

REQUIREMENTS AND ASSESSMENT OF TRACEABILITY AT DISTRIBUTORS OF CEREAL ORIGIN FEED INGREDIENTS

Andrea Csikai

University of Debrecen, Centre of Agricultural Sciences and Engineering, Faculty of Agriculture,
Institute of Food Processing, Quality Assurance and Microbiology
H-4032 Debrecen, Böszörményi út 138., Hungary
e-mail: andrea.csikai@gmail.com

ABSTRACT

Achieving full traceability in food supply chains is not only a legal requirement but it brings multiple benefits both to customers and manufacturers. The paper reviews the minimal requirements and summarizes the results and learning of audits at 5 cereal origin feed ingredient manufacturers based on a questionnaire compiled for traceability from relevant European legislation and standards.

1. INTRODUCTION

In the last decades food distribution networks become more and more complex, and with globalisation this trend is likely to continue. Although there is an other trend that customers look for more information about their foods, the ingredients, the sources, and how they were made. These developments call for better and, in case of recalls, faster traceability not only in food but also in feed production. These needs got into the spotlight when serious food safety incidents broke out in the past years.

Efficient and reliable food and feed traceability is built on product identification, data and document recording and keeping, mapping routes of lots (through storage, process, distribution), systems to enable storing, maintaining, and linking data, and verification procedures. These elements together provide the ability to identify the routes and channels of products or ingredients through the supply chain from farm to fork.

2. LITERATURE REVIEW

Regulation (EC) N° 178/2002 provides the legal frame for food and feed traceability, outlining the general principles, requirements and procedures. From the 1st January 2005 it is mandatory to comply with traceability requirements for all food and feed producers along the supply chain. The establishment of comprehensive traceability systems is the prerequisite to provide information and to undertake accurate withdrawals with minimal disruption in case of food safety issues.

The legislation defines traceability as the ability to trace and follow a food, feed, food-producing animal or substance intended to be, or expected to be incorporated into a food or feed, through all stages of production, processing and distribution. By definition, all

participant of the food chain, (from farm to fork), must get aligned on operating adequate traceability systems.

The cornerstones of traceability are identification, segregation, data collection and management, labeling and verification. The regulation obligates the relevant businesses to identify the sources and origin of inputs of the operation including food, a feed, a food-producing animal, or any substance intended to be added into the feed or food. These businesses should be also able to identify the destinations of outputs of their operations to which they were distributed, “one step back”-“one step forward” approach. The food and feed producers shall be able to demonstrate that traceability systems and procedures are in place and information is available for authorities on request. Traceability is also facilitated through product labels and relevant documentation. A proper system has to enable traceability not only downwards from farms to shops, but upwards also (from shops back to farms). However, food business operators do not have to identify the immediate customers when they are final consumers.

The Standing Committee on the Food Chain and Animal Health of EU provided a guidance document in the end of 2004 to answer the practical questions of European food chain operators and third country trading partners and to help them correctly apply solutions for traceability requirements. In the beginning of 2010 a revised version of the guidance document was published where certain sections were simplified and clarified. It is clearly stated that traceability alone does not make food safe, but it is a way of assisting in containing a food safety problem. As minimal requirement, food and feed businesses should document the names of suppliers, their addresses where the raw materials arrived from, the name and address of customers, and, of course the name of the product and date of delivery. Referring to food incidents in the past, the guidance document indicates the importance of traceability records as critical help in targeted recalls, enabling to maintain consumer confidence and facilitate risk assessments by authorities. Keeping quantity, batch numbers and more detailed description of the product is also recommended with the traceability records for at least the period of the shelf-life plus 6 months, however commercial documents are usually kept for 5 years, traceability systems hold information for the same duration.

The guidance document clarifies that the provision does not apply to veterinary medicinal products, plant protection products, fertilizers, seed for cultivation and packaging materials. (These are covered by other regulations that may impose more stringent traceability requirements.)

Regulation (EC) N° 178/2002 applies to all participants of the supply chain regardless of whether they take physical possession of the food or feed e.g. brokers must be considered as a form of supplier too. Although operators are not obliged to establish internal traceability by linking incoming and outgoing products, it would support more accurate identification of specific product batches in a fast manner, saving costs and time of recalls, and maintain consumer confidence. Delays of information delivery jeopardize prompt reactions.

The rapid alert system for food and feed (RASFF) had been established by EU Commission for the notification of risks to human health. In 2009, a total of 3322 original notifications were transmitted through the network, representing a 5.8 % increase versus previous years. Regarding cereals and bakery products genetically modified organisms (GMO) and

mycotoxins, for feed materials pathogenic microorganisms, foreign bodies, GMO, pesticide residues were the most often occurring risks.

