International Agricultural Trade and Policy Center

From Enterprise Activity Quality Management to Sector Initiative Quality Assurance: Development, Situation and Perspectives

By

Gerhard Schiefer

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OBJECTIVES:

The Center's objectives are to:

- Serve as a university-wide focal point and resource base for research on international agricultural trade and trade policy issues
- Facilitate dissemination of agricultural trade related research results and publications
- Encourage interaction between researchers, business and industry groups, state and federal agencies, and policymakers in the examination and discussion of agricultural trade policy questions
- Provide support to initiatives that enable a better understanding of trade and policy issues that impact the competitiveness of Florida and southeastern agriculture specialty crops and livestock in the U.S. and international markets

Abstract: In the agri-food sector, quality and food safety concerns receive increased attention and have been the focus of initiatives on various levels of activity, reaching from enterprises to the sector as a whole on regional, national and international levels. The initiatives have to integrate the business management approach of 'quality management' (QM) with the interests of society and consumers in food safety and trustworthy safety guarantees. This paper builds on enterprise level quality management concepts, integrates food safety concerns and develops a framework for a sector-encompassing system for quality and food safety assurance. It relates the framework to present sector initiatives and develops recommendations for the design and implementation of a consistent sector assurance system.

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Gerhard Schiefer, University of Bonn

1. <u>Introduction</u>

For agriculture and the agri-food industry, the assurance and continuous improvement of food quality and food safety in a competitive environment have become issues of major concern. This has initiated many activities and quality programs on all levels of the agri-food sector, including enterprises, regions, countries or internationally active institutions (Henson et al., 2001; Krieger, 2001, Schiefer et al., 2001). The majority of action programs are built around the business management concept of 'quality management' (QM) that attempts to improve the quality of food through improvements in the organization and management of processes in production and trade, integrate specific requirements to assure food safety and expand it to the quality and safety needs of the sector.

This integrated view is based on the understanding that not all food product characteristics with relevance for quality and safety could be identified and competitively evaluated through inspection of the final product. It refocuses attention from traditional product inspection to the prevention of deficiencies in food quality and safety.

Traditional efforts to guarantee food quality and safety build on a dual approach with
(a) public infrastructures for food safety control on one side and
(b) the engagement of enterprises in the implementation of their own individual quality
 management systems on the other side.

As has been demonstrated by a number of failures in food safety guarantees, the traditional approach no longer matches the challenges posed by the increasing complexity of food production with its multi-stage process organization, the increasing diversity in the origin of agricultural products and the dynamic developments in production technology and product design.

However, the change of focus towards an integrated approach is difficult to implement and, in turn, challenges society's ability to deliver food safety guarantees. The implementation of food safety requirements on process organization and process management depends on the cooperation of enterprises and their efforts to integrate the requirements in their individual quality management activities.

The merging of society's interests with enterprises' business interests in enterprise management activities is a complex task that could evolve through an evolutionary development process. However, actual difficulties in food markets and the loss of consumer trust in food safety guarantees ask for immediate action in the agri-food sector without sufficient empirical evidence on potential effects. This paper attempts to support sector efforts towards improvements in food quality and safety through an analysis of problems, concepts, and initiatives and to formulate a basic framework for sector developments.

The discussion follows the development path of our understanding of 'quality management' with its basis in business management (section 3) and the successive integration with sector-oriented management activities of sector groups towards improvements in food safety. The discussion leads to an organizational concept for the linkage of enterprises' quality management efforts with sector requirements on the organization and management of the enterprises' production and distribution processes (section 4). The concept is used as a basis for a critical discussion of actual developments in various countries (sections 5 and 6), their evaluation (section 7) and the formulation of a basic framework for sector efforts in the development and implementation of strategies towards improvements in food quality and safety (section 8).

2.   Assurance of Quality and Safety in Food - an Integration Problem
2.1   Driving Forces and Integration Requirements

Initiatives for sector-encompassing improvements in food quality and safety developed in different countries and with the engagement of different groups, primarily from agriculture, industry, and policy. Each of them had their own specific interests and objectives. However, the different initiatives can all be linked to three principal driving forces for development, the
(a) society with its interest in the health of its members and the safety of food,
(b) enterprises of the agri-food supply chain with their interest in market success, and
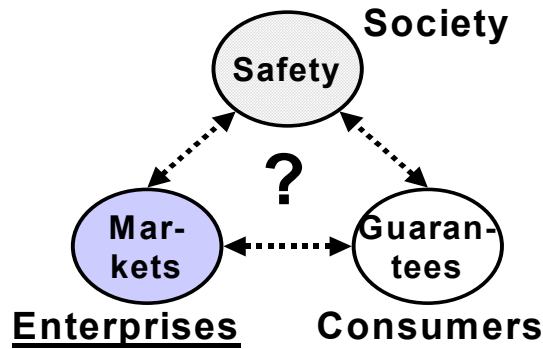(c) consumers with their interest in trustworthy guarantees on food quality and safety.

Figure 1: The quality triangle of driving forces

Society

One of the core interests of society is the elimination of any potential health risks to its members in general and, specifically, in connection with the consumption of food. This view is supported by the importance placed on health systems and the many public activities in food inspection services (EU, 2003). The increasing relevance of process oriented control concepts for the assurance of food safety has initiated a re-orientation in public food inspection services from product control to the formulation of requirements on process organization and process management in enterprises of the agri-food sector.

