

## Strategies to improve quality and safety and reduce costs along the food supply chain

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**Key words:** food quality, food safety, economics, supply chain

### Abstract

*The paper aims at contributing to a better understanding of the linkage between supply chain performance and possible performance improvement with respect to food quality and safety. Therefore, the paper addresses the question whether the level of collaborative planning and close supply chain relationships could help improve quality and safety of organic supply chains. The three main weaknesses in the performance of European organic supply chains identified are high logistic and transport costs, the level of input costs and low expenditure on research and product development. While we found a high level of collaboration for information sharing, there is almost no collaboration with respect to joint decisions on optimal order quantity and inventory requirements as well as for all cost relevant issues of the supply chain. As the potential to benefit from economics of scale on a company level is often limited in organic supply chains, we suggest to make use of the cost reducing potential of collaboration.*

### Introduction

Members of organic food chains face several challenges in managing and linking profitability and the quality of their products (Zeithaml 2000). The complex configurations of food chains and their actors complicates quality assurance on the one side and the equitable and efficient allocation of costs and returns to the supply chain actors on the other (King and Venturini 2005).

Petersen et al. (2005) found that supply chain and company performance is positively influenced by collaborative planning with the degree of trust between buyers and suppliers impacting on collaborative planning effectiveness. Collaborative planning processes are conceptualized as the joint buyer – supplier relationships that require bilateral information flow between supply chain partners. Effective collaborative planning is expected to improve supply chain performance by facilitating decisions that reflect a broad view of the supply chain and take into account interactions among the firms in the supply chain. Performance improvements are particularly to be expected

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in the form of increased inventory turns, reduced purchase prices, and/or reduced total cost and better food quality.

Synthesising research results which were conducted as a part of the EU project "Improving quality and safety and reduction of cost in the European organic and "low input" food supply chains", this paper aims at contributing to a better understanding of the linkage between supply chain performance and possible performance improvement with respect to food quality and safety. Therefore, the paper will focus on the question whether collaborative planning and close supply chain relationships could help improve quality and safety of organic supply chains. The paper will conclude by describing a preliminary set of cost effective strategies to improve quality and safety of European organic supply chains.

### **Materials and methods**

While Porter's concept of the value chain (Porter 1985) focuses on the enterprise in the first place, for this study we adapted the concept of Supply Chain Management (SCM). SCM is defined as the integration of key business processes from end user through to original suppliers/retailers that provide products, services, and information that add value for customers and other stakeholders (Lambert and Cooper 2000). SCM views a company as a part of a network of suppliers and customers. Thus, as deficiencies of food systems to deliver high quality and safe food are of systemic nature, we were primarily interested in studying the system, the network and nodes of suppliers and customers rather than analysing individual companies.

In a case study approach, six different supply chains in eight European countries were analysed: milk (CH, UK), apples (DE, CH), pork (UK, NL), eggs (DE, UK), wheat (HU, IT, FR) and tomatoes (IT, NL). Data were collected by semi-structured interviews with individuals representing all supply chain actors involved in the relevant supply chain (producers, packers, processors, transporters, traders, retailers). The questionnaire included a structured SWOT-Analysis, a partial value chain analysis and an analysis of supply chain relationships (Simatupang and Sridharan 2004, Roberts and Stimson 1997).

