Food Traceability Perspectives from the United States of America and the European Union

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Abstrakt

Måltidene til den moderne konsumentens inneholder råvarer fra hele verden. Produksjons- og distribusjonsmønsteret kompleksitet er blitt mye større de siste tretti årene og preferansene er i endring. Det er blant annet blitt større fokus rundt spesialmat (eks. halal og glutenfri) og matvarers tilgjengelighet utenom sesong. Et utviklingstrekk innen reguleringer på matvaremarkedet omhandler sporbarhet av råvarer. I EU skjer dette utelukkende ut fra et matvare-trygghetshensyn, mens sporbarhetsarbeidet i USA oppfattes å omhandle både bioterrorisme og matvaretrygghet. Evnen til å etterleve disse reguleringene vil være avgjørende for en bedrifts suksess, både nasjonalt og internasjonalt. For å møte de krav til innsyn som stilles av myndigheter, industri og konsumenter må man evne og spore ingredienser og råvarer raskt og nøyaktig. Matvaresektoren er sammensatt, hvilket gir forskerne store utfordringer når råvarer skal spores. I denne artikkelen ser vi på erfaringer med å skape transparens i matvareindustrien. Fokus er i hovedsak på bulksektoren i EU og USA. I tillegg skisseres fremtidige forskningsområder innen temaet.

Abstract

Much of the food that reaches the modern consumers plate is sourced globally. Production and distribution patterns have become much more complex than was common even 30 years ago and consumer preferences have evolved to include specialist foods and foods out of season. The most recent developments in regulations regarding food are in relation to the traceability of food stuffs. Within the European Union (EU) this is driven mainly by food safety concerns. In the United States of America (USA), traceability is perceived as important with regards to both bioterrorism and food safety. The ability to comply with these regulations will be a decisive factor for a company's success. Creating the transparency demanded by consumers, businesses and regulators requires the ability to trace and track ingredients in food stuffs rapidly and precisely. Since the food sector is of a highly complex nature, tracking and tracing presents us with many new research challenges. In this paper experiences in creating this transparency within the food industry especially within bulk sectors from EU and USA will be examined and future areas for research highlighted.

Keywords EU, USA, Track, Trace, Food safety, traceability.

Introduction

International trade is an integral part of the modern global economy and in the Northern Hemisphere it's roots go back to Viking times. Production and distribution patterns of food stuffs in this global economy have become much more complex than was common even 30 years ago.

Within companies from car manufacturers to pharmaceuticals (Ramarapu et al., 1995, Sohal, 1997) the ability to accurately track and trace information about products and processes has long been recognised as giving an advantage in terms of everything from internal stock control to better information to consumers. This ability to access a great deal of information about a product and the processes they have been through has been termed 'traceability'. ISO defines traceability as follows: 'Ability to trace the history, application or location of an entity by means of recorded identifications'(ISO, 1994). Applied to a product it may relate to the origin of materials and parts, the product processing history and the distribution and location of the product after delivery.

However traceability of food products between companies has only recently become an issue with the growing number of food safety and health issues (Carriquiry and Babcock, 2007, Caswell, 2000, Elbers et al., 2001, Fallon, 2001, Madec et al., 2001, Ozawa et al., 2001, Sporleder and Goldsmith, 2001). Consequently traceability of food stuffs between companies (in non integrated supply chains) has become an important area for research. Within the European Union (EU) this is driven mainly by food safety concerns whilst within the United States of America (USA) it is driven mainly by perceived threats from bioterrorism with food safety concerns being secondary. The ability to comply with growing regulations will be decisive factor for a company's success in both national and international settings.

Following the introduction of new legislation and ~~a~~ the current dependence upon global trade has been the need to resolve traceability challenges in local, national and international supply chains. The aim of this article is to provide a short review of data already collected from research into traceability on both sides of the Atlantic. This will allow the reader to quickly gain an overview of the current situation, the origins of this situation and the factors which may affect its further development. The paper will also contribute to future developments in the area of international standards and traceability initiatives at the transatlantic level. The products under consideration are bulk grains from America and fish from Europe (with a primary focus on the Nordic countries). The issues will be examined in the context of these bulk products, which are both of great importance in export terms. Experiences from both the USA and EU will be examined. This paper begins by considering the published literature regarding traceability in the EU and USA. It concludes by drawing on the authors' own research experiences with regards to similarities and differences in traceability initiative in the EU and USA. It concludes by summarising important areas for further research.

