FROM PRODUCT INSPECTION TO TOTAL QUALITY MANAGEMENT IN THE FOOD SUPPLY CHAIN

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ABSTRACT

The problem of defining, implementing and inspecting quality assurance schemes for all types of primary agricultural products is described and various examples from Denmark and other European countries are mentioned. The trends as to requirements, management and documentation as well as assessment are discussed from a European point of view. The authors suggest Total Quality Management in a form adapted to the food supply chain.

INTRODUCTION

The ever-changing requirements of the consumers and the retailers' increasing use of brands mean increasing pressure on the whole food supply chain. To meet these requirements each processing industry and agricultural cooperative develop their own schemes for environmental, quality and/or HACCP management. Therefore the primary agricultural producer now has to meet the requirements of a lot of different schemes and demands for documentation and he is subject to external inspections or assessments. The scope of this paper is to describe the problems seen from inside the farmgate and to comment on different concepts applied by European farmers.

Today several government directorates, local authorities and his different customers inspect the Danish farmer all year round. This is to secure that the farmer complies with legislation, the local environmental regulations and the customers' current quality requirements. This is real life for most European farmers. Although legislation, product specifications and consumer requirements vary from country to country, farmers are faced with increasing

requirements to present documentation and to accept inspection on their farms. How can a uniform and coordinated management and inspection system on the farm be organized? How can the costs be kept at a minimum and give the processors, retailers and consumers the assurance needed? Are relatively simple farm inspections sufficient or is it necessary to make product certification per commodity? Is it necessary to implement Total Quality Management on the farm and in the whole food supply chain?

DIFFERENT DIMENSIONS AND MODELS

Following the BSE and the dioxin crises, much effort is now being focussed on food safety and hygienic matters *(COM 719/1999)* in European food production. However, the primary producers, the processors and the retailers are also faced with increasing requirements related to animal welfare, environmentally sustainable production processes and specific quality properties of each individual product. These matters form a complex mixture of specifications, standards, rules and regulations that all come down on the farm. Each time a requirement takes effect, it means more inspection, which adds costs to the whole food supply chain. To keep the system reliable to the end user, several solutions can be chosen. We will describe the problems the farmer is faced with from the viewpoint of the following three dimensions: requirements, on-farm systems for management and documentation and external third-party assessment.

Requirements

The absolute baseline for requirements on the farms, the production processes and the products are national and EU legislation. It includes laws on hygiene and food safety, animal welfare, medicine and pesticides, fertilizer and organic wastes, feedstuffs, environmental rules etc. and several general farm regulations. Currently, a general EU food law is being formulated. It defines a new set of principles related to food safety and traceability and to the responsibility of the actual operators. This means that the existing baseline is being evaluated, probably resulting in laws at a higher level.
Requirements at a higher level could also be specifications set by a retailer for a special quality brand or rules for organic productions. As soon as the

requirements move upwards from the legislative baseline the farmers, processors and retailers are all interested in signalling these attributes to the end user. Either to get a premium price (farmers) or to differentiate from competing products (retailers). But as soon as a vendor wants to praise a product, he has to be able to document it and documentation has to be traceable through the food supply chain right back to the farm.
Over the past ten years most European countries have developed *Codes of Good Agricultural Practices* (GAP's), formulated by different actors in the market. In the UK the Ministry of Agriculture, Food and Fisheries (MAFF) has formulated GAP's for almost every agricultural production. In France the agricultural cooperatives have formulated a common set of practices *Agri Confiance (2001)*. In Scandinavia most agricultural organisations have formulated their own goals: *Godt Norsk (2001)* in Norway, *Swedish Seal (2001)* in Sweden and *Godt Landmandsskab* in Denmark. In principle, most of these national GAP's have to be followed by all farmers although the membership is based on voluntary application and most of the concepts are not assessed. At European level the organisation European Retailer Produce is currently formulating common GAP's for both fresh vegetables, combinable crops and livestock production *(EUREP 2001)*. This coordinating initiative is considered necessary since all major retail chains have formulated a large number of different requirement documents on all types of foodstuff.