### **Results**

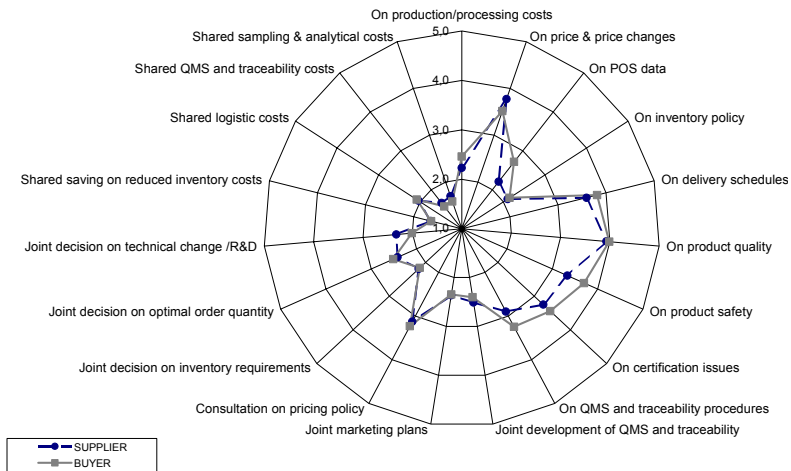
The structured SWOT-Analysis showed the strengths of European organic supply chains with respect to adoption of traceability procedures, customer feedback procedures, labour force and managerial skills as well as adoption of additional quality management systems. On the other hand, three main weaknesses in the performance of European organic supply chains were identified: high logistic and transport costs, high levels of input costs and low expenditure on research and product development (figure 1). While input, logistic and transport costs are considered to have only a low impact on food quality and safety the situation is different for expenditures on research and product development. Increased expenditure on research and product development offers the greatest potential for quality and safety improvement in organic food supply chains. Furthermore, high operating costs were mentioned as a weakness with a high quality impact in wheat and apple supply chains, while we found a low quality impact for milk and pork supply chains.

But how do the supply chain actors react on this stated problem in operating, input and logistic costs? Collaboration between supply chain actors is a proven means to reduce these costs. In our analysis of supply chain relationships we therefore investigated the level of collaboration with respect to three dimensions (Simatupang

and Sridharan 2004): information sharing, decision synchronisation (joint decision making in planning and operational contexts) and incentive alignment (degree to which chain members share costs, risks and benefits) (figure 2).

Impact on quality and safety	high	<ul style="list-style-type: none"> <li>&gt; Expenditure on research and product development</li> <li>&gt; Profitability (wheat)</li> <li>&gt; Competitiveness within the market (wheat)</li> <li>&gt; Operating costs (wheat, apples)</li> <li>&gt; Level output price (wheat)</li> <li>&gt; High integration in conventional supply chain infrastructure (wheat)</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Adoption for traceability procedures</li> <li>&gt; Customer feedback procedures</li> <li>&gt; Labour force skills</li> <li>&gt; Managerial skills of supply chain members (milk, apple, eggs, wheat)</li> <li>&gt; Adoption of QMS additional to organic certification schemes (milk, apples, tomatoes)</li> <li>&gt; Delivery times (eggs, wheat)</li> <li>&gt; Availability of raw material (apples, eggs, wheat, tomatoes NL)</li> <li>&gt; Use of a fully organic supply chain infrastructure (wheat, apples)</li> <li>&gt; High integration in conventional supply chain infrastructure (eggs, tomatoes)</li> <li>&gt; Ability to exploit economies of scale (eggs, pork, apples)</li> </ul>
	low	<ul style="list-style-type: none"> <li>&gt; Logistic and transport costs</li> <li>&gt; Level input price</li> <li>&gt; Marketing costs (wheat)</li> <li>&gt; Ability to exploit economies of scale (wheat, tomatoes)</li> <li>&gt; Availability of raw material in organic quality (pork, tomatoes IT)</li> <li>&gt; Operating costs (milk, pork)</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Competitiveness within the market (pork, eggs, tomatoes)</li> <li>&gt; Profitability (eggs, tomatoes)</li> <li>&gt; Marketing costs (pork, tomatoes)</li> <li>&gt; High integration in conventional supply chain infrastructure (pork)</li> <li>&gt; Use of a fully organic supply chain infrastructure (pork, tomatoes)</li> </ul>
		<b>weaknesses</b>	<b>strengths</b>

