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Final Report: Participatory Supply Chain Management for the Sustainable Development of Local Agrifood Networks

1 Introduction

The premise underlying this research project is that the survival of the small- and medium-scale farms that currently operate near modern cities and towns, both in Sweden and other industrialized nations, is dependent upon their ability to establish long-term sustainable relationships with local markets. Furthermore, if more substantial quantities of food are to be produced and sold locally than currently available through the existing weekend farmers markets and vegetable-box schemes, then these alternative marketing arrangements will need to be scaled-up, and new more sophisticated methods of food distribution and marketing, that create strong links between farmers and customers, will need to be established. Forging this relationship will require new distribution infrastructures and Supply Chain Management (SCM) routines that can mediate an expanded local food trade. A number of local agrifood networks that meet the basic criteria of these new networks have begun to operate in Sweden, and elsewhere. This participatory action research project worked with two agrifood networks in the Stockholm area - one well-established and one in the start-up phase - that demonstrated the most promise of becoming a high-capacity local food systems.

As an action research project that worked at the edge of innovation in local food systems, the project had both successes and failures. The project succeeded in uncovering the constraints and possibilities that innovative local food networks face as they expand to meet growing demand for their products. Additionally, through concrete actions, the author was able to work in a collaborative way with the organizers of the two studied networks to assist their further development. However, the project was unable to reach the objectives of the original project plan as they were first conceived. The failure of the project to achieve all of the original objectives can be seen in hindsight to be due to the fact that the project plan was very ambitious as regards the time needed to implement the plan. Furthermore, the fact that the project was dependent upon the participation and progress of a number of project partners whose work faced its own set of challenges and setbacks, which were out of the control of the author, inhibited the implementation of the original research plan. Most importantly, one of the two studied agrifood networks was in an earlier stage of development than originally anticipated, and was not yet mature enough for the research plan to be carried out in full, thus, the project plan had to adapt to this situation after the project was begun. The following report describes the work completed during the project, and the results of the work.

2 Objectives

The objective of this project was to uncover existing bottlenecks to the development of innovative agrifood networks in the Stockholm area, and to create and document a participatory SCM platform, or set of operating and logistics routines, where farmers and consumers would be able to collaborate, in a systematic way, on the coordination of the fresh food trade in their local region. The project was designed to lead to learning that could be replicable in other contexts through the documentation of the collaborative learning processes that the researcher and the members of the agrifood networks would go through over the course of one year. The learning gained through the project was to lead to a SCM platform that would be used by the members of the

network and be developed in collaboration with the farmers and private industry partners of the networks studied. Additionally, the learning was to be published in the form scientific papers, and shared with others working on similar innovations in this way.

3 Methodology and Methods

3.1 Action research

This project began by using Soft Systems Methodology (SSM) (Checkland and Scholes 1990, Checkland 2000b), combined with Supply Chain Management (SCM) theory (Chopra and Meindl 2000, Minegishi and Thiel 2000, Hill and Scudder 2002, Eng 2004, Ilbery et al. 2004, Reiner and Trcka 2004) to meet the objectives outlined above. The project worked with two food distribution networks, Bondens egen marknad (BEM) in Stockholm, and the food producers, processors and distributors operating in Järna, Sweden. After working in the field using SSM with farmers and food system organizers of both networks, SSM was deemed to be inappropriate to the task of generating the desired outcomes, due to the fact that SSM is better suited to mature organizations where the actors involved have an existing communication platform and common problems to solve (Checkland 2000b, 2000a). In reality, the research situation was much less structured, and the pre-conditions assumed at the beginning of the project in terms of the level of integration of the various actors involved with each agrifood network proved to be less than anticipated. Therefore, a more flexible action research (AR) (Whyte 1991a, 1991b, Stringer 1996, Checkland and Holwell 1998, Grady 1998, King 2000, Reason and Bradbury 2001, West and Stansfield 2001, Leeuwis and Pyburn 2002) methodology was chosen, because it allowed the author to interact with the food networks in question in a more natural, collaborative way, decreasing the subject-object dichotomy required by more rigid methods, such as SSM, and allowing for more freedom to interact with the actors involved with each agrifood network at levels commensurate to their availability and willingness to participate. In order to gain some level of empirical rigour, the AR methodology was backed-up with two traditional methods, semi-structured individual and group interviews (Kvale 1996), as well as a producer survey that was used to gather raw data on producers and processors participating in each network.