Enterprises

The success of enterprises depends on market acceptance of their products. It is common management practice to secure market acceptance in the highly competitive agri-food markets of developed countries by a focused customer orientation (also referred to as 'quality' orientation) of production and services. This has established 'quality management' as a customer and market oriented management concept in enterprises and, especially, enterprises of the agri-food sector (Pfeifer, 2001).

Consumers

In markets with a strong position of buyers as is the case in food markets of developed countries, consumers should be in a strong position to secure the quality they expect from food products. However, in agri-food markets, the position is weakened by the fact that consumers cannot identify all expected quality characteristics at the point of purchase or during consumption. This makes them dependent in their product evaluation on the guarantees of others. The delivery of guarantees and the design of trustworthy product 'guarantees' is one of the challenges in today's quality discussion.

For initiatives towards a sector-encompassing improvement in food quality and safety, the challenge is to integrate society's requirements on process organization and process management into enterprises' quality management in a way that actually improves quality and safety and provides consumers with a trustworthy, and accepted, quality and safety guarantee. The integration of the different forces in the agri-food sector proves to be more difficult than in other sectors due to specific characteristics of food products, food processes, and the sector's infrastructure.

2.2   Complexity of Integration

Today's view regarding the quality and safety of food products may differ between countries and food products. However, it is common understanding that expectations of consumers may involve quality and safety characteristics that are difficult to identify through sensual inspection or even through laboratory inspections of the final food product. Examples include the identification of hidden health hazards like BSE, the identification of GMOs, or information on the treatment of farm animals. In these cases, the assurance of quality and safety needs to address the cause and to eliminate the potential for quality and safety deficiencies at the point of origin. Apart from environmental influences, core causes involve the characteristics and origins of food ingredients that enter the production process at any stage, especially agricultural inputs and products, and the organization and control of production processes at the various stages of production.

In this scenario, improvements in the quality and safety of food and/or the ability to deliver quality and safety guarantees depends on cooperation between the different stages of the food supply chain and between different food supply chains as well. A key element in the cooperation and one of the central driving forces for the reorganization of the agri-food sector is the establishment of information flows that substantiate any quality and safety claims at the consumers' end and, in case of deviations, the adaptation of production and production processes at all stages to quality and safety claims used in market activities.

Cooperation within chains
Food supply chains, reaching from agriculture and the providers of agricultural inputs to consumers, may involve many enterprises and usually cover a broad range of production potential. Agricultural enterprises with rather low production potential engage, directly or indirectly, in market activities with global input industries and retail chains. This requires specific organizational concepts for chain cooperation including the integration of

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agricultural enterprises into groups with similar quality orientation. The organization of the groups and their representation within the cooperating chain leaves room for a broad range of development options (Schiefer, et al., 1995, Helbig, 2002).

Cooperation between chains
The agri-food sector is characterized by a multitude of different product lines. They all evolve from agricultural enterprises and deliver products that consumers summarily view as food. These relationships result in many interdependencies in the true or perceived quality and safety of food products. A safety hazard in a certain supply chain may affect market response in a whole product line (e.g. a certain variety of meat), a family of related product lines (e.g., meat and meat products altogether or food products of certain origins) or the food market altogether. Furthermore, agricultural enterprises are usually involved in several product lines simultaneously. This forces them to integrate individual quality initiatives of different product lines into a unified enterprise management concept or to further specialize their production. A sector-encompassing policy for the assurance of food quality and safety has to consider these relationships and establish appropriate coordination schemes.

3.   The Quality Focus in Business Management
3.1   Principles

'Quality management' is traditionally viewed as an enterprise oriented dynamic management concept that builds on three principal areas of management activity integrated into a systematic process of continuous improvement (Pfeifer, 2001). They include
(a) market orientation in enterprise activities through a dedicated focus on customer expectations, summarized as 'quality',
(b) stability and efficiency in the delivery of quality through the best possible organization and stabilization of production processes, and
(c) sustainability in the pursuit of quality objectives through the integration and motivation of all those involved in the design, production and delivery of quality in products and services.

The implementation of the quality management concept builds on two different but complementary approaches, that have been intensively discussed in literature and widely utilized in enterprises, the
(a) enterprise encompassing 'Total Quality Management (TQM)' (Pfeifer, 2001) that attempts to integrate everybody in initiatives for continuous improvement and

(b) quality oriented 'process management' (sometimes referred to as 'quality management' in a narrow sense) that concentrates on the organization, stabilization and continuous improvement of enterprise processes.

Present discussions on the assurance of food quality and safety in the agri-food sector concentrate primarily on the second approach and combine it with specific requirements on quality characteristics and safety levels. However, it should be noted that successful quality initiatives of enterprises usually build on leadership initiatives related to the TQM approach and with a strong focus on continuous improvement activities. In this scenario, the quality oriented process management is an integral part of the more comprehensive management approach and not a 'stand-alone' solution for the elimination of quality problems.

