VIEWPOINT

SUPPLY CHAIN MANAGEMENT AND TRACEABILITY IN PORK CHAINS: THE BELGIAN AND SOUTH AFRICAN CASE

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Consumer concerns about meat safety have led to an increased demand for information and transparency in food chains, and have acted as the major drivers for the development of traceability systems. This note focuses on the current and future role of supply chain management and traceability in Belgian and South African pork chains. The state of the art related to traceability is briefly reviewed and illustrated with the specific situation and recent developments in Belgium and South Africa. The background and evolution in both countries are similar, though occurring with some time lag. It is found that organisational and operational aspects of traceability are clearly dealt with. However, questions remain with respect to the management of information flows and the pro-active, instead of defensive use of traceability. Key attention points for future success in livestock production chains pertain to market orientation, claimed benefit substantiation and effective management of information flows.

1. INTRODUCTION

The importance of guaranteeing meat quality and safety to consumers, both from an agricultural producer, industry or government perspective, has emerged during recent years. Consumer concerns about food-related hazards, food safety risks and the impact of food consumption on human health have increasingly received attention during the last decade. In food safety debates, meat issues are clearly on the fore-forth. Debates about fat and cholesterol are

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on going since the late seventies. However, controversies towards meat consumption have extended to larger dimensions during the nineties in the EU. Issues dealt first with the use of growth hormones in beef production. Further disputes focused on the use of antibiotics in intensive livestock production. The latest developments include the BSE-crisis throughout Europe, the dioxin-crisis in Belgium and outbreaks of foot and mouth disease in several countries. Each of the aforementioned crises caused consumers to react heavily and to adapt their attitudes and behaviour towards meat (Burton & Young, 1996; Verbeke et al., 1999; Henson & Northen, 2000; Verbeke et al., 2000; Verbeke, 2001a; Verbeke & Ward, 2001).

The emerging issues and related problems pertain to different stages of the livestock production and meat supply chain. The urgent need for quality assurance schemes in order to ensure fulfilment of emerging consumer demands has recently been stressed (Sundrum, 2001). Additionally, there is an increasing urge for information and communication, both with end consumers as well as between participants within supply chains (Fearne, 1998; Leat et al., 1998; Verbeke, 2001b). In response, governments are currently placing much emphasis on the development of traceability systems and the organisation of more effective information flows. It is clear that this interest is driven from the demand side, with consumers and retailers taking the lead. From this perspective, the underlying paper focuses on one of the most paramount innovations that livestock and meat production chains go through during recent periods, i.e. the demand-driven development of supply chain management and traceability.

The focus of this paper is on traceability, which is considered as a promising response to consumer concerns and a prerequisite to satisfying the demand for trustworthy guarantees and information. First, the relevant literature related to traceability in meat chains is briefly reviewed, with issues dealing with principles, characteristics and the distribution of costs and benefits along the chain being covered. Second, the case of traceability in Belgian and South African pork chains is presented. Information was collected through expert interviews with chain participants. Finally, the current state of the traceability realisations is discussed and recommendations for improving pork meat chain performance and more effective communication or information on the basis of traceability are set forth.

2. DEFINITION AND HISTORY

Food traceability has been defined as the information necessary to describe the production history of a food crop, and any subsequent transformations or

processes that the crop might undergo on its journey from the grower to the consumer's plate (Wilson & Clarke, 1998). Specifically related to the meat sector, a working definition of traceability holds that it is a system that offers the ability to identify an animal, trace its movements throughout its life and subsequently trace the meat products of the animal to the final consumer. Obviously, the objective of being able to "trace" food products emerges as a crucial element within the "traceability"-concept and appears as the major differentiation with or supplement to the concept of "supply chain management".