3.2 Semi-structured Interviews

Individual semi-structured interviews (Kvale 1996) were conducted with the local food system managers of BEM, and in Järna. The concept and theories of Supply Chain Management (SCM) provided the framework around which the interviews were structured. The results of the interviews and discussions in Järna are outlined in a published report (Haden and Helmfrid 2004). Group discussions/interviews with the food producers sought to uncover what they envisioned in terms of their participation as suppliers of produce to the given network, and what they perceived as bottlenecks limiting the expansion of the network in question. In the case of BEM, the producers were selected due to their previous participation in BEM street markets, and were the producers who showed interest in participating in the expansion phase of BEM in Stockholm. The expansion plans entailed adding distribution, processing, and year-round retail capabilities to the existing physical marketplace locations. In the case of Järna, the participants were selected through their long-term established operations in the community.

3.3 Producer Survey

The producer survey also used a SCM framework as outlined in Chopra and Meindl (2000) and covered the following topics:

- General information: farm location, total employed on-farm, total turnover, growth trajectory, farmer's years as a farmer farming.
- Marketing information: current understanding of market trends, current methods of marketing, desire for collaborative marketing, visions and plans for the future.
- Production information: type of crop/livestock, certification, planting and harvest dates, production area, total production, desired price, current price to distribution company and direct to customers.

- Future production information: expansion plans, openness to collaborative farm planning, ability to produce to customer specifications, what changes could be made to farm plans and by what date.
- Current customer information: which customers farmers currently sell to (cooperatives, distributors, direct sales on farm, etc.), what percentage of production goes to which customer, etc.
- On-farm post-harvest handling information: quality control abilities, storage facilities, washing/sorting abilities, packaging abilities, etc.
- Transport information: handling requirements, type of boxes, etc.
- IT infrastructure information: computer and software currently used, internet access, bar-code equipment, PLU equipment, mobile phone, etc.
- Delivery times and distance information: distance from markets (cities nearby to farm and Stockholm), type of transport currently used, collaboration with other farms in transport, etc.

In the case of BEM, the surveys were given in paper form to the producers and were mailed back to BEM. IN the case of Järna, the surveys were filled in manually by the author during interviews with local food producers.

4 Results

The results generated by this research project are threefold: 1) knowledge about the bottlenecks limiting the development of the agrifood networks studied, which were categorized as follows: pre-existent bottlenecks, informational bottlenecks, communication bottlenecks, production capacity bottlenecks, cultural bottlenecks and logistical bottlenecks; 2) contributions to the practical development of each of the networks studied, and 3) new understanding about the role of food processing and distribution in the sustainable development of agrifood networks, generally.

4.1 Bottlenecks identified: Bonden's egen marknad (BEM)

The process underway within the BEM local food distribution system has met a number of challenges as it has moved closer to implementation of the expansion plans envisioned by the organizers of the network. The following table specifies a number of the bottlenecks that the BEM food system has encountered in its attempts to expand, and include some of the ways, both planned and implemented, for overcoming them.

Table 1. Bottlenecks identified in the BEM agrifood network.

Description of bottleneck	Means of overcoming bottleneck
<i>Pre-existent Bottlenecks</i>	
<ul style="list-style-type: none"> • As the project began, there was no company, or group of farmers, that were organized to supply large quantities of local food to inner Stockholm, while at the same time communicating an authentic message to customers that the produce they purchased came from a specific geographic area. Thus, the supply chain management systems (logistics infrastructure, order fulfillment systems, etc.) needed to supply large quantities of fresh local food did not exist. 	<ul style="list-style-type: none"> • The expansion phase of BEM was initiated to overcome this bottleneck. The development of the BEM distribution infrastructure was envisioned as a way to transport local, fresh, and high quality food to Stockholm, and solving this problem was the primary principle around which the distribution system is to be built.
<i>Information Bottlenecks</i>	
<ul style="list-style-type: none"> • At the beginning of the BEM expansion project, there was no formal, categorized database of local agricultural producers, showing what items the interested farmers produced and where their farms were located, or what their existing capacity was as regards IT infrastructure and product packaging ability. 	<ul style="list-style-type: none"> • The survey that the author designed through this project (outlined in the methods section) began the process of cataloging the capacity of the local producers interested in participating in the network, and is being used to form the basis of the database upon which the IT ordering system will be built. The survey was sent to 180 producers and the responses have formed the basis of the producer database compiled by the organizers of BEM. This database will be translated into an inventory-management and ordering system to be used by BEM, when full operations

commence in 2005/06.