3.2 Process Management and Quality Management Systems

A quality oriented 'process management' is characterized by management routines that support the organization and control of processes to assure desired process outputs with little or no deviation from output specifications (process quality). It is common understanding that 'good' quality oriented process management is based on four basic elements
(1) the delineation of core processes,
(2) the formulation of quality focused process objectives and their transformation into an appropriate process organization and process control scheme,
(3) the documentation and auditing of organization and controls, and
(4) the establishment of a continuous evaluation routine regarding process results, objectives, process organization, and process controls.

The integration and specification of all of these elements in a set of management routines constitutes a 'management system' or, with a view on the quality focused objectives, a 'quality management system'. It is not by chance, that these managerial elements constitute the core of recommendations and 'standards' for the organization and operation of quality management systems including the *standard ISO9000* (ISO, 2001) of the International Organization for Standardization or the *HACCP principles* (Hazard Analysis and Critical Control Points; Petridis et al., 2001) where the focus is not on quality in general but on food safety, a subset of the broader quality view embedded in the ISO9000 standard.

Both system concepts do not build on any pre-defined level in the quality and safety of products. They act as sophisticated management support systems for the realization of any required quality in products and services. The level will be determined by the specification of the organizational process elements and the process controls. In the terminology used in food quality and safety initiatives, there is usually no clear distinction between the managerial system elements discussed above and systems that are built around those elements but incorporate specifications of a certain quality level. In the following we will refer to the system of managerial elements as 'quality management routines' and to the comprehensive system that involves the necessary specifications regarding food quality and safety as 'quality management system' (see figure 2). Systems that do not employ the process management concept discussed above will be called 'quality programs'.

Quality-Management-System

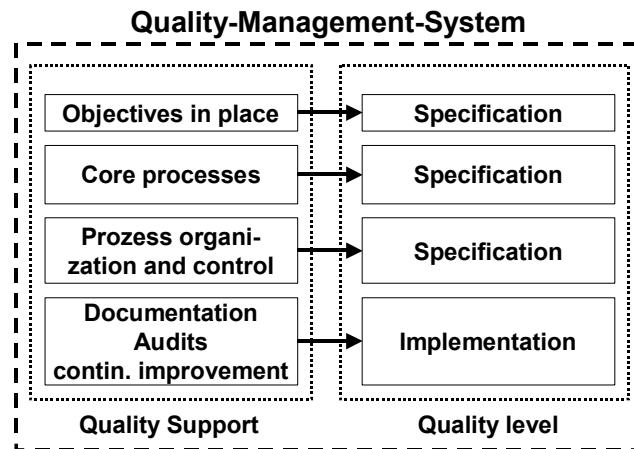| Quality Support	Quality level
Objectives in place	→ Specification
Core processes	→ Specification
Prozess organi-zation and control	→ Specification
Documentation Audits contin. improvement	→ Implementation

Figure 3: Organizational elements of a quality management system

3.3 From Enterprises to Food Supply Chains: Experiences

Production and distribution of food is usually linked to a multi-stage process carried by a vertical cooperation of enterprises within food supply chains. The traditional view of quality assurance in supply chains of any kind builds on the implementation of quality management systems in individual enterprises and assumes a sufficient consideration of quality objectives through the chain of supplier-customer relationships in which each supplier focuses on the best possible fulfillment of quality expectations of its immediate customers.

In the past, this approach has been dominating the quality improvement efforts in food supply chains as well, with efforts concentrating on the meat and dairy sector and, to a lesser extent, the cereal sector (Schiefer et al., 1995, Helbig, 2002). Within the countries of the EU, quality improvement efforts of non-agricultural enterprises were primarily based on quality management systems that followed the management recommendations of the standard ISO9000 and the HACCP principles (Bredahl et al., 2001). A more diverse development characterized the quality improvement efforts of agricultural enterprises. In some countries like, e.g., France and Denmark (Gottlieb-Petersen, 2002) agricultural enterprises were increasingly integrated into quality assurance schemes with an explicit linkage to the management recommendations of the standard ISO9000. In other countries like, e.g., Germany, the quality assurance schemes were of a more proprietary character and did not employ an explicit link to internationally standardized management schemes.

However, whatever schemes were in place, the traditional view of an enterprise oriented quality management activity in supply chains does not match with the increasing requirements on the quality and safety of food. The specifics of food production and food quality characteristics suggest that substantial improvements can only be reached through an increased cooperation between stages regarding information exchange, specification of quality levels, and the utilization of quality management schemes to support communication and the ability to deliver guarantees. This strongly supports tendencies towards the organization of tightly integrated (closed) food supply chains.

Initiatives towards tightly integrated food supply chains have been a focus of developments during the 90s, especially in export oriented countries like, e.g., the Netherlands and Denmark (Schiefer et al., 1995). For the organization and management of the chain cooperation, the reported examples followed, in principle, two different lines of development.

In the Netherlands, the chain concept of IKB involves the organization of closed chains with quality management systems that had, initially, no direct link to the management system requirements and concepts of ISO9000 and HACCP. Agricultural enterprises are looked upon as a more or less homogeneous group that jointly follows common requirements regarding production and management formulated by coordinating groups, primarily guided by processing industry. As an alternative, initiatives in Denmark did build on a participative integration of groups of agricultural enterprises into chain encompassing processes of continuous improvement and implemented quality management systems based on the standard requirements of ISO9000 throughout the chain (Schiefer et al., 1995, Helbig, 2002).