Discussion

Recent research has shown that the degree of traceability in food chains in Europe is a little more than 50 % (Donnelly et al., Karlsen and Senneset, 2006, Randrup et al., 2008) and is much lower at around 5 % in the USA (Levinson, 2009). Fig. 1 shows these differences. Traceability, in the context of this paper, refers to both internal and external traceability which is generally a more detailed form of traceability than is demanded by the relevant EU legislation. It can be seen that the number of products where it was possible to find the origin was much higher in Europe than the USA. This finding is perhaps not surprising as the USA has not been moving at the same pace or in the same direction as Europe with regards to food traceability until recently.

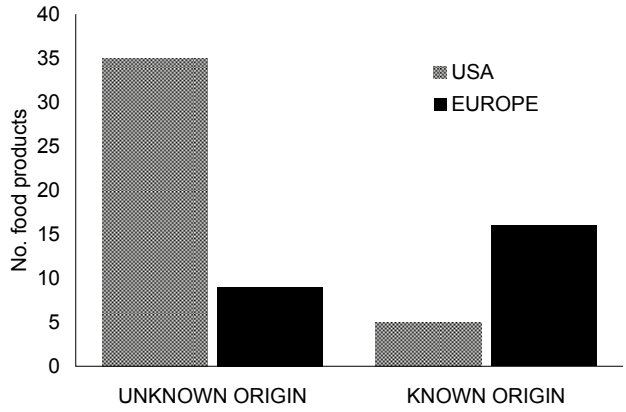

Figure 1. Comparison of the ability to find the origins of a selected number of products i.e. their traceability in USA and Europe. Data taken from Donnelly et al and Levison (2009)

This data shows that despite the focus on food traceability in Europe in the last 10 years still only a little over 50% of the food products offered for sale are traceable. What are the reasons for this? Is it the case that full supply chain traceability is not deemed to be economically important or necessary by the food industry? It is hoped that some of the research carried out in the past 10 years could shed some light on this and give industry actors some important insights. It is important that the consequences of and the reasons for the different degrees of traceability are understood and used to develop successful strategies further.

What are the driving forces in the two areas?

The initiatives within the EU have been greatly stimulated by the BSE crisis of the late 1990's. This led to legislation requiring so called 'one up one down' traceability. This means that companies have to know where the received resources are from and who they have been sent to but not necessarily what the connection is, in other words

there is no demand for an internal traceability system. Charlier and Valceshini (2008) argue that the EU regulation 178/2002 introduced following the BSE crisis only provides a minimal form of traceability but it can and has exerted influence on individual choice. One of these choices being that regarding the granularity or breadth and depth of the traceability system a company implements. This is reflected in the initiation of several projects within the EU such as TRACE (TRACE, 2007), PETER (PETER, 2007) and other national and international initiatives. The motivational factors are of a rather complex and multifactorial nature.

The main driving forces for food traceability in the EU besides food safety are outlined by Olsen (2009) and are summarised in figure 2. Olsen (2009) has suggested a model that seeks to illustrate the current motivational factors. They include certification for environmental and sustainability purposes in order to combat illegal, unreported or unregulated fish from entering the supply chain (Donnelly and Karlsen, 2010). They also include protection of the identity of high value food products such as in the Danish herring industry (Frosch et al., 2008).

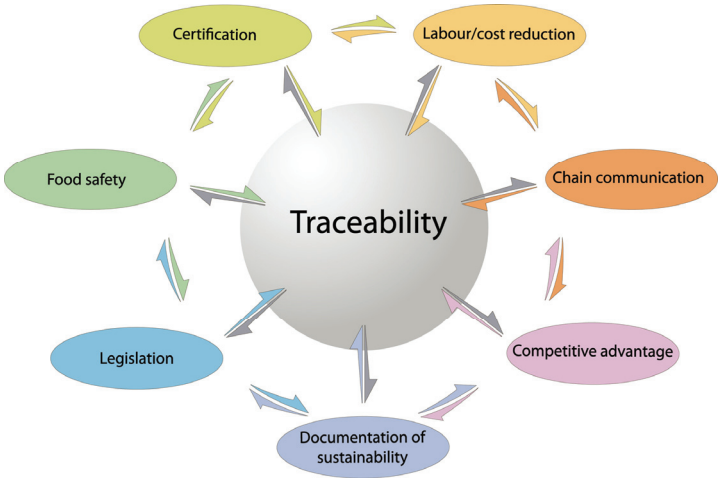

Figure 2. The driving forces for traceability inn the EU modified from (Olsen, 2009)

In the USA the motivational factors for traceability were sparked by the perceived threat from bioterrorism. The terror attacks of "9/11" (the destruction of the World Trade Towers on September 11 2001), being the catalyst. Legislation relating to traceability has only relatively recently been enacted. Although perceived threats of bioterrorism was the initiator many of the same drivers as those found in the EU are also present namely, better production control and food safety There is now a clear shift in the USA towards food safety concerns.