Communication Bottlenecks

• A primary bottleneck was uncovered early in the project regarding how to reconcile existing labeling strategies such as KRAV, Demeter, and Swedish Seal of Quality, which are 'proxy' forms of communication, with a new label, or similar tool, signifying local production. In the early stages, some project partners were insistent upon limiting the network to organic producers certified by KRAV which was a subject of active debate.

• An additional communication bottleneck regards the fact that a key factor in the success of the BEM street markets has been the opportunities it creates for producers and consumers of food to meet face to face, and to forge personal connections that are not possible in supermarkets and restaurants. This may prove to be a major challenge for the BEM food distribution system as it would essentially break this face-to-face link by functioning as a middleman between producers and consumers.

• The way around this bottleneck was the idea of 'transparency'. That is, to create a means of conveying to the final customer, as directly as possible, the production methods employed by the farmers in the system and the certifications they have obtained. The IT system will thus be a critical component of how this communication bottleneck can be overcome, by allowing customers to "see" the production system behind the product, with production data available through the BEM website.

• Strategies discussed for overcoming this bottleneck included having specific days set aside where farmers from the BEM network can visit the various outlets that purchase BEM food, and can therefore maintain the connection between producers and customers. Additional strategies include having electronic meeting spaces associated with the ordering system so that BEM could function as a electronic meeting space, where willing buyers of specialty produce could find willing growers. Meetings between network partners indicated that this would be very useful for gourmet chefs who are constantly looking to secure a supply of the freshest produce. It would also open the possibility for contract growing for special customers, which would mean more secure markets for producers.

Production capacity bottlenecks

• Over the course of the project it became clear that production capacity bottlenecks be may a primary constraint limiting the expansion of local food systems in the Stockholm area. The process of structural change within Swedish agriculture towards larger and larger farms with specialized meat, milk or grain production, and away from diverse horticultural production, which are some of the primary products to be supplied through the BEM distribution system, is very far advanced and is becoming more pronounced (SCB 2004). Competition pressure was evident in interviews with farmers, as many of them were struggling economically to compete against imported horticulture products from mainland Europe, and beyond.

• The farmers involved in the BEM project voiced their opinion that they saw a strong potential for a new brand of produce, that would highlight the location of production, and offer production process transparency, to help them survive economically. However, it remains to be seen that if the BEM distribution system proves very popular, will be there enough local produce in the Stockholm area to meet the demand? One positive indicator is that some farmers suggested that they would expand they operations if the BEM distribution system was successful with consumers and increased their profitability.

Cultural bottlenecks

• During my interviews with participating farmers, there were occasional expressions of skepticism for new and untried, such as the plans proposed by the BEM organizers. As farmers are highly risk-adverse, this creates a difficulty during the start-up phase of new and untried initiatives. Generally, there was a gap in cultures between 'urban entrepreneurial' culture, that seeks to innovate quickly, and the more conservative culture of farmers.

• This bottleneck can be overcome through the development of trust between the organizers of BEM and the participating farmers (Batt 2003), and successful implementation of the core business model of BEM. Following through on the initial excitement created by the vision of the organizers will also help build this trust.

Logistical bottlenecks

• The existing logistical bottlenecks were related to the fact the producers interested in participating in the BEM network were of diverse sizes, and produced many different kinds of products. Therefore, the specialized logistics infrastructure that currently transports individual food products around Sweden may not be readily adapted to BEM, due to its focus on transporting large quantities of

• One method identified for working through these problems discussed with farmers and BEM organizers was to allow the producers that have very specialized products, or very small quantities, to deliver their own produce to final customers, but allow them the use of the BEM information technology infrastructure for receiving and fulfilling orders. Later in the initiation process, a

single products. The products available from BEM will need both refrigerated and non-refrigerated transport, primarily in less-than-full-truckload quantities, and some producers require specialized processing infrastructure that is currently not available locally, such as slaughter houses.