These different developments were primarily initiated for gaining competitive advantage in a quality oriented competitive market environment; improvements in the sector's food safety situation were initially of secondary concern. The concept of tightly organized and closed food supply chains is an attractive one regarding quality assurance in a competitive environment. However, it is not a model for the agri-food sector as a whole and, therefore, not a suitable model for sector-encompassing food safety initiatives. The agri-food sector cannot completely build on a set of competitive closed food supply chains. The dependency of agricultural production on natural production factors results in variations in quantity and quality of products and, consequently, in conflicts between markets interests in a continuous delivery and the sector's ability to serve. This requires sector puffers and an at least partly open sector organization.

4. Management Concept for Food Safety Assurance
4.1 From Product Inspection to Safety Management

Society's interests in the assurance of food safety needs to build on initiatives that are effective and could be successfully imposed.

Traditionally food safety rests on the formulation and implementation of standards regarding the measurable quality of products as, e.g., the quantity of substances in the product with potentially negative effects on human health. This approach is increasingly being supplemented by a pro-active approach that intends to prevent quality and safety deficiencies from the beginning through an appropriate organization and management of production, trade, and distribution processes.

The implementation of such approaches is, however, not possible without cooperation by enterprises and their acceptance of formulated requirements on their process organization and management activities (fig. 4). This makes the general adoption of public food safety initiatives difficult and limits policy's ability to deliver trustworthy guarantees.
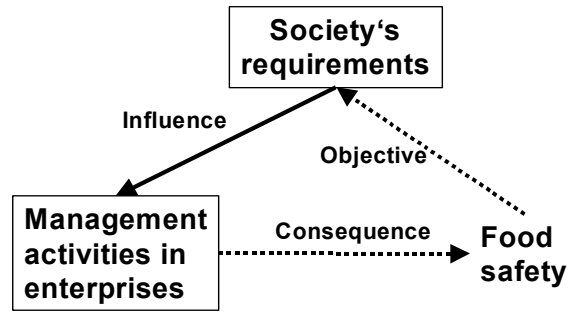
Figure 4: Chain of influence in food safety assurance

For addressing food safety concerns on short notice, one needs immediate adoption of food safety requirements on process organization and process management by all market participants and their acceptance as trustworthy food safety initiatives by consumers. This scenario is, in principle, best supported by the formulation of requirements that are similar for all enterprises and easy to communicate to consumers. This distinguishes sector initiatives towards food safety improvements from primarily competitive oriented quality improvement initiatives of enterprises in closed food supply chains (Table 1).

Table 1

Comparative Advantage of Organizational System Alternatives for Improvements in Food Quality and Safety

	Closed Chains	Open Network Systems
Market orientation	Competitive	Consensus
Improvement potential for food safety/quality in sector as a whole	+	+++
Value of total sector guarantees	+	+++
Quality level and value of guarantees in chain or network	+++	+
Opportunities to disassociate from system failures in sector	+++	+
Complexity of control system	Low	High

However, the conformity of enterprise activities to formulated system requirements is less guaranteed in sector organizations based on open supply networks as compared to food supply chains with a limited group of members and common responsibility for

attaining joint objectives. As a consequence, food safety guarantees in open supply networks require more complex control mechanisms.

The organization of sector-encompassing quality systems in open supply networks depends on the implementation of sector wide agreements on interfaces between different stages of the supply chain. In this scenario, the implementation of new sector quality initiatives requires cooperative support of main actors. This makes the move to a higher level of quality and safety assurance more difficult. Open networks tend to remain on a lower level of agreement regarding food quality and safety than closed food supply chains or even as closed networks with limited membership.

The ability to deliver guarantees on a sector level depends on the sector's ability to assure that the enterprises adhere to the relevant requirements on process organization and management. However, this has consequences for trade and constitutes, in principle, non-tariff trade barriers that have to adhere to the European and international trade agreements.

4.2   Trade Implications

At the international level, the World Trade Organization (WTO) provides the umbrella for trade regulations. Within the WTO, the 'Agreement on the Application of Sanitary and Phytosanitary Measures' (SPS; OECD, 1999) allows introduction of trade related regulations to avoid food safety hazards if backed by sufficient scientific evidence. An important reference in this context is the Codex Alimentarius Commission (FAO/WHO, 2001), a joint initiative by FAO and WHO. In its 'Codes of Practice', and 'Guidelines' it addresses aspects of process management including as its most prominent recommendation, the utilization of the HACCP principles.

At the European level, recommendations for a common European Food Safety Policy are summarized in the White Paper on Food Safety (CEC, 2001). It asks, in principle, for a European Agency for Food Safety to support risk analysis and risk management, an early warning system for risk control, a harmonization of EU regulations on hygiene throughout the food supply chain including agriculture, improved documentation on all levels of the chain including the ability for tracing and tracking, and the utilization of the HACCP principles in food supply chains with the exception of agricultural enterprises.

