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Moving towards Sustainability in Food Chains: Dealing with Costs and Benefits

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ABSTRACT

Sustainability concerns are receiving increasingly attention by society and in turn, the food sector and consumers as the food sector's final customers. Investments towards improvements in sustainability along the chain are usually not evenly distributed along the chain which affects the balance in the distribution of costs and returns. Transparency is a means for supporting an appropriate link between costs and returns. Various alternatives are being discussed. The chapter utilizes a case study approach for elaborating on the possibilities of regaining costs through price premiums, the communication of sustainability to consumers and the cooperation through horizontal and vertical networking alternatives that could support developments towards sustainability through gains in efficiency and concerted engagements in dealing with sustainability, costs and returns along the chain

Keywords: Supply chain; sustainability; price formation

1 Introduction

Sustainability concerns are receiving increasingly attention by society and in turn, the food sector and consumers as the food sector's final customers. In general terms, sustainability builds on social environmental and economic dimensions. Society's pressure on firms is, however, focused on the environmental and social issues while enterprises have to find ways on how to additionally assure economic sustainability.

Improvements in sustainability of enterprises and food chains build on improvements in individual sustainability characteristics of operations and products which constitute, from a sustainability view, the *added value* of products. Such improvements may ask for investments and operational changes in enterprises along the food supply chain. They might be feasible to a certain extent without costs or might even involve cost reductions. However, beyond a certain value, improvements in sustainability characteristics in the production and distribution of food lead to an increase in costs. For enterprises and food chains this poses a challenge which differs from challenges of the past where the focus was primarily on production and on improvements in efficiency. Improvements in efficiency had a positive effect on costs which was driving developments without outside interference. Efforts towards improvements in environmental and social sustainability cannot build, in general, on such clear relationships with costs which constitute a conflict in reaching general sustainability.

This raises the question on how to balance costs linked with improvements in environmental and social sustainability. One could distinguish between the following two scenarios:

1. If improvements in sustainability characteristics (added value characteristics) allow the realization of price premiums with consumers, the challenge is the distribution of market gains along the chain in line with the increase in costs.

2. If improvements in sustainability characteristics (added value characteristics) do not allow the realization of price premiums with consumer, enterprises are challenged to improve in efficiency, organization, and management that could offset some of the additional costs and to distribute efficiency gains according to engagements in sustainability investments.

In dealing with the different issues, one needs to consider prices and costs simultaneously. This is captured in the profit margin. While the identification of sales prices along the chain and towards consumers is a straightforward task, the identification of costs is difficult to reach. There is a lack of appropriate statistical data. Furthermore, in multi-product enterprises such as retail, the calculation of costs for individual products does, apart from the purchase price, very much build on the allocation of indirect and overhead costs. Information about costs is also a sensitive issue with enterprises who are reluctant to provide appropriate information in case study analysis.

However, despite these difficulties one can deduct from various case studies (Fritzen et al., 2012) and food sector statistics, that in very general terms, the profit margin per product unit is about the same in enterprise along the chain with a somewhat higher margin for agriculture which, however may vary considerably between years depending on harvests and demands. Assuming that the present distribution of profit margins along the chain is the result of an ongoing continuous adjustment process in the market we take the present distribution as a base and focus on changes that may result from engagements in value adding characteristics.

Discussions on changes and the need for balancing costs and returns depend on **transparency** in

a) prices and especially price premiums at consumers' end,
b) enterprises' cost engagement towards improvements in sustainability characteristics, and in
c) potential gains in efficiency improvements along the chain.

The transparency is the basis for a re-adjustment in the distribution of profit margins and a re-adjustment is the pre-condition for individual enterprises to invest if not forced through regulations or market pressures. If the value added characteristics do not allow for a price premium the costs could be covered by efficiency gains along the chain. An analysis of major efficiency potentials in chains with general relevance leads to the structure of food chains which sets it apart from chains in other production sectors. Both ends of the chain, farm supply and retail, build on large and even international active enterprises while enterprises in-between such as agriculture and to some extent also processing are pre-dominantly small and medium sized enterprises. This causes a problem for both the large companies as well as the SMEs. Large companies have problems in sourcing and the assurance of conformity in quality while small companies are limited in their price negotiation ability. This is the basis for networking initiatives among SMEs which supports efficiency but, in addition, supports SMEs in negotiating their appropriate share in the balancing of costs and returns in chains.

