

Traceability

Recall systems

Recall systems designed by the establishment operator should:

- utilize the approval/registration/listing number of the establishment as a means to identify meat to its final destination;
- incorporate management systems and procedures that facilitate rapid and complete recall of implicated lots, e.g. distribution records, lot coding;
- keep records that facilitate trace-back to the place of origin of the animals, to the extent practicable; and
- keep records that facilitate investigation of any processing inputs that may be implicated as a source of hazards.

Source: FAO/WHO, 2004.

INTRODUCTION

The need to trace an animal and its products as they progress through the production chain was initially occasioned by the appearance of human health risks derived from livestock – bovine spongiform encephalopathy (BSE), *Escherichia coli* “food poisoning”, residues derived from substances administered to animals on the farm, etc.

However, the pressure for traceability rapidly mounted as consumers demanded to know more about the animals from which their food was derived. It became more than a health issue – consumers needed to know more about the circumstances under which animals were raised, how they were transported, how they were slaughtered – in summary, a host of events along the production chain were of interest and had to be traced.

Traceability is now no longer purely a health issue, but a marketing tool designed to give the consumer assurance that the product he/she is consuming is both safe and ethically acceptable.

Thus arose the need for reliable and easy identification of the animal and a “paper trail” showing clearly where the animal had been and to what practices it had been subjected. Furthermore, the animal had to be linked to its products, meaning, for example, that the carcass and the meat cuts derived from it in an abattoir had to be identified and linked to the live animal from which they originated.

Traceability has been given many definitions and traceability techniques have been developed for everything from motorcar parts to vegetable soup. For the purposes of this publication (which concentrates on livestock), traceability will be defined as “the ability to, and the mechanisms designed for, the tracing of an animal product along all steps in the production chain back to the holding of origin of the live animal from which the product was derived”.

WHAT IS A TRACEABILITY SYSTEM?

A traceability system consists of a series of interlocking elements linked by an auditable “paper trail” and quality-controlled by a series of inspections or audits. Any item moving from one element of the system (or chain) to another

must be identified by an identification code or number, and each movement “into” and “out of” any given element in the chain is recorded using the item’s identification number.

In the case of animals, each animal must be clearly and unambiguously identified and, as it moves along the production chain, its identification code or number must be recorded at each step as proof that it has passed that way. A trace-back audit must be able to verify not only the path that it has travelled, but also that circumstances at each step in the chain have met certain standards. An animal may move from its holding of birth to an auction, then on to a fattening farm and finally to an abattoir. In this case, the date of entering and leaving each place must be recorded using the animal’s identity code. Additionally, there must be sets of rules governing the management at each of these places (farms, auction pens and abattoirs) whose implementation can be verified by inspection.

Traceability schemes usually have a central controlling body that: issues identification codes and sets standards or codes of conduct for each link in the production chain; has an accreditation system that ensures that all role-players conform to acceptable standards of management; and operates inspection and audit systems to verify the functioning of the system.

COMPONENTS OF A LIVESTOCK TRACEABILITY SYSTEM AND THEIR ROLES/FUNCTIONS

Controlling body or bodies

A traceability system needs a central controlling mechanism or mechanisms to carry out the following basic functions:

- setting of identification standards and specifications and issuing of identification codes to livestock producers for application to their animals via the specified identification devices;
- setting of standards for the various role-players in the system, i.e. farmers, transporters, traders, abattoir companies, and the accreditation and inspection of these role-players;
- the central recording of all movements of animals belonging in the system and, where

necessary, the follow-up and verification of these movements.

It is not necessary that all the above functions be vested in one controlling body; indeed it may be desirable to split these functions among more than one body so that a measure of cross-checking occurs within the system.

The registration of animal identification codes and their cross-referencing to owners and farming properties are of prime importance and go hand in hand with the register of farms/holdings (see below).