The conflict between society's interest in sector-encompassing improvements in guaranteed food quality and safety and the restrictions posed by international trade

agreements asks, in principle, for a sector management concept for food safety that allows distinguishment between different levels of quality and safety linked to different levels of sector enforcements in line with world trade regulations.

4.3   Integration with Enterprise-Based Quality Management Initiatives

During recent years, the discussion on food safety improvements through quality management activities concentrated on
(a) the assurance of tracking and tracing of products, a core element of any quality
     oriented process management including the ISO9000 standard, and
(b) the implementation of the HACCP principles.

While considerations of food safety concerns focus on recommendations for quality management in enterprises and their coordination throughout the supply chain, the society's interest is on food safety in the sector as a whole, not the individual enterprise. The objective is to provide a guarantee that involves a level of safety (or, similarly, a level of health risk) that is acceptable to society and consumers alike. This involves two problems,
(a) the analysis of the risk level reached in the sector and
(b) the analysis of consumers' perception of the risk level, its acceptance, and their
     trust in provided guarantees.

The analysis of the risk level in a sector needs to take into account both, the principle food safety level reached through the specifics of the quality management systems implemented in enterprises and, in addition, the effectiveness of the sector control systems that ensure or at least monitor the adherence of enterprises to these system specifics. This is a complex issue that is further complicated by the fact, that information on, e.g., the implementation of the HACCP principles in enterprises, usually does not involve information on the risk level accepted within a HACCP based system. However, a clear communication of the safety level reached in a sector is a pre-condition for the development of consumer trust.

The professional analysis of risk may not match the risk perceptions of consumer. This makes the convincing communication of the objective risk level associated with safety guarantees or, in other words, the development of trust in the guarantees a critical success factor for market acceptance. The development of trust in the effectiveness of food safety control may be based on elements like
(a) own experience,

(b) the understanding and acceptance of the control approach or

(c) the acceptance of a system's evaluation by others.

As food safety control systems that build on quality management initiatives are rather new developments, experience is not available und needs time to develop. Trust based on the understanding of a control approach requires an intensive communication with consumers on the specific features of a certain approach. This needs effort and time and can, in the short term, only be implemented in parts of the sector. The development of trust that builds on evaluations and assurances by third parties is the alternative that seems to be most successful in the short term; in a crisis it might be the only one.

In quality systems, certificates based on inspections by third parties are used to provide assurances on the quality of products and/or system management. However, in a sector environment, guarantee values of certificates do not have a solid foundation. The broad acceptance by enterprises might initially increase a certificate's guarantee value for consumers, but it also increases the probability of system failures in the sector and the accompanying loss of credibility for the certificate.

5.   **Implementations**

In different countries, different initiatives have been implemented to integrate food safety requirements into quality management systems of enterprises and food supply chains. Their approach is partly universal, partly regional or national but they compete with a similar focus within the European trade zone. This asks for integration. However, the comparison and possible integration of different initiatives is difficult because of differences in organizational concepts. In principle, all systems refer to the supply chain, but they differ in the way they separate between the management part of the quality system on one side and the requirements on process organization and control on the other side. Systems with a clear separation (in the following: systems of type A) are usually linked to the internationally recognized standards or concepts for management systems whereas others are not (systems of type B).

The initiatives focus on a multitude of sector organizations involving
(a) open supply networks,
(b) semi-closed supply networks based on groups of enterprises distinguished by
    region or product category but with flexible trade links within the group, and
(c) closed supply chains based on groups of enterprises with clearly defined trade links
    between participating enterprises.

Some principal examples for implementations of systems for the assurance of food quality and safety are listed in table 2. They include initiatives on the basis of rather closed supply chains as the Dutch 'IKB chains' (Wierenga et al., 1997) and sector-encompassing approaches that have little requirements on focused organizational linkages between enterprises as, e.g., the German Q&S system (Q&S, 2003).

A specific alternative is systems that evolved from retail trade. They do not involve the supply chain as a whole but function as a quality filter for deliveries from supplier enterprises.

Table 2
Organizational Alternatives in Quality Systems (Examples)

Chain/Network	Type A	Type B	Trade
Open	Agri-Confiance (FR)	Q&S (DE)	BRC, EurepGAP, IFS, GFSI
Semi-closed	Label Rouge (FR)	Little Red Tractor (UK)	
Closed		IKB (NL)	

6. Examples of Principal System Alternatives
6.1 The System Q&S – an Open Sector Food Safety Control System

The system Q&S addresses all stages of the vertical supply chain. However, it can be implemented by each individual enterprise on each stage and without any further coordination with its suppliers and/or customers. Certification is on the individual enterprise level with the exception of agricultural enterprises that can only be certified as a group. This condition marks a first step towards a further reorganization of the agricultural sector (fig. 5).

The Q&S system is an open system and its coordination is determined, in principle, by common agreements on interfaces between enterprises. The approach tries to best adapt the food safety control activities to the actual market infrastructure that builds on open supply networks with continuously changing trade relationships. It does not place new organizational requirements on enterprise cooperation or restrictions on the development of individual market relationships within the supply chain.
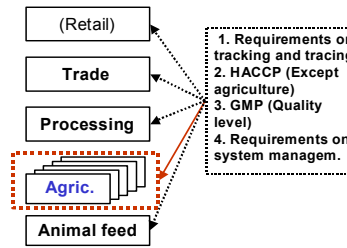
Figure 5: Q&S system organization

The system preserves flexibility in market relationships between enterprises but, as an open flexible system, does require substantial efforts to move the whole system to higher quality levels. Furthermore, the approach does not support the implementation of more advanced quality assurance systems of individual groups within the general system environment. Such efforts would reduce the guarantee value of the general system certificate for the remaining participants and contradict the interest of the system as a whole.