The origins of the traceability systems that are operational in today's European meat and livestock chains lie in the systems that were set up starting from the 1950s to eradicate animal herd diseases such as bovine tuberculosis and brucellosis. The early systems included identification and registration of cattle herds. Gradually, the registration of animal movements, herd owner, farm and farming characteristics were added to the existing systems. Most traceability systems that are operational today built further on these pre-existing systems of identification and registration. A gain in momentum for traceability system development was mainly initiated by changes at the consumer level, and it was further enabled through the rapid development of hardware, software and information technology since the 1980 (Downey, 1996; Douzain, 1996).

Several authors have indicated major "drivers" that are, at least partially, responsible for the rapidly evolving food and agribusiness chain and for the recent development of traceability systems in agriculture and food production. The need for market orientation has been referred to as the stimulus for co-ordination of marketing operations in the food-marketing channel (Meulenberg, 1997). Major impacts from government policy through the reduction of agricultural support programs, less restrictive trade policies and more stringent food safety, animal welfare and environment regulations, were also recognised. While numerous reasons for the development and adoption of traceability systems are named, the impact of consumer's health consciousness and safety sensitivity is considered as the single greatest driving force in most publications.

South Africa has been slow in instituting traceability systems in comparison to more developed countries. However, food safety and disease control enjoyed increased attention since the outbreak of Food and Mouth Disease (FMD) in 2000. During this crisis the costs and socio-economic impact of import restrictions on rural South African areas gained considerable attention and provided renewed impetus for food safety and hygiene issues the agricultural

sector (Business Day, 2000). The Meat Safety Bill of 2000 is aimed at propagating a culture of hygiene and food safety awareness amongst South Africa consumers, meat traders, and managers of slaughter facilities (RSA, 2000). The Bill primarily addresses Good Management Practises (GMP) and Hazard Analysis at Critical Control Points (HACCP), but no mention is made of a traceability system *per se.* Private institutions have initiated quality assurance programmes. One example is the South African Pork Producer's Organisation's (SAPPO) Quality Assurance Program which was initiated in 2001. The program will not be compulsory when it is implemented, but participation will be actively encouraged by SAPPO's Executive Council, veterinarians and scientists (SAPPO, 2001).

3. LINK BETWEEN TRACEABILITY AND SUPPLY CHAIN MANAGEMENT

The link between traceability and other concepts like vertical co-ordination supply chain management (SCM) and transaction cost economics (TCE) has yet been reported in literature. SCM theory focuses on the linkages in the chain with the objective to reduce transaction costs within chains. The economic foundations for SCM date back to early work by Coase (1937), on the basis of which Williamson (1979) developed the branch of economics that became known as TCE. Quality consistency can be related back to Williamson's fundamental characteristic of uncertainty in transactions. Uncertainty about product quality creates transaction costs and therefore encourages vertical co-ordination between buyers and sellers. In the new "industrialised" agriculture, transaction costs from quality uncertainty are exacerbated and urge for the development of closer vertical linkages in chains. Finally, strengthening of such chain linkages is seen as a major factor determining competitiveness.

Quality assurance (QA) and traceability initiatives all employ similar principles in that they set down standards and procedures which must be observed by members and which are monitored to ensure compliance. In the case of livestock and meat schemes, these standards, procedures and controls embrace each of the stages beyond the farm gate including livestock handling and transportation, slaughtering, meat processing and distribution. Key elements include identification and registration of animals, herds, processors, exporters, data capture, communication, and data management and verification. Critical points are registration and movement of animals, transfer of identification data and product predecessor-successor relationships. These critical points emphasise the need for verifiable standards, compatible

communication systems and clear lines and levels of authority, responsibility and accountability.

Besides focusing on animal or product movements, the facilitation of data and information movement to a centralised database requires specific attention. Clearly, the organisation of efficient and effective information flows is vital from a general management and SCM point of view. The task of collecting, storing and making available safety-related information to reassure consumers is considered to be particularly difficult for agriculture as compared to other industries. The main reasons are that there are a large number of primary producers and produce organisations in the agriculture sector. While key issues with regard to traceability are reasonably straightforward, it is their implementation that is complicated primarily due to the number of levels within the chain and the numbers of producers supplying the chain. Additional pitfalls for installing traceability systems pertain to low degrees of vertical integration in certain livestock and meat chains.