Management and documentation systems

While traditional farming has been managed without very much book-keeping, the legislative requirements on a Danish farm today include documentation for the use of most production means such as feedstuffs, veterinary medicine, fertilizers and manures, pesticides etc. Moreover, for management reasons the farmer keeps accounts of his livestock and his arable rotation. He plans feeding, fertilizing and pest control and he performs economic budgeting and accounting. Actually, all these management activities form the elements of an integrated and coherent overall management system that could be included in a Total Quality Management system on the farm.
If the farmer has to meet new requirements from his customers - processors, retailers and end users - and the official authorities, how can he do this with a

minimum of efforts by using his existing management routines? The philosophy of Total Quality Management is that the supplier (farmer, manager) himself has to manage his production and take responsibility for the fulfilment of the customers' needs. Therefore a pro-active attitude will benefit from building on the farmers' own management system to manage the external requirements by means of internal efforts, most of them existing already.

An effect of this is that every aspect of production can be documented - if the customer requires it. Moreover, it is relatively easy to expand the management system to include environmental matters and HACCP whenever wanted.

From our point of view an integrated management solution for farms can include any required standard without building separate management systems as illustrated in figure 1, i.e. the international standards for quality management *ISO 9002 (1994)* and environmental management *ISO 14001 (1996)*, the Danish standard for HACCP *DS 3027 (1999)* and perhaps the European EMAS regulation *(EU 1993).*

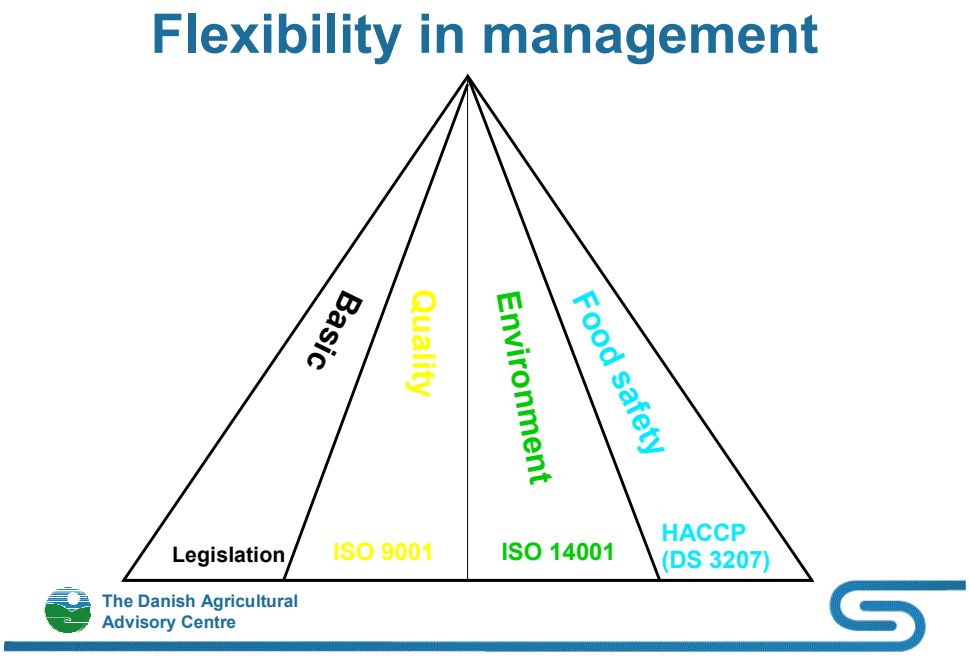

Figure 1: Integrated farm management system

Moreover, the same elements of management have to be used no matter whether the requirements are based solely on a single commodity or whether

the farm as a whole has to be certified (Figure 2).