Golan et al. (2000) examined the dimensions and objectives of traceability. The authors declare that none of traceability systems is complete. The amount of information collected defines the breadth of the system however recording all attributes of a product would be enormous, unnecessary, and expensive. Depth describes how far the system can track back or forward the relevant information. This may depend on where food safety hazards and remedies can enter the production chain. In specific cases safety measures need to be ensured at the farm level. Precision of the system is with what accuracy the system can pinpoint product movements or characteristics. The authors listed three objectives of traceability systems as improving supply management; facilitate traceback for food safety and quality; and differentiate and market foods undetectable quality attributes. The benefits of them are lower cost distribution systems, reduced expenses in terms of recalls, and expanded sales of products with attributes that are difficult to distinguish.

Moe (1998) distinguished four contexts of traceability:

- Product; it may relate materials, their origin, processing history, distribution and location after delivery.
- Data; it relates calculations and data generated throughout the quality loop, sometimes back to the requirements for quality.
- Calibration; it relates measuring equipment to national or international standards, primary standards, basic physical constants or properties, or reference materials
- IT and programming; it relates design and implementation back to the requirements for a system

The Food Standards Agency (FSA) of the United Kingdom (2002) suggests that traceability can be evaluated in audits for performance and speed, through a randomly selected product. The product must be identified back through the production and any products related through a common process. Having regular challenge tests to the traceability system is also critical. The most stringent requirement noted was full traceability back from delivery-to-customer to the supplier's raw material information in 2 hours. There is not an ideal system to cover the diverse needs of the food industry. Verification and assessment is according to the requirements of providing traceability back- and forwards, clear manufacturing windows are set for continuous production, the system includes all materials and ingredients and it gives response in appropriate time by providing readable traceability information to the customer.

FSA (2002) considers supplier assurance as a tool to minimize food quality and safety risks where traceability systems provide defense in case of crisis. In most cases suppliers submit a self-assessment, then they are audited before first delivery and re-audited regularly depending on the product and the risks, the size of orders, ingredient related customer complaints, and to assess the progress on requested changes at previous audits. For supplier selection the quality specifications are considered besides price as the outcome of the work of commercial and technical departments of the contracted parties.

The International Feed Safety Alliance (IFSA) published their Feed Ingredients Standard in 2005 providing guidance for traceability of raw materials and feed ingredients. It requires

traceability for each raw material and ingredient back to the point in the supply chain where the control of any hazards identified in risk assessments is necessary. Even if the applicant does not hold all traceability records, capability must be demonstrated to access the records if required. The applicant must record the names and addresses of raw materials suppliers, the type and quantity, dates of manufacture, batch numbers, unique identification reference of the transport and storage of incoming raw materials until the responsibility is passed to the buyer.

The European Feed Manufacturer's Federation (FEFAC) provided a detailed guideline in 2009 to good practices in the feed industry including traceability. Similarly to the requirements of legal and other frameworks, traceability data must include the name and address of all suppliers, batch numbers for purchased feed additives, nature and quantity of finished feed and their manufacturing date, name and address of the customers. Furthermore the registration number of suppliers (according to EU legislation) must be recorded too. The raw materials must conform to the required specifications, and controlled for known hazards according to a control plan (sampling procedure, frequency, analysis methods, actions in case of non-compliance) based on HACCP study and delivered by approved suppliers undergone an evaluation by the purchaser prior to the first delivery. There must be a documented, approved procedure for collecting traceability records, and it must be kept for the legally required minimum period of time in proper storage conditions preventing any damage to the records. These requirements need to be audited at least once a year by qualified personnel and non-compliances must be corrected.

GLOBAL G.A.P aims to establish a global standard for agricultural products that are capable of fitting to the globalizing agricultural market worldwide. Traceability, food safety and quality considerations related to compound feeds are key areas of assured animal production. GLOBAL G.A.P Compound Feed Manufacturing (CFM) Standard and a checklist summarize the most important control points and compliance criteria. The checklist contains 6 yes-no questions for documentation and traceability, each classified as 'major must' criteria. The questions include if the production process records maintained from feed ingredient selection to delivery to customers and capable of providing sufficient traceability and also, if feed ingredient records available upon arrival at the site within 14 days of delivery. There are a couple of general questions as well about each feed batch records being available and complete including medicated feeds. The high level approach in the CFM standard makes possible that feed producers can shape their systems according to their individual needs or local legislation, however the standard does not explain the criteria with recommendations for those who intend to improve their quality management system, supply chain or entire business operation further.