The analysis in this paper does build on case studies as well as on expert analysis and focus groups. The focus is on clarifying

1. the possibility of reaching price premiums for sustainability products,
2. the effect of consumer communication on their appreciation of sustainability products,
3. chain's ability and willingness to assure balancing of costs and returns along the chain, and
4. opportunities for supporting developments towards sustainability through networking.

The paper introduces into the subject by first outlining major sustainability characteristics that are directly linked to drivers of negative developments (chapter 2). Chapter 3 outlines the relevance of transparency along the chain with a view on sustainability characteristics as well as on the effects of sustainability improvements on costs and prices. Chapter 4 describes the case study approach followed in the paper. It is complemented by a systematic view on network initiatives linked to the different case studies dealt with in the paper (chapter 5). The case studies provide the basis for a discussion on sustainability improvements potentials in chains (chapter 5), possibilities for regaining costs related to improvements in sustainability through price premiums with consumers (chapter 6), and networking alternatives developed for supporting sustainability developments through improvements in efficiency and market activities (chapter 7). Chapter 8 concludes the discussion.

2 Sustainability characteristics in chains

Sustainability characteristics or added value characteristics of products are characteristics that add value to food products according to consumers' and/or society's interests in sustainability. The characteristics evolve from sustainability initiatives that focus on reducing the impact of certain major drivers that influence negative developments. Such drivers have been extensively discussed in literature (see e.g. SCAR, 2007 and 2011).

There are added value characteristics that depend primarily on initiatives of a single stage in the chain such as animal welfare, fair trade or GMO-free product lines. Improvements in animal welfare or fair trade are concentrated on the farm level, the challenge in GMOs is the organization of parallel logistics chains, which might reduce some of the economies of scale but not change the relationships between stages of the chain (Amani and Schiefer, 2012). Other major drivers are of direct chain relevance where different stages of the chain may influence the final outcome of the respective added value characteristics. We concentrate our analysis on the following chain oriented drivers and characteristics:

1. Driver: Climate change and global warming
   Added value characteristic: reduction in GHG emissions including carbon footprint
2. Driver: Protection of environment
   Added value characteristic: reduction in water use
3. Driver: Scarcity in fossil energy
   Added value characteristic: reduction in energy use of fossil source
4. Driver: Societal and demographic changes
   Added value characteristic: reduction in waste contributing to an increase in food and/or a reduction in resource use and emissions.

An earlier study (Amani and Schiefer, 2012) provides a literature overview on our present knowledge (mostly based on case study analysis) on the impact of various stages of food chains in different product lines on value added characteristics, especially on GHG emissions and energy. The impact of value added characteristics along the food chain may differ substantially between products. As an example one might look at the differences in the use of energy in the production of fresh meat or hamburger. In fresh meat, almost all energy use is concentrated in agriculture whereas in hamburger production, the use is more evenly distributed among agriculture, bakery and packaging (Amani and Schiefer, 2012).

GHG emission. For emissions, the Intergovernmental Panel on Climate Change (IPCC) provides a clear specification. It concludes that anthropogenic greenhouse gas (GHG) emissions (carbon dioxide, methane, nitrious oxide, and halocarbons) have been responsible for most of the observed temperature increase since the middle of the twentieth century (IPCC, 2007). A 2006 study for the European Commission found that food accounts for 31% of the EU-25's total GHG impacts (Eder and Delgado, 2006). GHGs contribution to global warming is expressed in CO2 equivalents. CO2 is rated with a factor of 1, nitrious oxide with a factor of 298 and methane with a factor of 25 (Brander, 2012). The GHG emissions linked to the production of a certain good are sometimes expressed in terms of 'carbon footprint'.

Water. Water as a resource is of major relevance for food production. About 70% of freshwater consumption is due to agricultural production (FAO, 2009). As a consequence, any water shortages endanger food production. The problem is further aggravated as future climate changes may lead to a 20% increase in water shortage (UN, 2006, p. 46). Water consumption in the production of goods is sometimes expressed in terms of 'water footprints' (www.waterfootprint.org).

Energy. Energy is an input factor all along the food chain. It is used as fuel or electricity in the utilization of machinery, in heating, cooling, lightning, but also in the production of fertilizer or pesticides.