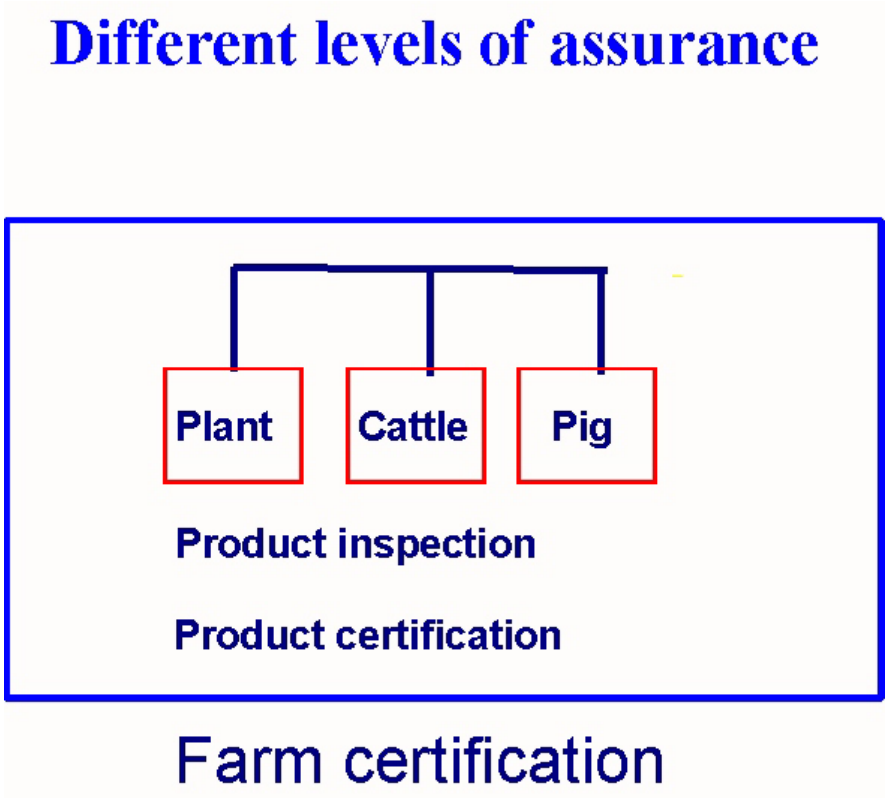

Figure 2. Different levels of assurance.

External inspection or assessment

By definition, the legislative requirements must be inspected by the government or the official local authorities, which is also more or less the case in the current situation. The level of inspection varies from country to country. Traditionally, primary agricultural products made for certain high-quality brands are produced on a contract for that special brand. The owner of the brand inspects special requirements on these products.

Today, more and more requirements are to be met and documented so several different authorities and customers inspect the individual farmer, and the time consumed and the costs added are rising to a level that is not sustainable. Therefore, initiatives have to be taken to simplify and reduce the inspection activities. The solution has to include and coordinate the official inspections and/or the use of independent third party inspection for a major part of the matters. Moreover, it should require more self-assessment of production and

lead to independent external assessment on a higher management level.

QUALITY CONCEPTS IN DANISH AGRICULTURE

Product inspection

There are several examples showing how a processor or retailer has formulated a set of requirements for the primary production processes or facilities. The requirements are formulated in a contract with the farmer and a representative of the customer then inspects production. Often the requirements cover several different matters, e.g. animal welfare (type and size of housing), use or banned use of certain types of medicine or feedstuff, environmental matters like banned use of certain pesticides or fertilizers etc.

The farmer has to keep records of his use of the different substances and inspection covers record book, physical facilities on the farm and may also include sampling of some material from the production. Recent examples from Denmark are production of wheat for bread, potatoes for crisps as well as bacon and beef. In all cases these products are sold under a special brand, praising one or more of the attributes.

These examples show that the customer (often a retailer) defines the rules, makes the contract with the supplier and organizes or demands inspection. This means that all the requirements are formulated on the premisses of the customer and without influence from the individual producer. Moreover, the rules and results of inspections are often not open to the public, and society or the consumer can question the overall reliability.

Product certification

The next step is called product certification. One example is the Danish Ministry of Food, Agriculture and Fisheries' quality label for beef and pig meat. Both requirements and inspections are managed by the Danish Veterinary and Food Administration *(DVFA 2001)*.

Also the audit of some retailers' branded meat is now being organized as product certification. Owners of beef brands have to use authorized requirements and organize independent inspection of the primary production according to a *EU regulation (2000)*, and the audit body has to fulfil the European norm *(EN 45011:1998)*.

