not to shift, that's the question – The environmental performance of the principal modes of freight and passenger transport in the policy-making context. CE Solutions for environment, economy and technology: The Netherlands, 94 p.

Vandermersch, M., Mathijs, E., 2004. Ethnocentrism and local food preferences: The case of apples, in: De Tavernier, J., Aerts, S. (eds.), Preprints of the 5th congress of the European Society for Agricultural and Food Ethics (Leuven, September 2-4, 2004), CABME, Leuven, pp. 116-120.

Vannoppen, J., Verbeke, W., Van Huylenbroeck, G., Viaene, J., 2001. Consumer valuation of short market channels for fresh food through laddering. Journal of International Food and Agribusiness Marketing 12(1): 41-69.

Vergunst, P., 2001. The embeddedness of local food systems, paper presented at NJF-seminar no. 327, 'Urban areas – rural areas and recycling. The organic way forward?; 20-21 August 2001; KVL, Copenhagen, Denmark.

Verhaegen, I., Van Huylenbroeck, G., 2001. Costs and benefits for farmers participating in innovative marketing channels for quality food products. Journal of Rural Studies 17: 443-456.

Verlinden B., 2002. Adviesopdracht GMO-koelkostberekeningen. Vlaams Centrum voor Bewaring van Tuinbouwproducten: Belgium.

Vlaams Instituut voor Gezondheidspromotie vzw (VIG), 2005. www.vig.be Accessed May 2005.

Wackernagel, M., Onisto, L., Bello, P., 1999. National natural capital accounting with the ecological footprint concept. Ecological Economics 29: 375-390.

Wackernagel, M., Rees, W.E., 1996, Our Ecological Footprint: Reducing Human Impact on the Earth. New Society, Gabriola Island, BC.

Weatherell, C., Tregear, A., Allinson, J., 2003. In search of the concerned consumer: UK public perceptions of food, farming and buying local. Journal of Rural Studies 19(2): 233-244.

Wenger, E., 1998. Communities of Practice: Learning, Meaning and Identity. Oxford University Press, New York.

Whatmore, S., 1995. From farming to agribusiness: the global agrofood system. In: Johnston, R., Taylor, P., Watts, M. (Eds.), Geographies of global change: remapping the world in the late twentieth century. Blackwell, Oxford.

Woolthuis, R.K., Lankhuizen, M., Gilsing, V., 2005. A system failure framework for innovation policy design. Technovation 25: 609-619.

Wynne, B., 2004. Public dialogue with science: some implications from the case of nanotechnology. Science communication conference, May 2004.

Yin, R.K., 2003. Case Study Research: Design and Methods. Third Edition. Sage

www.eia.doe.gov/oiaf/1605/gwp.html

www.gdrc.org/uem/footprints/what-is-ef.html

www.mcspotlight.org/media/reports/foodmiles.html

www.nal.usda.gov.afsic/csa/csadef.htm

www.vodo.be/documenten/Peccei%20lectures.htm

www.vodo.be/html/themas/index.htm

www.voedselteams.be