Waste. Waste may be identified as food which is aimed at but unfit for human consumption. Products not meant and unfit for human consumption but fit for other uses are defined as food by-products. According to FAO (2011) about one third of the edible parts of all food produced for human consumption becomes loss or waste. Food losses occur at all stages of the chain (Parfitt et al., 2010). In Europe and North America, losses mainly occur at the end of the supply chain at retail and consumer households while in developing societies, the production of waste is more linked to early stages of the chain.

There is a broad basis of literature on the relevance of sustainability characteristics in different stages of chains related to different production lines. However, knowledge on impact is different from knowledge about potential opportunities for changes in impacts and the related consequences for enterprises and the chain in terms of costs and returns.

The key in the analysis of added value characteristics and their linkage with investments, costs and pricing is the identification of a baseline from where to count. A suitable approach could build on the common characteristics of commodities or, in non-commodity products on what is commonly considered to represent the basic expectations or the present 'average'. While the identification of a basic expectation level might look complex from a theoretical point of view, it is a feasible working base building on very 'obvious' expectations such as food safety guarantee, the exclusion of child labor, the exclusion of obvious cruelty to animals, the obvious damage to the living environment, etc.

3 Transparency on sustainability characteristics

One of the core requests in assuring competitiveness and sustainability in the food value chain is transparency on the characteristics of products and processes in production and distribution. Transparency with enterprises supports them to improving on critical food characteristics that are of major relevance to consumers and society (Schiefer and Deiters, 2013b). In turn, transparency towards consumers allows them to make informed decisions that fit their needs. Transparency in sustainability concerns is a pre-requisite for the identification of deficiencies and the realization of improvement activities (Schiefer and Deiters, 2013b). This reaches beyond characteristics in products and processes and includes transparency regarding costs and returns linked to engagements in sustainability improvements along the chain. The mutual information exchange on costs, returns and the willingness to balance the distribution of costs and returns is a pre-condition for swiftly moving towards increased sustainability.

Realizing transparency is, however one of the most complex and fuzzy issues the sector is facing. The complexities are due to complexities in food products and processes but also due to the dynamically changing open network organization of the food sector with its multitude of SMEs, its cultural diversity, its differences in expectations, its differences in the ability to serve transparency needs, and its lack of a consistent appropriate institutional infrastructure that could support coordinated initiatives towards higher levels of transparency throughout the food value chain (Schiefer and Deiters, 2013b).

There is a substantial number of initiatives going on that work on improving **transparency**. They involve initiatives that

a) deal with the establishment of an appropriate communication *infrastructure*,
b) focus on the identification and communication of appropriate *indicators*,
c) deal with the identification and realization of system *functionalities* that serve information needs in specific scenarios, and
d) transform information into appropriate messages at consumers' end.

The variety of initiatives demonstrates the broad range of issues that need to be dealt with but also the many deficiencies in the realization of transparency on value added characteristics. An overview on deficiencies is being provided in the Strategic Research Agenda of the European project Transparent_Food (Schiefer and Deiters, 2013b). Transparency builds on appropriate signals which integrate available information and communicate a certain message to recipients (e.g. 'food is safe'). Transforming information to simple, clear, and easily understandable 'messages' and assuring that messages do build on information that can be trusted are key issues in ensuring transparency and trust.

One of the **basic signals is prices**. However, their message is blurred. Higher prices communicate a message of being of value to customers or of being more valuable than competing products. The value is defined by the expectations which customers link with the product. Pricing along the chain could reflect the distribution of production and distribution costs along the chain or include, additionally, the contribution to realizing and communicating the value added characteristics to consumers. While the first part could be clearly quantified, the second part depends on the evaluation of customers, which might differ between different customers from different backgrounds but also change over time.

4 Methodology - the case study approach

4.1 Overview

The analysis in this chapter builds on a case study approach. A case study approach is trying to capture a true picture of the situation in the cases it deals with. This differs from a statistical approach which can provide a 'representative' picture which, however levels out differences between cases. The true picture of the situation in individual cases gets lost.

Case studies are most relevant, if they allow to draw a picture which helps to understand the situational conditions and if this understanding could have a broader relevance beyond the individual cases. They may also capture future developments under consideration. Both approaches, case study analysis and statistical analysis, could in certain situations complement each other. In this chapter we focus on the case study approach to arrive at a realistic picture in individual cases. Furthermore, because of the focus on emerging challenges towards moving towards increased sustainability, there are not enough network initiatives with a sustainability focus that could support a statistical analysis.