The system reaches its guarantee value for consumers through the fact that the Q&S labeling of consumer products requires that enterprises on all stages of the vertical production process conform to the system's requirements. It involves
(a) the assurance of tracking and tracing of major product components,
(b) the utilization of the HACCP concept on all stages except for agriculture,
(c) requirements on the organization and management of processes and on the realization of quality levels that reflect GAP (Good Agricultural Practice) and GMP (Good Manufacturing Practice) quality expectations, and
(d) requirements on system documentation that assures appropriate implementation and control of enterprises' quality assurance activities.

It resembles an integrated quality system. It incorporates, in its quality management system part, the HACCP concept and core elements of the ISO9000 standards but fails to explicitly base its system on the ISO9000 requirements.

6.2   The 'Little Red Tractor' Initiative – an Open Umbrella System

In the UK, quality assurance systems have been designed for a diversity of product lines. They show similarities with the Q&S system but may differ from it and from each other in details to allow for the specifics of different products. Differences include considerations of requirements formulated by the British retailer standard (BRC-

Standard; Krieger, 2002) and attempts to establish the HACCP concept not just in industry but in agricultural enterprises as well. To avoid confusion with consumers, the different systems are linked to a common umbrella label, the 'Little Red Tractor' (Table 3).

Table 3
Examples of chain encompassing quality management systems within the 'little red tractor' label (Krieger, 2002)

ACD (Assured Chicken Production)	Poultry
ABP (Assured British Pigs)	Pigs
ABM (Assured British Meat)	Meat
NDFAS (Nat. Dairy Farmers Assurance Scheme)	Dairy
ACCS (Assured Combinable Crops Scheme)	Cereals
APS (Assured Produce Scheme)	Fruits, vegetables, cereals
FABBL (Farm Assured British Beef and Lamb)	Beef and lamb
Genesis	Principally open

The label allows communication of a unified quality level, food safety level, and quality guarantee. It levels existing quality differences and will diminish, over time, the identity of the various product related quality systems. This is especially true for systems that relate to similar product lines under the 'little red tractor' umbrella.

With these developments, the concept of the 'little red tractor' resembles increasingly the concept implemented in the Q&S initiative. However, as of now, the 'little red tractor' represents semi-closed systems that are restricted to product lines of British origin.

6.3   'Agri-Confiance' and 'Label Rouge' – Distinguished System Families

Agri-Confiance has been established in France as an umbrella label of different (>60) chain-encompassing quality systems. Initially, these quality systems were designed for agricultural enterprises and their linkage with the cooperatives they traded with. Today, the quality management initiatives under the label of Agri-Confiance may include the whole supply chain. Furthermore, Agri-Confiance now employs an open systems approach and has been formulated as a public standard in its own right.

The Agri-Confiance umbrella approach is different from the 'little red tractor' initiative in the UK. The umbrella concept was initiated at the very beginning of a major quality offensive and provided recommendations and requirements on the organization and management of the quality systems in agriculture and its cooperatives. These systems could from the very beginning build on the label of Agri-Confiance and a common set of requirements in its efforts to assure food quality. A core requirement is the utilization of the ISO9000 standard for the quality management system in all enterprises including agriculture (Gottlieb-Petersen, 2002). As a result, all chain-encompassing Agri-Confiance quality systems can build on a unified system management approach throughout the chain. This simplifies the coordination of quality improvement activities within a chain.

6.4   The Closed System Concept of 'IKB'

The 'IKB concept' is a chain management concept for food supply chains that was designed in the Netherlands in the 80s for improvements in the efficiency and quality of food production. Its initial focus was on closed production chains with a central coordinating body linked to processing industry (Wierenga et al., 1997). Today's developments open the closed chain approach and move it closer towards a network system concept similar to the Q+S concept.

Product deliveries into the IKB chains are restricted to enterprises that conform to certain quality requirements. A key example involves the Dutch standard GMP+ that summarizes requirements for suppliers of animal feed including the utilization of the HACCP concept. The IKB system concept involves requirements on the organization and management of processes but does not explicitly build on the ISO9000 standards.

6.5   Trade Initiatives

Independent of developments in quality management concepts for enterprises in vertical supply chains, the retail sector has designed its own 'standards' for requirements on quality systems in their supplier enterprises, including those from agriculture that deliver directly to the retail stage as, e.g., in fruits and vegetables. They include EurepGAP for fruits and vegetables, IFS, the international Standard for the Auditing of Suppliers of Retail Brands, originating in Germany, the standard of the European Food Safety Inspection Service (EFSIS), originating in the UK, the standard of the National Food Processors Association (NFPA) of the USIFS, the International Food Standard, and BRC, the standard of the British Retail Consortium (Fig. 6).