Stockholm-based produce distributor who currently ships imported produce from central Stockholm to surrounding areas, approached the network seeking collaboration. Their trucks currently return to Stockholm empty, from the edges of the county where they deliver their produce. In the future, they will be picking up produce from BEM farmers, and delivering it to Stockholm. In regard to specialized processing infrastructure, some producers voiced the notion that they might be able to invest in a co-operative slaughter house if BEM offered them a secure sales channel.

4.2 Bottlenecks identified: Järna

The local food distribution system in Järna is much further developed in comparison than BEM, but also facing challenges as it seeking serve and expanding market for its produce. The following table outlines the major bottlenecks identified and how they could be overcome.

Table 2. Bottlenecks identified in the Järna agrifood network.

Description of bottleneck	Means of overcoming bottleneck
<i>Pre-existent Bottlenecks</i>	
<ul style="list-style-type: none"> A primary bottleneck limiting the expansion of the food system in Järna is the insistence that only Biodynamically-certified produce be sold in the community. Thus any farmer that seeks to sell through the distribution companies in the community must be certified by Demeter, the certification agency for Biodynamic (BD) produce. This adds considerable requirements beyond the standard rules required by certification agencies such as KRAV. 	<ul style="list-style-type: none"> This bottleneck is really a "double-edge sword" in that the insistence of BD-certified produce also allows the producers and distributors in the community to maintain "brand integrity", and the produce available from Järna producers and food related-businesses is sought out for this reason. Interviews indicate that Järna distributors and processors will continue to insist on BD-certified produce.
<i>Information Bottlenecks</i>	
<ul style="list-style-type: none"> Currently no IT system mediates the local food trade in Järna, beyond simple telephone, fax, and email. This will limit, to some extent, the ability of producers and distributors in the community to interact with markets beyond the community, due to lack of ability to accurately forecast product availability and price, or to take orders electronically. That is, if no one is available to take orders manually, then orders may be lost. 	<ul style="list-style-type: none"> Many farmers, processors and distributors interviewed did not see IT infrastructure as a bottleneck, and were content to continue doing business as they had been. The primary distributor of vegetables was open to collaborating with the BEM network in Stockholm. In which case, they will need to integrate with the IT system that BEM puts into place.
<i>Communication Bottlenecks</i>	
<ul style="list-style-type: none"> Due to the fact that the community is close-knit, interpersonal conflicts exist that block certain synergies from forming between market actors that could mutually benefit from increased collaboration. For example, there were some companies that performed overlapping, or competitive functions which confuse some customers. 	<ul style="list-style-type: none"> Bottlenecks of this kind may be difficult to overcome, unless the parties in question decide to work together, or the respective business of each party grows in a direction that diminishes the potential synergetic effects, and/or decreases competition.
<i>Production capacity bottlenecks</i>	
<ul style="list-style-type: none"> If the food system of Järna is only intended to serve the residents, businesses, and institutions of Järna, then production bottlenecks are limited to having too few local vegetables in winter - especially root crops, too little grain for the local flour mill and bakery, and too little milk processing capacity. If the food producers in Järna have an inclination to serve customers beyond the community (i.e. BEM in Stockholm), then there will likely be too little of 	<ul style="list-style-type: none"> Increasing production and processing capacity is the only way to overcome these bottlenecks. Some of the new farmers in the community see growth opportunities and will likely expand to meet the new demand. The willingness of consumers to pay premium prices for Järna produce is a strong impetus to expand.

every kind of product produced in Järna.

Cultural bottlenecks

- There exists a number of very successful and progressive organic farmers in Södertälje kommun that could collaborate with Järna farmers and food processors. It seemed that the unique cultural aspects of the community in Järna was a barrier to this kind of collaboration.
- These bottlenecks may prove very difficult to overcome, except through more interaction between Järna community members and the wider community.

Logistical bottlenecks

- Although there were very few logistical bottlenecks identified due to the close proximity of the primary producers and the main customers. However, refrigerated storage was mentioned as a bottleneck by a number of producers.
- Some form of community food storage facility would help create a longer period of availability for local food.