As each case is in principle different from others, it is part of the analysis to judge which conclusions can be drawn that reach beyond the case and have wider relevance, allowing some relevance for policy and the sector. The judgments are principally based on an evidence-based reasoning approach. One needs to be aware that those judgments are 'soft' results where recipients need to judge for themselves to what extent they are prepared to follow the arguments and accept the conclusions.

The case studies deal with established trade relationships and enterprises engaged in sustainability and networking activities. Spot market activities are not considered as they do not allow a coordinated move towards increased sustainability.

The case studies build on

a) representatives of a number of networks each one representing a typical network design,
b) an expert group of industry representatives from retail and from chains dealing with grain, meat and potato products who bring in their own case experiences, and
c) a consumer focus group.

The network case studies are of specific relevance as they allow to discuss opportunities for coordinating improvements towards sustainability among many SMEs involved in a chain, gaining in efficiency that could offset sustainability improvement costs, and supporting the balancing of costs and returns for SMEs in a chain.

4.2 Classical network arrangements

Networking is especially relevant for SMEs where individual companies usually do not have the internal and external strength to move ahead and gain market recognition. In addition, networking could support interaction and knowledge exchange deemed necessary for a successful move into new and emerging trends and requirements in food supply (Schiefer and Deiters, 2013a). The multidimensionality of sustainability and the changing relevance of individual dimensions such as animal welfare or energy require knowledge, interaction and learning opportunities.

As the vast majority of enterprises in the food sector (FoodDrinkEurope, 2013) as well as in farming are SMEs, the question of the value of networking in moving towards increased sustainability is of major relevance for the sector's development towards sustainability. Networking may provide the necessary motivation and the necessary market relevance to induce enterprises into investments towards increased sustainability. Networking especially in agriculture has been an established approach in dealing with emerging challenges individual farms could not deal with. Classical examples are the cooperatives that were established for marketing support or the food networks established for supporting innovation that could help the food sector in meeting the challenges the sector is facing (Schiefer and Deiters, 2013a).

The classical network arrangements are focusing on either horizontal cooperation or on vertical cooperation. Typical examples for horizontal cooperation are traditional cooperatives. Horizontal networking allows improving especially SMEs standing within a chain and support investments in coping with external pressures through efficiency gains in production and marketing. They bring individual enterprises together for joint marketing activities building on some common agreements in production and process organization.

Vertical cooperation is usually captured under the heading of food chain. Vertical networking allows chains to reach a production and distribution level that better matches emerging needs from consumers and society especially regarding issues on sustainability while at the same time assure a new balance in the distribution of costs and returns. Food chain cooperation may be linked to improvements in marketing that build on commonalities along the whole chain of enterprises involving a branding of products. Food chain cooperation might also be linked to improvements in risk management assuring appropriate controls along the chain, specifying agreements on production quantity (through e.g. contracts) and assuring a pre-determined quality at the various stages of the chain. Examples are the classical organic production chains or chains building on contract farming.

Cooperation in networks may be an opportunity to deal with the challenges involved in moving towards

increased sustainability for remaining competitive in the food market. The cooperation would build on common agreements, could gain in efficiency (at least in marketing), and could more easily develop a branding image with customers and consumers that could facilitate reaching higher prices with customers and eventually consumers.

4.3 Evolving network alternatives

With the increasing pressures towards improvements in sustainability, these classical network arrangements which constitute baseline cooperation options are being developed further for better fitting the challenges towards sustainability. In discussions with experts and networks engaged in sustainability developments a number of network alternatives emerged that could be structured as follows.

1. Production driven networks
    - Open horizontal/vertical network
    - Dedicated horizontal/vertical network
2. Customer driven networks
    - Open horizontal network
    - Dedicated horizontal integration
3. Complete horizontal integration

Some of the networks evolved from networks already in place while others were specifically initiated for dealing with sustainability developments. The open networks represent networks that are not linked to any specific chain of supplier/customer relationships (chain). They were usually initiated with food safety and food quality in mind and later broadened their scope towards environmental and social issues. This chapter discusses examples from all of these categories, covering networks initiated globally and networks initiated in Germany and France. However, the 'best practice' examples are not specific for any region but are of general relevance.

The cases that have been selected are all active in promoting sustainability developments covering a broader range, i.e. including environmental, social and ethical issues. As such they are forerunners of developments that could be envisaged for the future.