Register of participating farms/holdings

As alluded to above, there needs to be a register of accredited farms or holdings. These are farms whose management practices have been approved by the scheme through a suitable inspection and reporting system. The holdings must be inspected regularly by an inspectorate that will update the register as necessary. There needs to be a clearly stated set of standards or code of conduct to which these farms must conform; where farms fail to conform, their marketing privileges should be suspended until the shortcomings are corrected.

A key element (but not the only one) of the standards to be maintained is the reporting by farmers of the movement of animals to and from their farms.

Other registers

Accreditation standards and registers of approved organizations must also be set up for:

- livestock transporters;
- livestock marketing agents or traders;
- abattoirs.

The implementation of these standards should be monitored by the same inspectorate that monitors farm standards. Apart from the obvious health and welfare standards, these organizations and individuals should be required to keep a register of movements based on the identity codes of the animals with which they deal, and to submit regular reports on these movements to a central controlling authority.

Animal identification and backup measures

An animal identification scheme must be in place, under the control of a centralized body that sets standards, allocates identification codes and controls the distribution of identification

devices specified for use by the traceability system. Careful records must be kept of the identification codes issued – to whom, on which property and for which animal/s.

Identification devices must comply with certain minimum standards with regard to readability, tamper-resistance and safeguards against fraud.

The most straightforward system uses group identification and traces back only to the farm of origin immediately prior to slaughter. All animals will wear the same identification code; should an identification device be lost, it is easily replaced with another of the same type.

Most systems are more complex than this; animals are uniquely identified by the farmer at birth, weaning or just before leaving the farm. The farmer must keep a record of the identification numbers issued, together with a rough description of the animals thus identified; he/she must also notify the central authority of these identifications so that they can be centrally registered.

This type of identification – individual identification – assigns a unique identity number to each animal, which it will keep throughout its life. The animal thus keeps its own identification device from early in its life until it is slaughtered. If it moves to another farm, the new owner must notify the central registry that the animal (identified by its unique number) has come into his/her possession.

Given that the animal will keep its identification for a considerable period of time, a backup system is needed, should the identification be lost. What will happen if an ear tag is lost, or if a microtransponder malfunctions?

One way to handle such a situation would be to have a detailed description of each animal kept on file. If an animal loses its identification, its code could be found by looking up its description, and a duplicate identification device could then be requested by the owner. However, such a procedure would add enormous complexity to the system, as a database containing complete and detailed descriptions of each animal in the system would have to be kept.

The best way to handle such a contingency would be for each animal to carry a small secondary identification device: if the main device were lost or malfunctioning, there would

be a backup available. In Europe, cattle are tagged in both ears with tamper-proof plastic tags. A cheaper option would be to place a large and readable primary tag in one ear, and a small metal tag (unreadable except at very close quarters) in the other ear. Upon loss of the primary tag or microtransponder, the owner would read the animal's identity number from the secondary tag and file a request to the registering authority for a duplicate primary identification device.

Traders and transporters

Livestock trading agents, auctioneers and transporters have an important role to play as links in the production chain, even though their contact with the animal may be short-lived. They would have to:

- put in place a bookkeeping system with detailed records of all animals passing through their hands (identification numbers and dates of transactions at the very least);
- regularly notify (on a weekly or monthly basis) the central authority of all animal movements both into and out of their enterprises;
- maintain animal welfare standards in terms of the facilities they use, animal management, vehicle standards and acceptable driving practices.

Abattoirs

Abattoirs would be responsible for keeping records of all arrivals, and for notifying the central authority of arrivals and slaughterings so that slaughtered animals could be recorded as having been "terminated" and no longer in the system.

Abattoirs would also have to monitor the identification of animals carefully so that animals coming from farms that had lost their accreditation were rejected and not slaughtered. Records of such rejections would also have to be kept, and the central authority notified.

Abattoirs would have to adhere to a code of conduct in terms of animal welfare (facilities, handling, humane slaughter) and hygienic practices inside the abattoir.