4.3 Contributions to the practical development of the BEM and Järna agri-food networks

In many instances the author was engaged in the activities of the two networks in question as an active participant in the work at hand, with the intention to help to establish the workings, or improve the existing operations, of the network in question. Action research (AR) was the methodology employed for those activities in which the author functioned as both researcher and participant in the development of a given network (Reason and Bradbury 2001). The following paragraphs outline what the author considers to be his contribution to the two separate networks.

4.3.1 Contributions to the BEM agrifood network

A primary contribution of the author to the BEM network was the producer survey that the author created, which was used to develop the primary producer database now being further developed by BEM organizers. In addition to the survey, the author also devised a logistics strategy, that was used as a conceptual tool for interested participants (especially farmers) to understand how the logistical aspects of the network could function. Figure 1 is an overview of the collaborative logistics solution that the author devised for BEM, after consulting farmers, logistics providers, IT consultants, and trucking companies.

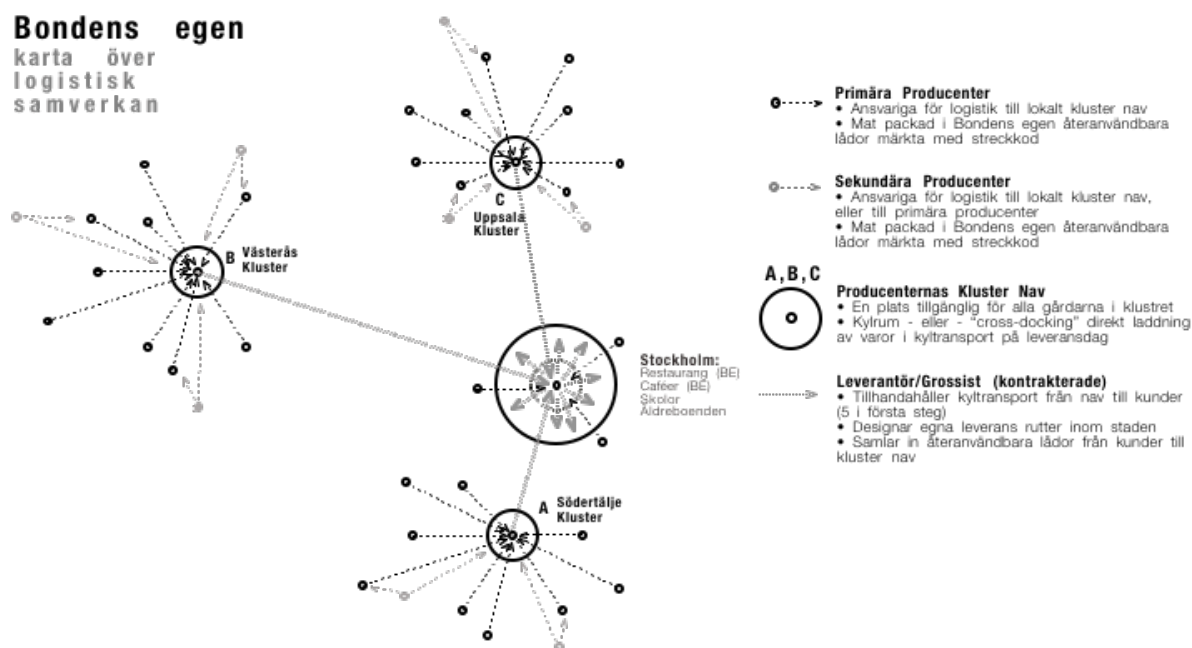


Figure 1. A graphic depiction of the proposed logistics solution for connecting local farms to the outlets engaged in the BEM network.

The core idea behind the logistics solution was that the BEM network should not behave as a traditional produce distribution company, but instead the logistical operations should be designed to meet the farmers 'half-way to the farmer's market', with a professional distribution company handling the remaining logistics in the city. This opens up a new relationship between these actors, and is a key 'participatory' feature of the network. In the past, distribution companies have held power over farmers by being the primary holder of information regarding market demand. In this arrangement, the distribution company becomes a service provider to the network of customers and producers. The power resides with customers and farmers, as they can change distribution companies at any time, based on the performance of the company. This would be a new development in the fresh food trade, generally. This is also keeping in line with the supply chain management concepts of each member of the network doing what they do best, and finding low-cost solutions (Reiner and Trcka 2004).