4. SANITEL: TRACEABILITY IN BELGIAN PORK CHAINS

Traceability in Belgian meat chains is realised and guaranteed through the establishment of the so-called Sanitel. The present Sanitel system is a development of pre-existing systems that were established since the 1960s to eradicate animal herd diseases. The system is fully operational for beef since 1993, for pork since 1995 and for poultry since the end of 1999. It already proved its effectiveness through tracing recent BSE cases, outbreaks of classical swine fever or other animal herd diseases, and incidences of dioxin or PCB contamination.

Sanitel basically includes three components. First, animals, actors (farmers, veterinarians and transporters), and entities (farms, transport facilities and slaughterhouses) are identified and electronically registered. Second, all animal or herd movements are registered. Third, farms receive a health standard classification depending on their hygienic and production environment status. Hence, the process towards SCM and QA is based on three major realisations: livestock identification and registration, health standard qualification at the farm level, and controls at the slaughterhouse level. The system herewith corroborates most traceability systems that were set up in other countries from which some characteristics were described before.

The major component of the Sanitel system consists of identification and registration (I&R). The objective is to register a maximum amount of information about all entities, actors and movements in the meat chain. Entities include farms, products, transport facilities and slaughterhouses. Actors include farmers, veterinarians and transporters. Since every movement of animals or products is registered, the system is a key instrument to execute effective control over the spreading of infectious diseases and to trace potentially harmful residues in or other problems with the final meat product.

The second realisation towards SCM and QA is an officially regulated health standard qualification system at the farm level with different qualification levels. The system is based on strict rules that relate to infrastructure, activities and health status. This component is quite similar to the Animal Safety Index (ASI) in the Dutch pork production chain (Van der Gaag et al., 2000). In the specific case of pork, general rules for infrastructure pertain to hygiene measures inside the stables, while rules for activities deal with access to the stables, disinfecting of stables and materials, protection against vermin and insects, control over the use of drink water, animal feed and stable litter. Farms that meet the basic rules are assigned health quality standard B. Those farms that don't meet the basic rules are assigned C. An additional rule dealing with the proof of absence of zoonotic agents and zoonoses (e.g. *Salmonella*, *Campylobacter*) has to be met in order to obtain health quality standard A. Specifically for beef and pork, an additional classification, including the so-called H- (hormone) or R (residue)-status is added. The H-status refers to previous abuses to the existing hormone legislation, while the R-status indicates indecencies of residues of animal health products or growth promoters.

The final step deals with controls at the level of slaughterhouses. The intrinsic meat quality is controlled by the veterinary services of the Ministry of Public Health. This type of control is the usual standard control, as it is yet established and applied for several years in all Belgian slaughterhouses. An additional control instrument has been introduced in 1996. It concerns so-called supervised self- or auto-control. The emphasis is on controlling hygienic standards and manufacturing practices through charters of Good Hygiene Practices, Good Manufacturing Practices and HACCP. It is referred to as self-control since own trained slaughterhouse personnel is responsible for the permanent implementation under regular supervision of the official veterinary services.

5. PISSA: TRACEABILITY IN SOUTH AFRICAN PORK CHAINS

As previously indicated, a numbering and identification system is of utmost importance in any livestock production database, including those used specifically in animal breeding. The development of an intercontinental pig information system (APIIS) has paved the way for utilising this system as an aggregate industry information system. This system is known as PISSA (Pig Information System of South Africa). It is intended to produce a generic pig information system that is adaptable to any pig breeding program, covering all the data collection areas from central to peripheral on-farm systems including intermediate genetic improvement locations like test and AI-stations. In future aspects like on-farm financial and production management (including mating, farrowing and weaning), marketing models and abattoir information will be included (Voordewind & Kanfer, 1999). The PISSA system will achieve the following traceability measures (SAPPO, 2001):

- The birth date, parents and five lineage history of any animal across herds and stud-breeders;
- Movement of animals across herds;
- Reference database that makes provision for herdbook data, field test data, station test data, reproduction data, and carcass evaluation;
- Unique animal identification; and
- Backward traceability from abattoir to stud breeder.