The International Food Standard (2004) requires on foundation level the establishment of a traceability system that enables the identification of product lots and their relation to ingredient batches, consumer unit packaging materials, processing and distribution records. Internal traceability system must be regularly tested with documentation up- and downstream between raw materials and product shipments including product reworks too. Traceability records must be kept for recall purposes for a defined period according to regulatory and customer requirements. Identified production samples to be stored appropriately and kept until the end of end-product shelf life.

Notermans and Beumer (2003) differentiated supplier traceability, process traceability, and customer traceability. Their interfaces must be managed with special attention to ensure

seamless traceability and introduction of an auditing system advised. For identification the lot was defined as a quantity of feed or feed ingredient produced and handled under uniform conditions, in a limited period of time, from identical ingredients, on a particular production line. The authors indicated general difficulties of traceability which are the labeling of products (if it cannot be physically labeled e.g. bulk materials), deciding on the lot size, separation of lots and stock management, mixing of feed, carry-over of ingredients from one batch to another and reprocessing of returned material.

3. MATERIALS AND METHODS

To assess traceability in the supply chain of a theoretical feed manufacturer, a traceability audit questionnaire has been compiled based on the legal requirements and other recommendations from standards that were referred to in the literature review section. The questions were grouped into 4 categories: ingredient to supplier, process at supplier, product to buyer, general traceability requirements at the supplier.

Table 1: Audit questionnaire for testing traceability

Nr.	Question
Ingredient to supplier (supplier traceability)	
1	Are risk assessments carried out for all feed ingredients?
2	Is there a risk based specification available for each ingredient?
3	Are the vendors audited frequently by the buyer company?
4	Are actions from audits defined and followed through for non-conformities?
5	Is there a procedure followed for supplier selection and approval and regular qualification (audits)?
6	Are the following data records kept for each ingredient batches?
7	<i>material name, type</i>
8	<i>name and address and status of supplier</i>
9	<i>batch size, amount, batch number (unique identification)</i>
10	<i>date of delivery</i>
11	<i>identification of vehicle or storage</i>
12	Is there a risk-based control plan defined and followed for incoming ingredient deliveries?
13	Is the sampling method, frequency, analytical methods followed as defined in a control plan for each ingredient?
14	Are the sample results compared to the limits defined in the relevant ingredient specification?
15	Is there a procedure followed to manage non-conforming ingredient batches?
Process at supplier (process traceability)	
16	Can be the traceability proved through process for each components?
17	Are the weighing certificates available for each product lots containing the components?
18	Are rework considered for traceability?
19	Is there a system to segregate production batches?
Product to buyer (Customer traceability)	
20	Are the following data records kept for each ingredient batches?
21	<i>material name, type</i>
22	<i>name and address of buyer</i>
23	<i>batch size, amount, batch number (unique identification)</i>
24	<i>date of delivery outbound</i>
25	<i>identification of vehicle or storage</i>
26	Is there a risk-based control plan defined and followed for finished products?
27	Is the sampling method, frequency, analytical methods followed as defined in a control plan for each finished product?

28	Are the sample results compared to the limits defined in the relevant finished product specification?
29	Is there a procedure followed to manage non-conforming product batches?
General traceability related requirements at the supplier	
30	Are the traceability records controlled?
31	Is a 24 hours contact available?
32	Are the traceability records stored at appropriate conditions?
33	How long are the traceability records kept?
34	How long does it take to carry out traceability tests upstream and downstream?
35	Is there a written procedure for product recall?
36	Is there a procedure followed that defines the frequency of internal audits?
37	Are the internal audits carried out by qualified personnel?

The audit questionnaire has been taken to and answered by 5 industrial companies dealing with cereal origin feed ingredients in Hungary. The firms have been also asked to carry out traceability tests both up- and downstream on a randomly selected product batch. The answers have been assessed as “adequate” or “non-adequate” and reported back to the relevant contact people.

4. RESULTS

All companies participating in the study had a traceability system that stored and maintained and linked ingredient and product records. 3 companies had a fully computer supported database system, while the other 2 applied the combination of paper documents and computer systems to trace the lots. All of the companies could effectively segregate batches and keep very similar records about ingredients, and the products too.

One of the differences between the companies was in the answers to Question 3. Even though all answered that they audit their suppliers, the frequency of the audits varied between 1-3 years. None of the companies particularly connected the audit frequency to the risk assessments for the ingredients (Question 1 and 2) that they indicated to carry out otherwise.