4.3.2 Contributions to the Järna agrifood network

The author's work within the Järna agrifood network was related to the case documentation and the further development of the food system as a whole. Through a series of meetings that were arranged in part by the author, a number of new connections were made by members of the Järna agrifood network and the surrounding community. One example of this includes connections between the primary vegetable and meat distributor in Järna and the organizers of BEM in Stockholm. As of this writing, Järna producers will be helping to supply the customers of the BEM network in Stockholm with fresh, organically-certified produce. Another important connection was made between two primary schools in the Södertälje area and Järna farms. As a result, the farms have been hosting school groups, where the children have a chance to learn about, and participate in, the growing of food.

Much of the author's activities and learning within this project has been captured in two documents, and the author has attached the following papers as evidence of this learning, see Haden & Helmfrid (2004), Helmfrid, Haden, and Ljung (manuscript).

4.4 Understanding of the role of processing and distribution in the development of agrifood networks

In the course of this research, the author uncovered a largely unidentified aspect of agrifood network organization that resurfaced again and again, and lead to insights regarding how local agrifood networks can better be developed as integrated systems. The insight is related to the relative importance of the various functions that are required to be performed by agrifood networks, such as production, processing, distribution and marketing. The best means of conveying the insight may be by employing the metaphor of natural ecosystems. In natural ecosystems, not all species are equally important to the maintenance of ecosystem function or resilience (Peterson et al. 1998). 'Keystone species' have a disproportionate impact on ecosystem function than other, possibly more abundant, species. Keystone species control ecosystem dynamics by creating and destroying habitats, creating niches which confer competitive advantage on certain species while denying it to others, and can control overall resource partitioning within the system in which they operate (Rosemond and Anderson 2003). In the author's experience working within agrifood systems it has become clear that the processing and distribution sectors of agrifood systems are equivalent to the keystone species of ecosystems. Without these functional units, the products of the primary producers (farms) cannot be effectively accessed by the agrifood system's client population. In the author's experience, food processors and distributors have disproportionate control over what kinds of farming systems can be sustained in a given area, the profit margins that their participating producers can expect to receive, as well as the geographic extent of the market areas accessible to them. In aggregate, the processing and distribution functions of agrifood systems stand apart in their cumulative influence over the functioning of agrifood systems as a whole. Thus, a major concern is that, as the process of farm consolidation and vertical integration in food processing and distribution sectors has progressed, the functional diversity in food systems has decreased. This process is diminishing the number of 'keystone species' available to create diverse economic habitats for producers, and the resultant 'habitat' degradation is leaving key systems functions neglected and may be leading to an overall diminution of the resilience agrifood systems, and thus the security of the food supply itself.

In the interviews and meetings conducted for this research, the author found a clear need for an increased availability of small-scale and locally-oriented processing options for local produce. In addition, the availability of a distribution system that connects farmers with the most profitable sales outlet in both of the studied agrifood networks (BEM and Järna) was clearly a pivotal factor in whether or not the producers were able to maintain profitable farming operations. This basic insight is now being formulated more thoroughly in a manuscript co-written with the author's doctoral supervisors.

4.5 Project failures and shortcomings

Although much has been learned by the author from the research of this project, several concrete contributions were made to each of the agrifood networks studied, and one publication, one finished manuscript, and one manuscript in-progress have resulted from the work, the results of the project do not fully match the objectives of the project as written in the research application. One primary reason for this is that the main objective of the project, which was to create a participatory SCM platform that could be extended to other contexts, was to be carried out primarily through interactions with the BEM agrifood network in Stockholm. However, as the author's work with network commenced, it became clear that the network was not yet in a state of maturity to where the actual operating routines of a participatory SCM platform could be formulated and documented. As of summer 2005, the BEM food distribution system is still not yet functional, although correspondence with BEM organizers indicates that the project is moving forward and will be in limited operation in the Fall of 2005. In retrospect, it is clear that only after the network is actually operating that the original objectives of this research project can be fulfilled.