15 Danish farmers have agreed on a concept together with a cooperative and developed a quality management system for malting barley production. The concept is based on the international standard ISO 9002 for quality management systems, and the barley is sold under the brand *Q-barley*.
The characteristic features of these examples are that the concepts are more or less based on open international standards and national or European legislation. This means that the requirements are formulated, and that independent persons perform the inspections or assessments then the concepts become as reliable as possible.

Farm certification

By far most comprehensive concepts are what we call farm certification. In 1995 a total of 130 Danish pig producers had their production officially certified according to the ISO 9002 standard. This certification was based solely on the production of slaughter pigs and organized and developed in cooperation with the slaughterhouse Steff-Houlberg *(Hansen 1995)*.
From 1995-98 The Danish Agricultural Advisory Centre developed a concept for farm certification in cooperation with 58 farmers and their advisers. The concept met the requirements of the international standards *ISO 9002 (1994)* and *ISO 14001 (1996)* and the 58 farms were certified by the independent, accredited company BVQI. The concept is called Kvamilla and has been described elsewhere *(Gottlieb-Petersen, 1997 and Knudsen, 1997)*.
According to the Danish Organic Foods Act *(MFAF 1999)* Danish farmers can apply to the Danish rules of organic production and be inspected and certified by the Danish Plant Directorate. Organic production is subsidized during the period of conversion and current inspections are without costs for the farmer. More than 3,000 Danish farms are now certified and can use the official organic logo: *red Ø-logo*.
As described, several concepts for quality and environmental management and documentation have been developed and evaluated in Denmark. Except for the last example, none of the concepts are widespread due to high costs of certification and minimum support from the processing industries, the retailers and the consumers.

UK ASSURANCE SCHEMES

During the past ten years, the UK retailers, processors and farmers' organisations have developed a huge number of voluntary assurance schemes. The overview in Table 1 shows that the different schemes cover different parts of the country and that there are separate schemes for the individual commodities. The situation in 2000 was that the individual farmer had to fulfil several different sets of requirements and inspection was uncoordinated and much too expensive. Therefore initiatives were taken to coordinate all the different schemes under a common brand and under the organization of Assured Food Standards.

As can be seen in the table, most schemes have many thousands of members, and as regards some commodities the farmer can hardly sell his products today if he is not a member of a particular scheme. This means that although not all farmers are pleased with the certification, the UK farming industry has succeeded in introducing certification of all agricultural products. The schemes are based on membership allowing the members to sell under the brand. Contrary to other countries, the system is not based on contractual production. At the moment not all UK schemes are working under full accreditation from the official authorities *(UKAS 2001)* but during the next years this will probably be the case. Independent technical committees set the requirements of the schemes and independent third-party private and accredited companies carry out assessment.

In the future the major UK retailers will totally rely on these coordinated and assessed schemes and the costs will be more reasonable.

Table 1: UK schemes under Assured Food Standards

Scheme	Acronym	Launced	Members*	Accr.**
Assured Produce (vegetables)	AP	-	>3,000	no
Assured Combinable Crops	ACC	1998	11,200	no

National Dairy Scheme	NDS	-	-	no
Assured Chicken Production	ACP	2000	-	no
Farm Assured British Beef & Lamb	FABBL	1992	24,000	yes
Farm Assured Welsh Livestock	FAWL	-	-	yes
Farm Assured British Pig Scheme	FABPigS	1996	2,500	yes
N.Ireland Food Quality Assurance Scheme	NIFQUAS	-	-	no
N.Ireland Pig Assurance Scheme	NIPAS	-	-	no
Scot. Quality Beef&L. Ass. Farm Assurance	SQBLA	1990	12,000	yes
Scottish Pig Industry Initiative	SPII	1990	340	yes
Scottish Quality Cereals	SQC	1995	2,500	no

* Number of members from different sources

** Accredited - status Feb. 2001 - source: UKAS

OTHER EUROPEAN CONCEPTS

In 1992 the French cooperative association (CFCA) initiated a concept called *Agri Confiance*. The contents of the concept are described in a common French Norm V01-005 and contracts are set up by the individual cooperative with its members. The local cooperative is certified according to rules similar to ISO 9002 and right now approximately 40 cooperatives are certified. The farmer members sign contracts with the cooperative in a vertical integration. The farmer is committed to produce according to the requirements of the concept and to buy all his production means and advice from the cooperative. The cooperative performs audits on the member farms in a three-year-cycle.