1. **GlobalG.A.P network**. A global *network of farm* enterprises that follow similar rules in the organization and control of their production processes. They are viewed as a network of its own as, e.g. some retailers only accept products from the GlobalG.A.P network irrespective of the individual farm supplier. According to our classification, the network is a *customer driven network* as it was initiated by retail groups. It is an *open horizontal network* that farms could join everywhere.

2. **Q&S (Quality and Safety) network.** Q&S represents a network of *networks of companies at all stages of the food chain* that at each stage and within a certain food sector follow similar rules in the organization and control of their business processes. It evolved out of the farming community and was step by step extended to later stages of the food chain. Enterprises at all stages are considered as being members of a network as some customers and eventually some retail groups accept products from the Q&S network irrespective of the individual supplier. According to our classification, the network is an *open horizontal/vertical and production driven network* that could be joined by any company everywhere if its rules are being followed.

3. **Naturland network.** Naturland represents a network of *networks of companies at all stages of the food chain* including farms, processing industry, and marketing groups that cooperate in providing the "Naturland Brand", a major brand in the organic sector. It evolved out of the production sector, representing a *production driven network*. The members follow dedicated rules that guarantee the brand image. Products are sold in dedicated retail outlets who are also members of the network but also in the general market. According to our classification, the network is a *dedicated network* with *horizontal and vertical cooperation*.

4. **Retail network under development (referred to as RetailNet)**. The case involves a major international retail group with headquarter in Germany that is launching a sustainable product line. For serving this product line, the group initiates a dedicated network especially of farms but also involving other enterprises along the chain (*horizontal/vertical network*) and promotes production of products fitting their requirements throughout Europe. According to our classification, the farm network is a *customer driven network*.

5. **Producer network under development (referred to as ProducerNet).** The case involves a major cooperative in France that builds on a farming community but also includes processing industry which is market leader in some segments. It is working on launching a sustainable product line with a dedicated

network of its farmers and processing companies (*horizontal/vertical network*). Retail is not part of the network. According to our classification, the network is a *production driven network*.

These network discussions are complemented by an analysis of some regional initiatives linked to the network initiatives mentioned above and involving trading and processing industry but also of trading enterprises involved in different networks. The results of these interviews are more limited in scope but provide complementary views.

5 Sustainability improvement potentials (hot spots)

The intensity of negative impacts of production and distribution activities in enterprises along the chain on sustainability characteristics may not match the improvement potential within a given production and distribution structure. As an example, the negative impact of milk production on GHG emissions of farms is primarily due to the emissions of the cow population. If an end of milk production is not an option, the potential for a reduction of GHG emissions is very limited. A summary overview on the improvement potential regarding energy, water, waste and GHG emissions shows the following characteristics.

GHG emissions. GHG emissions occur primarily at the farm level. If a reduction of animal production is out of question, the saving potential is, however, limited and primarily linked to fuel consumption. There is some potential through improvements in technology, but the developments have reached a state where reductions in emissions are in conflict with energy use.

Water. Water is needed for food production and cleaning purposes. The major saving potential is in the cleaning processes. Possibilities and reduction potential depend on the product and factors like the technology level of a company or its location.

Energy. Energy is by far the added value characteristic with the most substantial savings potential. Along the chain the energy demand is an important factor, but there are great differences in saving opportunities. While there is not much room for savings on the farm level (excluding drying activities), processing industry apart from some exceptions such as mills might have substantial room for savings. Examples demonstrate that the saving potential is only partly dependent on additional investments in processing technology but could build on more intelligent energy management activities.

Waste. A major source of waste at farm level and other stages is due to legal demands and retailer requirements. As retailer demands tend to be stricter than legal demands, one of the opportunities to reduce food waste would be to find opportunities to bringing food to markets that fits legal demands only. The realization of this added value does not require much in enterprise investments but asks for organizational initiatives.

As an example, the savings potential in the grain chain could be identified as follows:

1. Energy savings: industry, bakeries (somewhat in farms' drying processes)
2. Waste reduction: retail, industry (e.g. through changes in packaging)
3. Water savings: industry (e.g. cleaning processes)
4. GHG reduction: limited (somewhat at farms through fuel reduction)

These developments would affect the distribution of profit margins along the chain with the processing stage at a disadvantage. Within the chain, the most savings potentials are in industry despite the fact that agriculture has a major impact on some of the characteristics. The picture in other product lines is quite similar. This places special responsibility on industry and retail regarding investments towards improvements in sustainability while all stages including agriculture would have to cooperate in regaining an appropriate balance in the distribution of costs and returns.