Two new food safety bills have been introduced in the USA; Food Safety Enhancement Act and Food Safety Modernization Act. The former was introduced in June 2009 and has been passed in the House of Representatives. The bill will now be voted on in the Senate. The latter Act was introduced in February 2009 and is the first step of the legislative process. Both of these Acts would enhance the Food and Drug Administration's (FDA) authority to access records from the food production facilities. The legislation also require the food facilities to evaluate their hazards and

to implement preventative controls. These Acts will also provide the FDA not only with mandatory food recall authority but also with establishing mandatory inspection frequencies for food facilities. These regulations will also apply to the food businesses outside the USA that wish to export their goods for consumption there (FDA, 2009). If this new food safety legislations is passed, it would put USA on the track of implementing sophisticated electronic traceability systems; both for internal and chain traceability.

Jenkins (2003) also notes that other drivers for traceability include the need to know the country of origin, overall food safety and the level of Genetically Modified Organisms (GMO) present in foodstuffs. The need for the latter arising from the import criteria of regions such as the EU that requires documentation regarding the level of GMO in grain imported to the EU. GMOs are an issue in both USA and EU and clearly illustrate that traceability is often most important with regards to import and export issues. American exporters wishing to access the European market need to label products containing or that have been produced from sources containing more than 0.9% GMO content. Within Europe due to consumer pressure, companies will often obtain a better market share if they can show that their products contain no GMO and a traceability system is needed to show this. On a more general level the perceived risks posed by GMO containing products and food scares such as BSE has increased awareness of the European consumer to the origins of their food. Smith et al. (2005) observed that the USA is still lacking in legislation regarding specific traceability, with the exception of the Bioterrorism Act. This Act requires that all food producing businesses be able to provide any requested food safety related records within a 24 hour time frame.

Importance of critical traceability points

Observations from both the EU and the USA show that in order to achieve any level of traceability a major factor in both countries and across all food sectors is that of Critical Traceability Points (CTPs) (Karlsen et al., 2009). In multiple studies of both internal (e.g. mineral water bottling, honey production) and chain traceability (e.g. dried salted fish production, fresh fillet production, grain) it has been shown that the first step is to identify and address points in production systems where information is systematically lost e.g. loss of identity of fish during the production of wet salted fish (Donnelly and Karlsen, 2010).

Both in the wild fish and particularly the farmed fish sectors there are greater incentives for companies to develop and employ traceability systems in order to protect themselves against allegations regarding the quality of their fish. For example, in the case of heavy metals found in farmed fish in late 2005 (Bethune, (2006) it became very important for the producer to be able to accurately identify the feed used in production.

The grain sector, particularly the grain elevators, have both similar and different reasons for implementing traceability systems. The identification of CTPs is very important and one of the most important CTPs is the internal movement of grain in

an elevator. Information is lost when the grain is moved internally, usually to avoid spoilage caused by rising temperatures inside the storage bins. The internal grain movements (that cause splitting and mixing of lots) often go unrecorded. Implementation of a traceability system that would record data related to mixing and splitting could potentially solve this problem of information loss. Another reason for implementing traceability in the grain sector is to be able to prove the product identity including things such as the level of or absence of GMO's in their products. Identification of such CTP's receives a higher importance when international trade is the focus of the elevators activities. This is one of the common motivational factors for both the USA and the EU.

Standards

The need for international systems and standards for traceability has been highlighted by several authors including Folinas et al(2006) Jansen-Vullers et al. (2003) and Bollen et al. (2006). Golan (2005) observes that tracking all inputs and outputs in industry processes would be costly and that firms in the USA are adapting traceability to their individual needs and demands. Work within European projects underlines that this strategy becomes unhelpful when attempting traceability for food safety purposes. For example, food may need to be traced throughout non coordinated supply chains (Donnelly et al., submitted). There is a clear need for standardisation of both data elements to enable efficient information exchange.