In Sweden, the Farmers' Union (LRF) has organized a concept called *Farmcertification* that covers all aspects of production on the farm and fulfill the requirements of ISO 9002. The cooperative Svenska Lantmannen has developed a concept for product certification of plant products named *Swedish Seal (2001)*. Furthermore, a concept for voluntary environmental management has been developed *(Miljøhusesyn)*.

TRENDS AND SOLUTIONS

As regards farm certification the current situation in European agriculture shows a great deal of variation as to both formulation of requirements, level of reliability and to the actors in the scene. Some initiatives to coordinate requirements and even formulate generic norms have been taken and based on these initiatives the processors and retailers will formulate special requirements for their own brands in the future. Increasing requirements mean higher pressure on the food supply chain, and several requirements will go back to the primary producer. This is illustrated in the top line of figure 3.

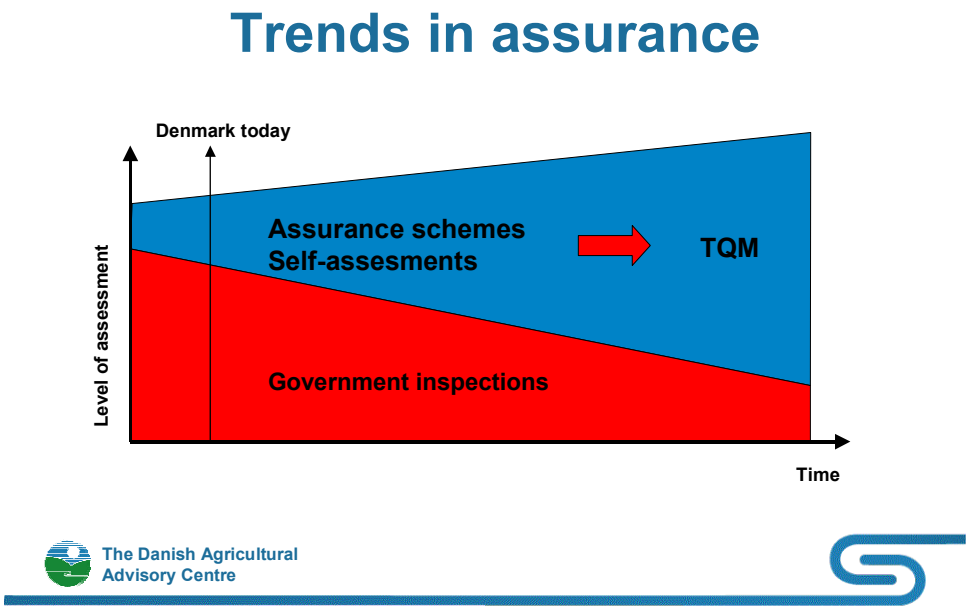

Figure 3: Trends in assurance.

Clear requirements defined by any customer in the food supply chain will be followed by a demand for documentation and reliable assessment. What is now sporadic inspections by distinct private or official bodies will in the near future change towards independent audits or assessments performed by accredited third-party private bodies.

The trend is towards third-party assessment leading to certificates - either on product or farm level - as a sign to the customers and the public that the subject is in accordance with the requirements. When an officially accredited body

issues certificates, they are under government responsibility, which gives the customers the highest level of reliability.

These trends are developing for all types of commodities, and it is absolutely necessary to equalize the level of assessment and coordinate the practical carrying out of assessment in the field. Although this will give the assessment bodies some trouble in selecting and educating their assessors, it has to be solved to keep the system operational as a whole and the costs at a reasonable level.