6 Regaining costs through price increases

As it is assumed that an improvement in value added characteristics is in the general interest of the society but also in the interest of consumers as members of society, one might ask if the additional costs of investments towards sustainability could at least to some extent be carried by consumers paying a premium price.

This question has been raised in interviews with the case study industry representatives and discussed within the consumer focus group that was comprised of people of different ages and sex. It is striking that the views between the different groups did match quite well.

Examples such as the one from organic networks (Naturland) demonstrate that investment costs could in fact be regained if supply of products is limited and if there is a niche market of people able and willing to pay a premium. The examples also support the view that investment initiatives at individual stages and especially at farms may not lead to a major distortion in the distribution of profit margins along the chain but that additional returns from consumer sales are to a major extent channeled back to farms as the stage where the major additional costs occur for delivery of the added value characteristics of organic chains.

The question arises, to what extent the situation in the market for organic products might match the situation in markets for products based on production and distribution processes with improvements in sustainability. It became evident from expert analysis that in the competitive environment of mainstream markets additional costs could not be regained through retail price increases as long as competitive products with lower production costs are on the market. Consequently, an investment in added value characteristics would need to be covered as much as possible by savings through improvements in process efficiency and management. It was argued that consumers have little knowledge on the content of the term 'sustainability' which is a fuzzy term of dynamically changing focus. This is supported by a recent business study about Germany (Nestle, 2011) which demonstrated that even that the term sustainability is known by a majority of consumers, only about half of them can make sense of it. Sustainability is an argument which is not of market relevance at this moment and might not be soon. As a result, it is individual sustainability domains such as animal welfare, non-GMO, contamination, or, increasingly, social issues that determine the discussion at retail's end. This is in line with results of the above study where consumers could phrase their importance rankings and willingness to pay for individual dimensions of sustainability. While importance rankings ranged from about 30 to almost 70%, there was even a 'willingness to pay' of between 10 and more than 30% signaling an understanding of issues.

However, it was made clear in discussions that in the long run, the limitation in focus on individual sustainability characteristics is not the way to go. The relevance of characteristics may change and more and more of individual characteristics are becoming of interest. Furthermore, the extent to which individual sustainability characteristics are being dealt with may differ between stages of the chain which makes it almost impossible to communicate with consumers. This argumentation has been behind the classical certification schemes as well. As a consequence, enterprises are looking for ways to appropriately communicate 'sustainability' to consumers. It is from this background that enterprises look for opportunities for linking 'sustainability' with other indicators.

Sustainability vs organic. It is the experience of network representatives that, apart from highly involved customers, consumers cannot differ between 'sustainable' and 'organic' (Naturland, 2013; RetailNet, 2013). Furthermore, the great number of certificates adds to the confusion (Nestle, 2011). So the tendency of consumers with awareness regarding sustainability characteristics is to purchase organic food, considering it sufficient for environmental and other concerns.

Regional vs organic. According to Nestle (2011) about 37% of all consumers buy local products on a regular base, while the respective number for organic products is only 13%. Consumers associate local products with freshness, support of the local economy, short transportation distances, and knowledge about the origin. In this context experts emphasized that regional production involves in the view of consumers a multitude of additional 'goodies' such as trustworthy claims, acceptable animal welfare considerations by responsible people, non-GMO, etc. According to DBV (2011) organic food is mainly bought on the basis of a perceived higher health benefit, to some extent combined with the understanding of animal welfare, environmental protection, and better taste.

Summing up the arguments it can be stated that the following preference scale for the general public holds true:

Regional > organic > sustainable

This makes the combination of 'sustainability' with 'regional' the most attractive alternative for offering sustainable produced products to consumers. A similar situation towards achieving acceptance of a premium for added sales value may develop through a combination of sustainability characteristics with other attributes that promise an individual added value such as health support as linked with organic products or the identification of certain production sites as an indicator for food safety and quality.

A case in point is the example of the sustainability initiative of the company Barilla. The company developed a double pyramid model that links healthy eating with sustainable production (http://www.barillagroup.com/corporate/en/home/our-sustainable-model/sustainable-business-reports.html). The well-known pyramid of eating recommendations with vegetables at the bottom (broad base) and meat at the top (limited consumption) is paralleled with a reverse pyramid on negative

environmental impacts with plant production at the bottom (little negative impact) and animal production at the top (large impact). This double pyramid communicates the message that what is good for one's health is also good for the environment.