TRACING OF LIVESTOCK MOVEMENTS THROUGH A TRACEABILITY SYSTEM

The role of the central authority

The work of the controlling authority is central to the success of a traceability system. Each movement of an animal through the system, together with the animal's identification number and the date of the movement, must be recorded. Movement recording of groups of animals is less voluminous than recording of individuals, but both types of system will require a computer database that keeps details of all movements. For a sample set of specifications for such software, see Box 4.1.

The role of the livestock owner

The livestock owner has a twofold role with respect to the system:

- allocation and registration of new identities;
- recording and reporting all movements to and from the farm/holding.

There are various options for the timing of assignment of identification codes to individuals. When a farmer orders a set of identification devices, his/her order is recorded by the central authority and the farmer is then responsible for the allocation of these devices to individual animals. He/she must then report such allocations to the central registry. The timing of allocation of identity numbers to animals may be:

- At birth: in farming systems where there are small numbers of animals involved, or that are intensive or semi-intensive, this is feasible.
- At weaning: in extensive systems where animals are usually handled at weaning for the purposes of vaccination and dosing, this would be a better time for the application of identification devices and reporting allocations to the central registry.
- On leaving the farm: where cost-saving and administrative simplicity are important, this would be the best time for assigning animals their identification codes. Only animals that move need be traced; thus, strictly speaking, only those that leave the farm need be identified.

The traceability scheme would spell out rules in respect of the above, and it would be the farmer's duty to abide by these rules. For ease of administration, a farmer would best be required to report on such registrations at regular

intervals (say monthly) by completing a registration record and sending a copy to the central registry. For an example of such a report, see Box 4.2.

Once an animal or group of animals leaves the farm for another destination, the farmer has to keep a record of the date of the transaction, as well as the identification numbers of the animals that have been moved from the farm. The central authority would also have to be informed, so that the movement could be recorded on the central register of movements.

There are a number of options for tracking and recording such movements. These include:

- **Option 1.** Animals retain their original ear tag lifelong. When change of ownership occurs, the owner completes a change-of-ownership document (on paper or by Web access or e-mail) for submission to the central registry, giving the date of the transaction and the name of the new owner.
- **Option 2.** Animals retain their original ear tag lifelong. Each animal has a passport that

accompanies it; original and new owners complete change-of-ownership notices (paper/Web/e-mail). In Europe, the chequebook-type passport has removable pages that are used as change-of-ownership notices.

- **Option 3.** Animals retain their original ear tag lifelong. Old and new owners complete registers of “arrivals” and “departures” on a monthly basis, which are submitted to the central registry (paper/Web/e-mail) each month. See Boxes 4.3 and 4.4 for examples of such registers.

By ensuring that each person in the chain records arrivals and departures, every animal movement is recorded twice; thus there is a double-check on each movement. The disadvantage of these systems is that there is a time lag between the time that a movement takes place and the time that it is centrally recorded. There are thus always a number of animals “floating” in the system. However, as long as farmers recorded movements immediately on their own on-farm registers,

BOX 4.1 Movement tracking software at the central registry – sample software specification

1. The software will be Internet-based and allow access by users from all over the country against a password. Data input may be by remote users (where possible) or by registry staff.
2. The database will be hosted by the central registry and managed from its servers.
3. The database will include data on:
 - properties: name, number, district, linked to producer/s on each property;
 - producer: name, personal ID number, postal address, telephone + fax, e-mail;
 - property identification codes as linked to properties and producer;
 - characteristics of livestock belonging to the producer:
 - i. individual identity number (i.e. ear-tag number)
 - ii. birth date
 - iii. sire and dam (where available/appropriate)
 - iv. performance data: birth mass, weaning mass, 18/24-month mass, slaughter mass and grade, date of slaughter/death, diseases, treatments (where available/appropriate).
4. The software will make provision for the recording of individual movements to other properties, auction pens and abattoirs, and the tracing of such movements through the appropriate queries. Additionally, the software shall make provision for ownership changes so that the animal with its ID is attached to a new owner, and each of these movements/changes of ownership shall be recorded in the database with the date at which each transaction occurred.
5. The software will be directly linked to abattoir tracing software such that a query made regarding a traceability code on a meat package will lead directly to the farm(s) on which the animal stayed during its life. Slaughter mass and grading data will also be transmitted from the abattoir to the central registry.