The South African Pork Producer's Quality Assurance Program envisages a system that will "provide the market with superior quality pork products, traceable back to the farm of origin, produced by independent farmers, guaranteeing a minimised risk of food-borne threats to human health through standardised, audited and certified production procedures." The quality assurance program will focus on the standardisation of bio-security and hygiene, carcass food safety, re-coding and documentation allowing traceability and certification. Producers will be audited and graded into three classes (A, B and C) which will indicate the measure of compliance to the program. Bio-security and hygiene will addresses the standardisation of contamination control measures for the humans handling pigs and pig products and also the housing of the animals. Carcass food safety will address the application of chemical substances and use of approved feed for the animals. Traceability will address the recording and documentation of

each batch of pigs throughout the supply chain. Finally, an approved veterinarian will certify the whole process (SAPPO, 2001).

6. DISCUSSION AND CONCLUSIONS

Literature review reveals that there are many debates about traceability, its principles, system components and potential benefits to chain participants and end consumers. It is recognised that traceability systems per se guarantee nothing except the ability to track the product throughout the food chain. However nowadays, traceability systems are considered to be indispensable to assure product safety and implement quality standards. Therefore, the development of traceability systems should not be the objective per se, but merely a tool for the determination of health and safety status's, for delivering wholesome products to end consumers and reliable information and feedback throughout the livestock production chain. Additionally, the idea emerges that today's value added products will be tomorrow's commodities. Hence, the benchmark for standard products is raised and it becomes increasingly difficult to differentiate livestock products.

Former case studies presented how the traceability system Sanitel in Belgium and PISSA in South Africa are established in order to serve as an instrument towards QA and SCM in livestock production chains. The current situation of the Belgian meat chains after the recent BSE and dioxin crises, and consumer's reactions towards meat information, exemplify the validity and necessity of a full chain approach. The major aim lies in striving to build and hold a sustainable competitive advantage based on customer satisfaction through the delivery of safe, healthy and high quality products. Current information and communication technologies (ICT) offer great perspectives, but still face shortcomings related to specificity, rigidity and scope. Additionally, a major challenge involves assessing benefits and costs, as well as coping with deficiencies in information flows back upstream from consumers to suppliers and chain participants including livestock producers.

Evolutions in South African chain management and traceability systems follow a very similar pattern to that seen in Belgium. This means starting with private initiatives, which are gradually taken over by government through legislation and subsequently evolve into the new standard. This new standard finally forms the starting point for further differentiation by private industries or chains. The traceability systems in South Africa still have some way to go to be fully functional. The pork industry in South Africa is significantly smaller than that of Belgium with less sophisticated consumers. Therefore it is not surprising that the South African system is lagging behind the Belgian system.

The pressures of internationalisation and the proliferation of non-tariff barriers to trade will necessitate a traceability system in South Africa to ensure international market access. Government interest for traceability systems is increasing which will bolster traceability initiatives. An interesting issue pertains to following-up whether consumer concerns and changes in demand will play an equally important role in speeding up the process in South Africa, as happened in most European countries.

Alike most existing traceability systems described in literature, the Belgian Sanitel and South-African PISSA includes the potential for being used as a chain management or quality assurance tool and as the basis for reliable communication with customers and end users. Future success appears to be determined by four key attention points. First, the degree of continued market or demand orientation, including efforts to better satisfy consumer demand for wholesome products and reliable and trustworthy information. Second, the ability of substantiating benefits to the appropriate parties, i.e. individuals or companies involved in the livestock production chain. Third, the effectiveness and efficiency of information flows and feedback throughout the meat chain, and finally, the incorporation of the system into innovative supply chain and quality management practices.

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