The line of discussion from expert analysis can be summarized as follows:

1. If consumers have an alternative, the majority will not be prepared to pay an extra premium. They might prefer such products against 'traditional' products as long as prices are comparable providing 'sustainable' products with a competitive advantage.

2. A small segment of people would be prepared to pay an extra premium as is the case for organic products. It is assumed that the price premium would be somewhere between the price for traditional products and the 'reference price' for organic products. Prices for organic products would constitute the border line as 'organic' involves in the view of consumers a health premium not included in the 'sustainability' characteristics.

It is further argued that even for the segment of people who would be prepared to pay an extra premium, people need to be guided to the extra premium and to get used to appropriate appreciation of the product. A case in point is an experiment carried out by a major meat processing company in Germany which tested consumer reactions on price premiums for poultry meat. Introducing poultry meat certified as 'Label Rouge (LR)' with its higher levels of sustainability standards in higher level retail stores was a failure with customers. With an additional price of 9 EURO per kg, the turnover was only about 1/50 of the turnover of regular poultry meat. With a switch from 'Label Rouge' to a label 'Nature and Respect' with a reduced price premium the turnover increased. It became apparent that consumers who value certain sustainability aspects are not yet ready to pay a premium they consider too high. They would prefer to compromise and to focus on products with some improvements but with a lower 'price shock'. Moving towards increased sustainability may be a long way involving gradual improvements that consumers can digest.

7 Networking

7.1 Overview

The different network alternatives outlined before do all build on improvements in sustainability characteristics but with some differences in focus. As a baseline they are all engaged in improving efficiency in production and distribution but also in providing reliability and guarantees in the delivery of their sustainability claims which facilitates retail sourcing but also improves the standing of agriculture within chains.

An interesting case on how profit margins are being distributed across the chain is being reported from a chain consisting of farms, a trader and retail. Requirements from retail regarding improvements in sustainability characteristics that asked for additional costs in farms could not be covered by appropriate premiums in consumer prices. This led to two developments towards improvements in efficiency in farms and the trading stage that could cover additional costs.

1. Farms entered into a network cooperation that covered part of the additional costs.
2. The trader paid a premium to farms that covered the remaining cost deficiency.
3. The trader increased efficiency that allowed to covering the premium paid to farms.

In this example, farms and trade joint in improving efficiency for covering the cost that occurred at farm levels. The efficiency gains at the trader did also build on an increase in horizontal cooperation which was, however not realized through networking but through growth, eliminating coordination costs. The principal organization of all networks is quite similar. Farms and to some extent also other members of the chain (all other networks) follow certain production and distribution rules that are formulated and controlled by an institutional unit. Major differences concern the consideration of sustainability characteristics in the rules and the governance of the institutional unit which may be linked to the production stage, the retail stage or served by all members of the chain.

All networks claim efficiency gains. Naturland (organic production) and the retail network claim the realization of possible price premiums. Both claim that price premiums are being channeled back to stages where improvements in sustainability result in additional costs. Apart from the production network all networks involve the retail stage which they claim provides them with a competitive advantage at the retail stage.

As an example, we discuss the retail network as one of the most advanced approaches for improving on efficiency as well as on sustainability characteristics aimed at creating a 'sustainability brand' for the mainstream market with the ambition of reaching a price premium even in a competitive situation. The approach developed out of the GlobalG.A.P. approach as it is governed by retail but does not limit itself to farms but integrates all stages of the chain.

In this network, all stages involved in the production and distribution of a certain product are evaluated according to their performance in a number of sustainability characteristics such as energy, GHG emissions, water use, land use, waste emissions to water etc. The individual evaluations regarding the sustainability characteristics are aggregated in an 'ecological' index for the product for each stage. The aggregation across all stages provides an ecological index for the final product. Products which reach a certain threshold are integrated into the sustainability brand. Price premiums for the brand are at least partly channeled back to farms through a clearing unit. The organizational set-up is outlined in figure 1.