The development in the use of assurance schemes and related generic standards is illustrated in figure 4. The baseline shows the situation in the UK a few years ago: Many different schemes with no reference to standards and with limited reliability. The situation right now is in the middle section: Partly independent inspections by many different bodies. The next step in the near future is: Most assurance schemes will be coordinated with assessments by accredited bodies and integrated inspections covering all relevant schemes at a site.

There is no common agreement for all of Europe whether or not the agricultural schemes are to approximate the generic ISO standards for quality and environmental management. In the UK par example, mainly standards for product certification are used. In France, the system is similar to the ISO 9002 standard. From our point of view, the generic approach is the solution to be used first of all in the processing industries and the agricultural cooperatives but also applicable on the farms.

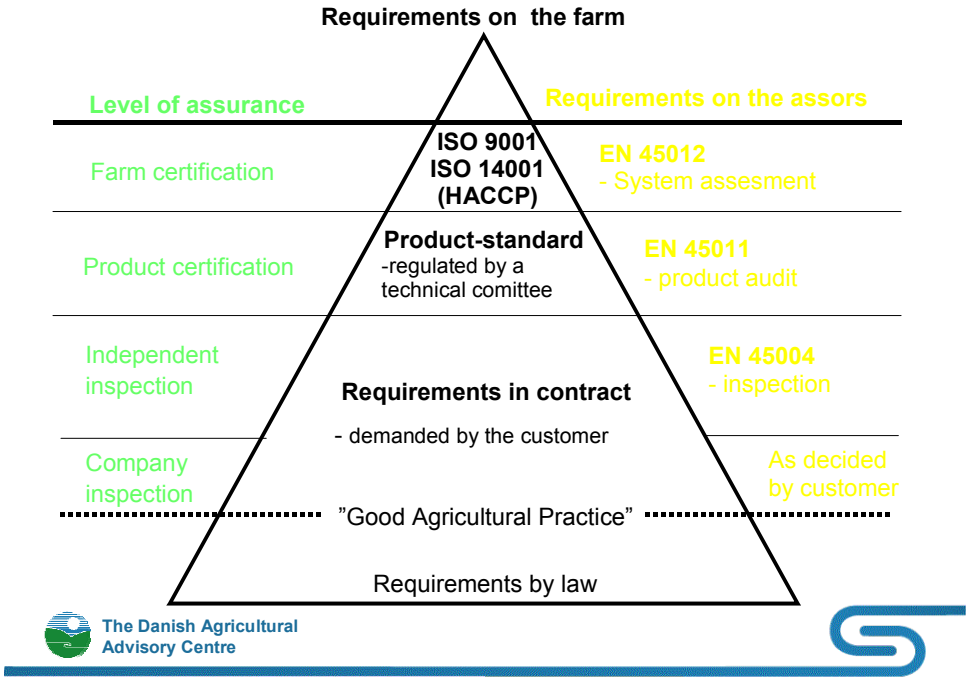

Figure 4: Generic standards in food assurance schemes.

It may be a clear advantage to the farmer that he decides his own level of management and that he has agreed with his customers what has to be done in the production process. In the example from France, every aspect of quality management is decided and laid down by the cooperative in a totally vertical integrated concept. This does not consider the farmers' integrity. As we have shown, most of the management elements are already implemented on farms in a way that works for the farmer. The importance of documentation and record keeping is that it is done and that it is assessable. The way it is done must fit in with the working environment on the individual farm.

As the Scandinavian examples illustrate, it is possible to develop a common quality management system for farms and implement it successfully. The question of further evolution will depend on the degree of support and general acceptance from the cooperatives, processors and retailers. A movement towards a Total Quality Management system on the individual farm and further towards an integrated farm management system (figure 1) under full farmer responsibility will be the ideal solution for the future. This solution is in good

harmony with what is going on in the rest of the food supply chain. More and more dairies, abattoirs and food processors are being certified in accordance with the quality and environmental standards - and in the near future also with the HACCP standards.

The farmer himself decides whether he wants to perform more self-assessment on the farm, and whether he will contract with an independent certifying body to be certified (figure 3). The overall objective is to get as much reliability as possible into the total food supply chain without adding too high costs to the individual links - and that the farmer can keep down costs by performing much of the work as self-assessment.

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