BOX 4.2 Example of notification of allocation by farmer of identification devices

NOTIFICATION OF REGISTRATION (TAGGING) OF BOVINE(S)

To be completed at the end of each month and forwarded to the Scheme Administration, PO Box 38, Blikkiesdorp. info@blikkies.com <http://www.blikkies.com/ID>

Producer name:	Producer code:
Year:	Month:

Date of birth dd / mm / yy	Ear-tag no.	Sire (Ear tag no.) (if available)	Dam (Ear-tag no.) (if available)	Sex (M/F)	Breed	Birth mass (kg)

BOX 4.3 Example of departures register

To be completed at the end of each month and forwarded to the Scheme Administration, PO Box 38, Blikkiesdorp. info@blikkies.com <http://www.blikkies.com/ID>

Producer name:	Producer code:
Year:	Month:

Full ear-tag number	Moved to District	To farm (name/number)	New owner	Veterinary movement permit number	Date of movement

BOX 4.4 Example of arrivals register

To be completed at the end of each month and forwarded to the Scheme Administration, PO Box 38, Blikkiesdorp. info@blikkies.com <http://www.blikkies.com/ID>

Producer name:	Producer code:
Year:	Month:

Full ear-tag number	Arrived from District	From farm (name/number)	Previous owner	Veterinary movement permit number	Date of movement

there would always be a means of tracing movements between farms in the event, for example, of an outbreak of contagious disease.

Many countries have a veterinary movement control system that controls the movements of groups of animals from one place to another through the issuing of movement permits. Endorsing the identification codes of moved animals on these permits would provide a further backup mechanism for movement tracing.

The role of traders and transporters

Agents and transporters would have to keep their own registers of movements of animals into and from their enterprises; records similar to the arrivals and departures registers, or “tear-outs” from passports would have to be submitted to the central registry so that the movement of each animal or group of animals would be recorded against a date and their identification codes.

The role of abattoirs

Abattoirs need to maintain their own “in-house” tracing systems so that a package of meat or a carcass can be traced back to the animal, or at least to the group of animals, from which it originated. Recording times of deboning or packaging would allow trace-back to the slaughter of the original consignment of animals provided that the time from slaughter to packaging was constant and known. Such “time-based” systems are common, but a carcass marking system is far better.

Each carcass should be assigned a number immediately after bleeding-out and skinning, which should be recorded on a computer system; when the carcass is weighed and graded, this information could be recorded against the carcass number. If meat is deboned and packaged (i.e. mixing of meat from various carcasses occurs), the numbers of the carcasses in the consignment that is deboned must be recorded so that at least the batch numbers of the meat packages can be matched to a consignment of animals.

Ideally, the number assigned to the carcass should be recorded in the abattoir’s system against the identification number of the live animal so that the abattoir traceability system is seamlessly linked to the “field” traceability system. In theory, a farmer should be able to

query the traceability system to ascertain the slaughter weights and grades attained by each animal he/she consigned for slaughter.

Legislation and codes of conduct

Where a traceability system is obligatory at national level, appropriate laws or regulations are needed, and an institution must be designated as the enforcing authority.

In many countries, traceability schemes are voluntary and involve a group of farmers serving a particular market. In such cases, the scheme must have its own internal rules and farmers, agents, transporters or abattoirs not complying with these rules must be excluded from the specific market.

OVERALL SPECIFICATIONS FOR A TRACEABILITY SYSTEM

The first decision to be made when planning a traceability system concerns the level of definition to be used by the system. Tracing groups only means that herds are given single identity codes and that when the group is moved (e.g. sent from the farm to the abattoir) a single identification code is used in recording the movement, and all animals in the group will bear the same code.