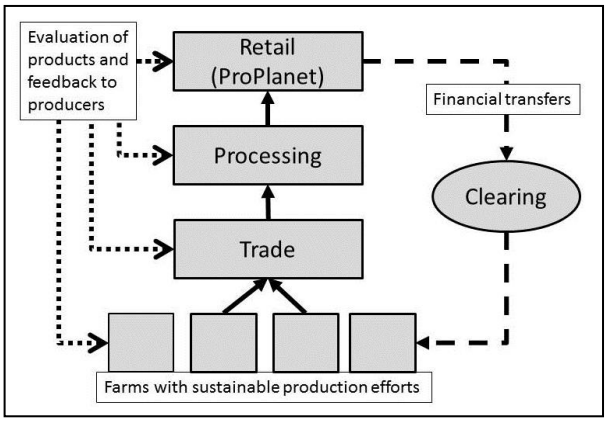

Figure 1. The retail network approach.

The network is characterized by a number of advanced features:

1. The network utilizes a broad range of sustainability criteria integrated into the sustainability index.
2. The use of an index allows farms and other enterprises flexibility in developing towards sustainability goals and allows to cater for different backgrounds and scenarios.
3. The evaluation of products covers all stages of the chain so that a 'true' chain encompassing sustainability index can be identified.
4. Participants reap financial benefits through a financial clearing system that transfers part of sales premiums back to participants according to their level of sustainability.
5. Evaluations are carried out under the supervision of an external expert board independent of retail and participants.

7.2 Summary comparison

With a broad base in the farming community, the GlobalG.A.P. and Q&S networks are scarcely fit for a differentiation policy. Both networks are mostly directed towards business customers and have limited consumer communication. They provide an advanced baseline level in food safety and food quality as well as in environmental and social concerns. This is underlined by the fact that the products do not reap higher sales prices but are more or less requirements for market access. Market access and improvements in organizational and managerial efficiency towards savings in costs are the major benefits associated with the networks. Q&S may gain a competitive (price-)advantage in sectors with processing involved as it can provide guarantees for all claims regarding quality or sustainability throughout the chain. Combining GlobalG.A.P.'s global sourcing base with Q&S value chain controls would match the advantages of both networks.

Products from Naturland and the retail network are both visibly present to consumers in retail outlets. Supporting visibility is part of both networks' marketing policy. They both cover all stages of the chain and can provide guarantees for claims associated with the production and distribution of products. As a result, products are clearly differentiated from other products and allow to potentially reap a price premium. The added value is mostly channeled back to where additional costs occur but may not cover them completely. The linkage of sustainability with additional drivers for sale such as 'regional' may close the

gap, especially if market stability and benefits from organizational efficiency as well as from inherent advisory services are included in the calculation. The retail network has a competitive advantage in reaching broad market acceptance as it is part of a group's strategic development program. This may be offset by Naturland's focus on a dedicated target group.

Matching the production network against the model represented by the retail network, it is doubtful that it will receive broad market acceptance if not dedicatedly supported by a retail group. If not, it may create and remain a niche brand with a limited sourcing base. In this scenario, it is difficult to see room for price benefits at the retail stage.

8 Conclusion

For gaining some insights on price formation in food chains, the chapter has selected a case study approach to better understand the situation in different food sector scenarios. However, prices are just one side of the coin. They have to be linked to costs and eventually the profit margin for products at the various stages of the food chain. In the analysis, we take the present distribution of the profit margins along the chain as a base from where to proceed. Our focus is on developments towards sustainability which would require investments and additional costs not evenly distributed along the chain. As the balance of costs and returns is the result of adjustment processes over time, transparency in costs, prices, and investment needs supports a re-balancing of costs and returns in line with developments towards improvements in sustainability.

The additional costs could be gained through a price premium with consumers and/or efficiency gains along the chain. However, price premiums are the exception especially found in niche markets such as the market for organic products. In these cases, price premiums were in principle channeled back to the stages where the additional costs for reaching the higher level of sustainability occurred. In general, however, sustainability improvements do not pay off in terms of price premiums. This requires improvements in efficiency for reaching feasibility. Various case studies demonstrate that gains in efficiency are channeled to those stages in the chain where additional costs from sustainability initiatives occurred.

For small and medium sized enterprises which involve farms and the majority of enterprises in the food industry, networking provides a major potential for realizing efficiency gains not just in individual enterprises but also in the integration into the chain. There are different alternatives on how to organize networking. However, the most promising are the ones that build on a combination of horizontal and vertical networking integrating all stages and reaching from farms to retail. For improving sustainability on a broader scale in the mainstream market this seems to be the most promising approach for the future.

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