Furthermore, a global retail initiative, the 'Global Food Safety Initiative (GFSI)' has formulated requirements on food safety for retailer-based standards, which, if met, leads to a formal acceptance by the GFSI.

EurepGAP-Standard

EurepGAP developed out of a joint initiative of retailer groups from the UK and the Netherlands (Euro-Retailer Produce Working Group) and focuses on quality management and quality level requirements for agricultural enterprises (GAP: Good Agricultural Practice) in the production of fruits and vegetables. An extension to other products is in preparation. EurepGAP provides certificates that can be used in business relationships between enterprises but not with products. Key elements include the utilization of the HACCP concept and a production program that follows rules of integrated production.

BRC-Standard

The 'British Retailer Consortium' (BRC) has formulated requirements on quality systems in supplier industries that are closely linked with ISO9000, HACCP and GMP (good Manufacturing practice). Enterprises that conform to the requirements receive a certificate, the 'Best Practice Seal'. The standard has received wide attention and has influenced many quality initiatives in food supply chains, as, e.g., the 'Assured British Meat (ABM)' initiative.
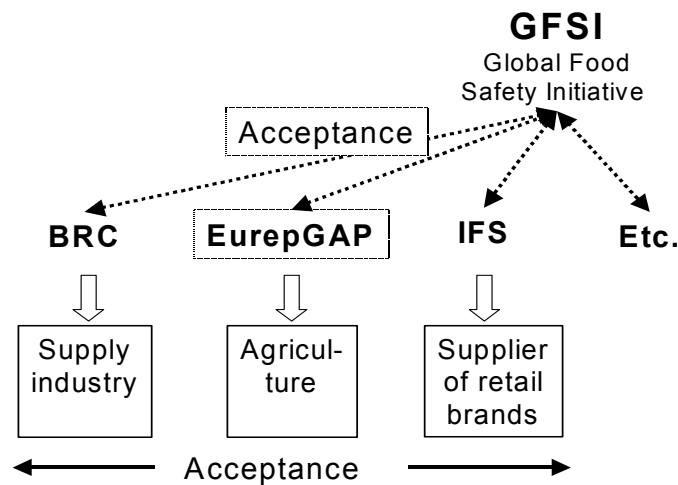

Figure 6: Retail Initiatives

7.   Evaluation

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7.1 Overview

The interests of society, enterprises, and consumers in improvements in the quality and safety of food led to many initiatives and recommendations for the establishment of quality assurance systems in the sector (including its enterprises and food supply chains), commonly referred to as 'standards'. With the many different developments it needs to be clarified to what extent they support the interests of the three groups involved.

The developments have a common basis that include
(a) recommendations on management activities towards process stabilization,
(b) the utilization of the food safety focused HACCP concept, and
(c) the ability for chain encompassing tracing and tracking of products.

These features support, in principle, improvements in food safety and in the ability to successfully act in case of failures. However, there are no clear indications on the consequences for risk containment. None of the common approaches formulates and publicizes specific risk acceptance values in connection with the utilization of the HACCP concept or specifies the risk control value of their quality management recommendations. Despite these deficiencies, the positive effects on food safety control are undisputed.

The effects on the interests of enterprises do not seem to be as positive. Apart from enterprises with a regional market focus, the effects are mostly negative. Regarding consumers, the signals are mixed. The many different developments make it difficult to effectively communicate the improvements in food safety that are being reached.

7.2 Enterprises and Quality Management

'Enterprise quality management' is a tool that supports management in efforts towards continuous improvements in customer orientation, quality development and business success. As such, it provides a guideline for enterprise development strategies. However, the multitude of sector developments towards improvements in food quality and safety with their requirements on quality management efforts in enterprises have created a situation in which enterprises are confronted with different requirements from different sources on the organization of their quality systems and their production and management processes (fig. 7). This makes it difficult for enterprises to remain focused in their internal quality management and in their quality communication towards customers.

This situation is further aggravated by the fact that for the transfer of the HACCP concept into a management system different specifications have been developed that might even provide their own individual certificates of conformity (Krieger, 2002).
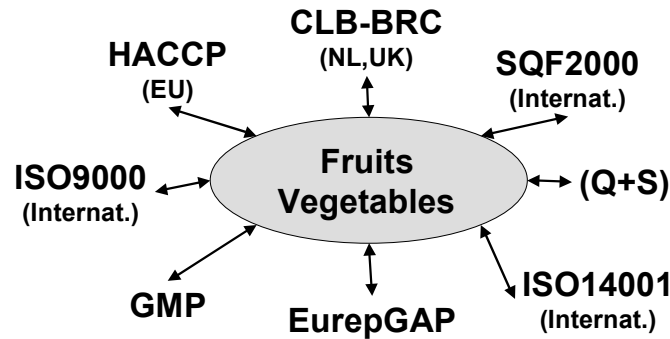

Figure 7: Market forced certification requirements (case: international trade in fruits and vegetables)

There are first efforts to control further differentiations at least at the level of quality management systems. The ISO organization attempts to integrate the different HACCP implementation alternatives into a single ISO standard (22000). Furthermore, it has published, as ISO15161 standard, recommendations on the integration of ISO9000 and HACCP requirements into a unified quality management system.