One company out of 5 said that there is no regular performance assessment for their suppliers, although they did not provide further details of reasons.

There were no particular concerns around the ingredient records and sampling, methods, and frequencies. Typically every ingredient batch that the companies receive from their contracted partners are sampled and analyzed for more or less parameters. Procedures to manage non-conforming ingredient lots were also in place. All questions in the process traceability and customer traceability sections got positive results too.

Question 33 asked the duration of traceability records kept at the company. The answers of participants varied between 2-6 years. Regarding the speed of demonstrating traceability of randomly selected product and ingredient lots, one of the companies was able to provide all necessary information in 30 minutes, while others needed from 1 to 4 hours that is considered to be an acceptable timeframe.

5. CONCLUSIONS

Traceability has a decade long history in the food and feed production chains. By now, most of the companies got familiar with the legal requirements, they are aware of the criteria and the ways how to reach them. Due to the fact that most of the partner companies buying the food or feed ingredients also follow strict rules of quality management, ingredient manufacturers are not only obliged to conform to quality standards, but they are also audited frequently on traceability too.

Other observation made during the study was that yes-no type questions in audits limit the opportunities to collect further information about the processes and standards of the companies above the minimum criteria. Therefore, when auditing traceability at companies, it is recommended to ask for examples or evidences beyond marking conformity to the standard when the answer is positive.

The results showed that traceability was possible at all companies both up- and downstream, the differences that occurred was related to „how” they achieved conformity and what systems they built to support it.

If we consider that one of the objectives of traceability is to differentiate undetectable quality attributes of food (besides supporting the management of food safety issues) a fast traceability system may promote brand reputation. Connecting traceability and other important information from the supply chain about a particular food product and making it easily accessible to the consumer (e.g. on website by entering unique identification of the product), it may have a significant impact on the willingness to purchase and building trust. This case traceability brings value to the customer, but theoretically the producer and his vendors could get also direct information and build a robust database about final customers, their location, age, buying habits, social environment, interests in food information if the product information can be retrieved after personal registration to the web-based system (value to the producer).

REFERENCES

1. Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety L31/1. Available at: http://eur-lex.europa.eu/pri/en/oj/dat/2002/l_031/l_03120020201en00010024.pdf (last downloaded: 10th October, 2010)
2. Guidance on the implementation of Articles 11, 12, 14, 17, 18, 19 and 20 of Regulation (EC) N° 178/2002 on general food law conclusions of the Standing Committee on the food chain and animal health (2010), Available at: http://ec.europa.eu/food/food/foodlaw/guidance/docs/guidance_rev_8_en.pdf (last downloaded: 10th October, 2010)
3. The Rapid Alert System for Food and Feed (RASFF) Annual Report 2009, Available at: http://ec.europa.eu/food/food/rapidalert/docs/report2009_en.pdf (last downloaded: 10th October, 2010)

4. Golan, E., Krissoff, B., Kuchle, F. (2004) Food Traceability: One Ingredient in a Safe and Efficient Food Supply. Amber Waves, U.S. Department of Agriculture, Economic Research Service. April 2004. Available at: <http://www.ers.usda.gov/AmberWaves/April04/Features/FoodTraceability.htm?ref=ARKADASBUL.NET> (last downloaded: 10th October, 2010)
5. T. Moe (1998) Perspectives on traceability in food manufacture. Trends in Food Science & Technology. Vol. 9, nr. 5, 1998, pp. 211-214
6. Food Standards Agency (2002) Traceability in the Food Chain. Available at: <http://www.food.gov.uk/multimedia/pdfs/traceabilityinthefoodchain.pdf> (last downloaded: 16th September, 2010)
7. European Feed Manufacturer's Federation (FEFAC) (2009) European Feed Manufacturers Guide (EFMC) version 1.1 Available at: <http://www.fefac.org> (last downloaded: 18th September, 2010)
8. International Feed Safety Alliance (2005) Feed Ingredients Standard for Producers & Processors of Feed Ingredients. Available at: <http://www.ifsa-info.net/lmbinaries/ifis.pdf> (last downloaded: 10th October, 2010)
9. Global GAP (2010) Compound Feed Manufacturing Standard and Checklist.v.2.0 Available at: http://www.globalgap.org/cms/front_content.php?idart=142 (last downloaded: 10th October, 2010)
10. International Featured Standards (2004) Food Standard Version 4
11. Notermans S., Beumer H. (2003) Safety and Traceability of animal feed. In: Food authenticity and traceability Ed: Lees, M., Woodhead Publishing. pp. 518-553