The need for standardisation in order to enable both effective communication and chain traceability has been identified by research in both the EU and the USA. Folinas (2006) and Senneset et al. (2007) have pointed out that a key technology for enabling communication for the purposes of traceability in supply chains is the use of standards and particularly sector specific standards (Thakur and Donnelly)

This need for standards was clearly revealed in the EU project TRACE (TRACE, 2007) which resulted in the development of 'Good Traceability Practice' (GTP) guides (TraceFood Wiki, 2009). Another example of developing international standards is to be found in those proposed for the wild and farmed fisheries sectors such as ISO/TC234.

Research such as that carried out by Thakur and Donnelly (2010) shows that transatlantic standards and cooperation is necessary in sectors such as Grain and Fisheries where large quantities of goods are traded internationally.

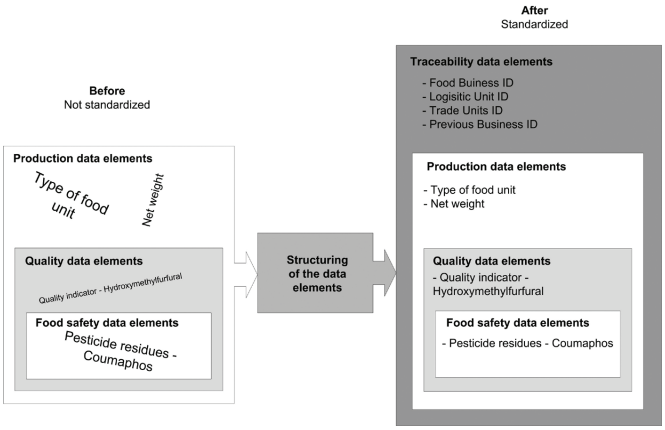

Figure 3. Figure demonstrating the difference between standardised and non standardised data taken from Donnelly et al. (2008)

As well as standards regarding what information should be recorded it is also important that there are standards of how to record the information. It is widely recognised that the open electronic standards are important within both the fisheries and grain industries (Donnelly et al., 2008, FDA, 2008, Senneset et al., 2007, Thakur and Hurburgh, 2009). This is exemplified by the attempts made in projects such as TRACE to create standards such as the TraceCore XML basis for standardised electronic information interchange in the food supply chains, for instance as an extension of the Universal Business Language (UBL). UBL is a library of standard electronic XML business documents such as purchase orders and invoices developed and supported by Organisation for the Advancement of Structured Information Standards (OASIS) and already supported by many national governments, in particular by Denmark and Iceland.

What is the experience from implementation projects?

Traceability of the bulk products, fish and grain, are areas that have been studied in the USA (grain) and the EU (fish). Both these products have similarities and differences. For example, the separation of batches can be difficult when there are large catches of fish which may be mixed from several trawls or catch areas. Similarly the individual grain lots from several farmers can be transferred to one storage bin at the elevator which causes mixing of these lots and the loss of their individual identities. When shipping grain to the customers, it is blended from several storage bins to meet the customer specifications. Thus, mixing and splitting of lots takes place several times at a grain elevator. Similar sorting and mixing production process are found in the dry and wet salted fish industry. Donnelly and Karlsen (2010) demonstrated both the difficulties (long maturing times, production process involving sorting and resorting with consequent difficulties in maintenance of ID's) and also proposed solutions (modifying the process in order to maintain connection to ID's and systematic electronic recording of information.) for this industry. Since both fish and grain are of great export value to many of the countries in which they

are produced the incentives for traceability are very clear. Clearly on both sides of the Atlantic traceability challenges such as information exchange, identification of critical traceability points and standardisation are important. Previous findings however (shown in figure 1) suggest that the EU generally has a greater awareness of the problem than the USA despite research efforts. Perhaps this signals that traceability will achieve a higher status on the US research agenda in the coming years.

Conclusions

Traceability has become very important on both sides of the Atlantic. It has been casually observed by experts within the field that 'with regards to traceability the USA is 5-10 years behind the EU' (pers comm.). If this is correct it is surely related to the driving forces reported here in addition to a multitude of other factors (social, cultural, economic, legal, etc.) which affect the willingness of governments and industry to implement traceability. It is thought that food traceability issues would benefit from transatlantic research cooperation. The research should focus on identifying the reasons for the differences in approach and motivations for traceability. Such research will also give a strong indication of areas for future research.

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