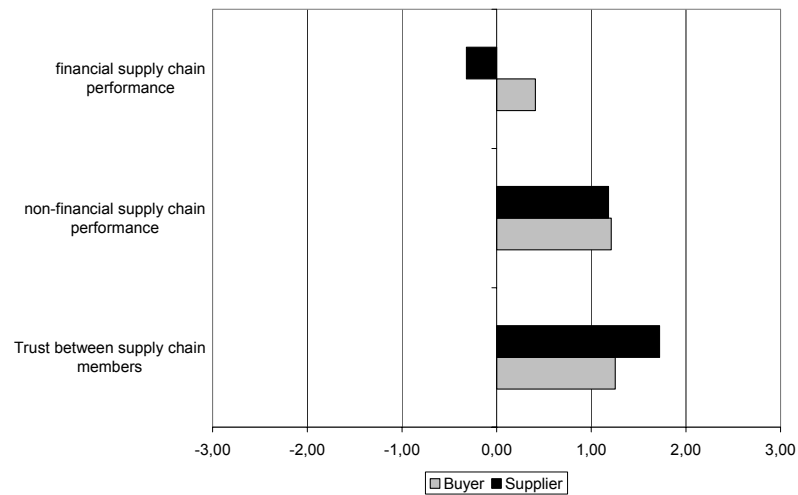
**Figure 1: Strengths and weaknesses of organic supply chain performance aspects and their impact on food quality and safety**



**Figure 2: Level of collaboration between organic supply chain actors (collaboration index)**  
 (Scores: 1=never; 2=seldom; 3=sometimes; 4=often; 5=always)

While we found a high level of collaboration on information sharing with respect to prices, delivery schedules, product quality and product safety, the supply chains surveyed showed a very low level of collaboration with respect to incentive alignment and decision synchronisation. Indeed, there is almost no collaboration with respect to joint decisions on optimal order quantity and inventory requirements as well as for all cost relevant issues of the supply chain (analytic, traceability, logistics, inventory). Analogous to the findings in the structured SWOT-Analysis, collaboration with respect to research and product development was found to be very low.

As a consequence of the high operating costs which are one of the most important weakness of organic supply chains and the low level of collaboration with respect to cost reducing activities the level of satisfaction with the financial performance of the respective supply chains was negatively ranked from the supplier perspective (figure 3). On the other hand, the highest degree of satisfaction was found for the trust dimension which is a necessary condition for successful collaboration.



**Figure 3: Level of satisfaction in organic supply chain relationships**

(Scores: 3=strongly agree; 1=agree; 0=neither agree/ disagree; -1=disagree; -3=strongly disagree)

### Discussion

Operating costs covering manufacturing, inventory, logistic and distribution costs cover approximately two thirds of the selling price of the organic commodities analysed in this study and represent one of the most relevant financial weaknesses in organic supply chains in Europe. On the other hand, our study showed that collaboration between supply chain members aimed at reducing costs is poorly developed. Thus, the European organic supply chains analysed take little advantage of this important cost reducing strategy. However, the supply chain actors interviewed did not recognise that the poorly performing cost categories have an impact on the quality and safety of the supply chain's products. The majority of interviewees stated

that product quality is not an issue for improvement. However, the pressure on operating costs limits the leeway for investments in product research and product development, which in turn are highly relevant to product quality. Investment in product development for quality improvements is one of the key issues to stay competitive and to keep market share. Moreover, economic pressures on the supply chains not only derive from increasing costs, but are also due to decreasing margins as a result of market competition and/or decreasing sales. No wonder, that the supply chain actors see a negative economic cycle/trend to be one of the most relevant risks for quality and safety in organic supply chains.

### **Conclusions**

From our analysis we can suggest the following set of strategies to improve the performance of organic supply chains:

- The organic share of the total food turnover in the EU is about 1% (Hamm and Gronefeld 2004). In this niche market, the potential to benefit from economics of scale at the individual company level is often limited. Therefore, a key strategy for companies in the organic market should be to make use of the cost reducing potential associated with improved collaboration.
- Collaborative product development is a delicate issue which needs to be based on a high level of trust and on a long term perspective in the partnership. According to our survey however, the latter is only found in milk and apple supply chains while in wheat, tomato and pork supply chains the long term perspective of partnerships was negatively ranked. Strategic partnerships are therefore particularly relevant to these supply chains.
- According to Petersen (2005), supply chain actors should recognise the difference between truly strategic suppliers and other suppliers. Collaborative planning and trust should be further enhanced particularly with strategic partners. In these partnerships the level of information sharing and joint decision making needs to be improved.
- In these strategic partnerships, supply chain members should establish action steps to achieve targeted performance levels. For the supply chains analysed this applies particularly to inventory planning, logistics and product development.

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