5 Discussion and recommendations

The author's work in the two projects has been successful in both generating understanding about how these networks function, the constraints they face, and how they can be move closer to creating more participatory structures for the interaction of producers and consumers of locally grown food, as well as expanding to meet a growing market demand. Both of the networks studied have benefited and will continue to benefit from differentiating themselves in the marketplace by focusing on the fact that the food they sell comes from local sources. Additionally, the local aspect of their production implies "traceability", which is becoming more and more of a concern as of late, due to increasing concern of outbreaks of food-borne illness (Schwagele, Smith et al., Dupuy et al. 2005, Bertolini et al. 2006).

As for recommendations for policy, it is the author's opinion that agricultural subsidies and quotas which are currently directed to farmers for their production or land holdings, might be profitably transferred to the processing and distribution functions of the agrifood system, with the aim developing a higher level of local food distribution capacity in local cities and towns. Furthermore, some portion of the current agricultural subsidy might be refocused on those processing companies that buy local produce, and money should be directed to assist the development of local markets through advertisements. However, a direct subsidy to the processing and distribution functions of agrifood systems for food purchased, processed and sold locally might make a much more substantial contribution to the sustainability of the Swedish and European food supply, than the current system which attempts to subsidize farmers so that they might be more competitive in regional and global agricultural markets. The current strategy has the effect of indirectly subsidizing the lengthening of European and global food supply chains, and thus decreasing sustainability.

Through the learning generated while conducting this research, as well as in the previous work by the author, the need for a more coherent theory of agrifood network structure and function has become apparent. The remaining work of the author's doctoral studies will be devoted to this task. A manuscript now in progress utilizes theories from ecology, biology and the business literature, to show how agrifood systems are organized as hierarchical networks, with each level in the network having varying degrees of influence on the organization of the network as a whole. The paper explores the concept of 'modularity' as a way of framing agrifood system design in terms of the underlying architectural features that promote or detract from the autonomy and adaptability of agrifood systems, with emphasis on the role that food distribution and processing infrastructure plays in creating options for future agrifood system change, using the 'keystone species' concept from ecology. The paper seeks to outline a spectrum of agrifood system orientations: from

'conventional' export-oriented agrifood networks operating on the principle of 'global interdependence' and organized around the nexus of 'least cost suppliers', to 'alternative' locally-oriented agrifood systems operating on the principle of 'local self-reliance' and organized around the nexus of 'relative proximity'. To illustrate the theory, the author will use examples from the research outlined in this report, as well as the author's previous research.

6 Publications and plans for future research and activities

A portion of the work of this research project has been included in two publications focusing on the Järna agrifood network. The data and experiences gathered from the work conducted on the BEM agrifood network will be incorporated into the theoretical article currently in progress. A list of existing and eventual publications from the project are given below:

Haden, A., and H. Helmfrid. 2004. Järna, Sweden - Community consciousness as the base for a learning local ecological food system. *in* L. Seppänen, editor. Local and Organic Food and Farming Around the Baltic Sea. Center for Sustainable Agriculture, Swedish University of Agricultural Sciences, Ultuna.

Helmfrid, H., Haden, H. & M. Ljung. (Manuscript). The role of Action Research (AR) in environmental research projects: learning from a project on local organic food and farming.

Haden, A., Geber, U. and Salomonsson, L. (Manuscript). Structural modularity and the resilience of agrifood networks.

In addition to writing for publication, the author plans to share insights gained from the research conducted under this grant at the upcoming "Ecological Farming Conference" sponsored by the Center for Sustainable Agriculture (CUL) in November 2005. Additionally, the author is working with Hillevi Helmfrid on a paper that discusses the potential effects of the global oil production peak for agriculture, which will form the basis of a conference and workshop sponsored by the Center for Sustainable Agriculture (CUL) and The Royal Academy of Agricultural Forest Sciences (KSLA) in winter 2006.

The remaining funds associated with this project, will be used for follow-up research on the BEM network so that more aspects of the original project plan can be carried out, and included in the larger manuscript that aims to develop new theory regarding agrifood networks and which will summarize the learning gained through the author's interaction with the two agrifood networks studied in this project, as well as previous projects.

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