Besides efforts to clarify the situation with quality management systems, there are similar attempts regarding quality systems as a whole. There, the identification of common grounds is more complex. Efforts include
(a) a congregation of systems in system families,
(b) the reciprocal recognition, and
(c) the stepwise approach towards generally accepted reference systems.

Congregation
The congregation of different quality system concepts under a common umbrella label like, e.g., the 'little red tractor' and 'agri-confiance' initiatives, primarily supports communication with customers and defines a unified guarantee value. However, as all known initiatives leave the individual system concepts in place, they do not contribute to a simplification of enterprise internal management, an aspect which is especially true for agricultural enterprises that engage in different product lines simultaneously.

Reciprocal Recognition

Reciprocal recognition usually focuses on the recognition of certificates and allows enterprises with different quality certificates to engage in business relationships. It is a pre-condition for a simplification of the communication relationships within the market and with consumers. At present, such discussions are still at an early stage and require time to develop.

Approach towards Reference Systems

A third alternative concerns the general acceptance of a standard as a reference system and the stepwise transition of other standards into the reference system. This alternative has been chosen for the British 'Feeds Material Assurance System' that will approach the Dutch GMP+ system over a period of time.

7.3 Consumers and Food Safety Guarantee

The simultaneous but different developments in different countries towards improvements in the sector's ability to provide guarantees may not be as effective as envisaged by their initiators. With open markets, consumers might be confronted with different types of guarantees (certificates) from different countries and the core messages might partly get lost. A lack of international cooperation prevents a clear and convincing communication of the common ground in food safety improvement. Retailer guarantees based on standards like BRC and others are an effort to overcome this deficiency.

Independent of this, sector-encompassing open systems for improvements in food quality and safety are susceptible to system failures. Single occurrences may have potentially wide-reaching consequences regarding trust in the sector's assurance system, even in cases where the system as a whole had a positive impact on food quality and safety.

It is in the interest of consumers, that the different sector initiatives agree on a common and clear communication strategy and on the design of easy to distinguish alternatives that allow consumers to differentiate between different levels of quality and guarantee and to choose among alternatives in case of system failures in any one of them.

8. Development Framework

Despite the multitude of standards and certificates, the initiatives employ, in their efforts to improve food quality and safety, a consistent approach that is captured in similar

organizational elements they utilize to gain reliability. The quality management system requirements of the ISO9000 standard and the HACCP concept document explicitly that these elements are in place and appropriately implemented. The differentiation between quality programs builds on the substantiation of these elements that define the different quality and safety levels.

However, the majority of quality programs do not only specify quality levels. They specify, in addition, basic organizational and managerial elements that are already covered in ISO9000 and the HACCP concept but fail to provide the consistent layout of these standards or concepts. This weakens, if not eliminates, the common basis for cooperation and recognition and engages quality programs in specifications, for which others have already provided solutions.

In a fully consistent quality program concept, enterprises built their quality system on the implementation of a quality management system in accordance with the requirements of ISO9000 and HACCP. Sector quality programs utilize this basis and formulate their specific requirements on objectives, controls, etc. Such a clear separation facilitates coordination within the food supply chain or between different quality programs and the specification of a hierarchy of quality levels that could be communicated to consumers (fig. 8). It allows, in addition, the providing of an ISO9000 or HACCP certificate in connection with implementations of any quality program.
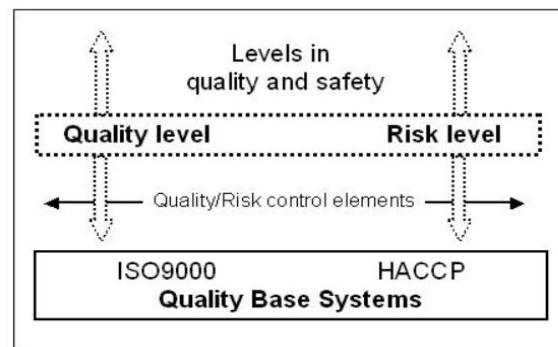

Figure 8: Development Framework and Hierarchy of Quality Levels.

The different arguments can be integrated in a general development procedure for the organization of a quality assurance system in agri-food sectors in which enterprises act within an open network of communication and business relationships.

The procedure involves the following activities:

1. Establishment of a hierarchical control and certification system, that allows a clear differentiation between different levels of food quality and safety.

2. Clear separation of cooperating sub-networks of enterprises that allow the implementation of different quality levels, of different speeds in quality improvements, of different levels of quality communication with consumers, and the separation from other sub-networks in case of system failures.

3. Utilization of quality and trust supporting elements like,
    (a) Personalization through the separation of sub-networks that relate to consumers' separation views (e.g., regions),
    (b) Implementation of 'tracing on demand' that allows consumers an individual internet-based and possibly visual inspection of control activities,
    (c) Motivation of people in enterprises from all stages of the food supply chain to engage in continuous improvement processes and communication of motivation to consumers.

4. Organization of quality management systems and quality programs on the basis of generally accepted standards wherever possible to facilitate coordination and cooperation in sector initiatives for continuous improvements.

The principal development approach needs, for its implementation, appropriate sector initiatives und requires the establishment of suitable coordination mechanisms and coordination groups or institutions.

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