In practice, group identification presents problems, especially when animals from different groups are mixed (e.g. a transporter moves animals from several farms to an abattoir). For this reason, many traceability schemes opt for individual animal identification. The specifications given here are proposed for individual identification.

The aim of the traceability system should be to provide for trace-back of a meat from the packaged product to the premises of origin so that the origin and cause of defects may be traced, and also to provide for forward tracing from any point in the production chain so that a batch of products can be recalled, if necessary. The system should further ensure that only products originating from approved role-players in the production chain can enter the market, and provide for the exclusion of products from non-approved sources.

- The traceability system should be under the control of one or more central authorities that will formulate and enforce the standards

- and rules of the system.
- Animal identification should be under the control of a central authority that will control the allocation and distribution of identification codes and identification devices.
 - Animals should be individually identified with devices that are safe, tamper-resistant, fraud-protected and adhere to certain standards, and are thus uniform in appearance and quality.
 - The scheme should make backup provisions in case of loss of identification devices.
 - Animal identification codes should be quoted in the recording of all movements and transactions within the scheme.
 - The scheme should make provision for the recording of movements of animals along the production chain from birth through finishing to the abattoir.
 - The allocation of identification codes to animals is the responsibility of the producer who should regularly report details of such allocations to the central authority.
 - The scheme should provide for standards to be adhered to by all role-players in the scheme, and should operate an accreditation mechanism to allow participation in the scheme.
 - Adherence to scheme standards should be monitored by regular inspections carried out by an inspectorate accredited to the scheme.
 - The scheme should ensure that traceability of animals in the field is linked to traceability within abattoirs.

• Checklist for the implementation of a traceability system •

Animal identification and traceability go hand in hand, and those responsible for initiating modern systems of identification are usually also those who take the lead in setting up traceability systems, i.e. private sector role-players.

For this reason, the initial steps to take in setting up traceability schemes would be the same as for identification systems. Market and regulatory requirements would have to be balanced against the abilities of the farming community, agents, transporters and abattoirs in order to assemble a workable scheme.

A registering/controlling body would have to be created, and its exact responsibilities and resources defined. The creation of one or more controlling bodies might also be contemplated, or a government department or agency might be able to take on some of the control functions required by the scheme. Thought would have to be given to the issue of whether a voluntary or compulsory scheme would be appropriate.

Detailed and careful consultations would be needed in designing the scheme, the responsibility for which would lie with the controlling institution. Considerable time would have to be invested in publicity and training, given the complexities of administering the system.

A checklist of tasks to be undertaken in assembling a traceability scheme follows.

ACTIVITY	✓
Assessment phase:	
Market needs	
Farmer abilities	
Initial design proposals (taking identification system into account)	
Planning:	
Identification and involvement of stakeholders in planning	
Scheme standards and procedures	
Registration and control (including software design)	
Logistics of implementation, recording, reporting	
Specification of administrative procedures	
Cost implications and cost-bearing	
Central controlling/registering body – structure, functions, resources	
Drafting of legislation/registration (if necessary)	
Awareness and training:	
Formulation of publicity message	
Undertake publicity campaign through relevant media	
Identify categories of people to be trained:	
– farmers	
– extension workers	
– agents/traders/transporters	
– abattoir staff	
Creation of appropriate training materials	
Set training dates, venues and execute training	
Implementation phase:	
Set implementation date	
Finalization of necessary software, purchase of equipment	
Creation of registration body	
Creation and testing of traceability procedures, computer system	
Begin registration processes, recording of movements	
Monitor progress	

Summary

- The need for animal traceability began with the emergence of various food-borne diseases and the need to control the entry of harmful residues into the food chain; it has now evolved as a marketing tool to enable consumers to be certain that purchased food items originate from production practices that are safe and morally acceptable.
- A traceability system allows for the identification and tracing of a given item as it moves through a production chain from start to finish.
- Conditions at each point in the chain must satisfy certain minimum standards and be monitored by a system of regular inspections.
- There must be a central authority or authorities controlling the traceability system/scheme.
- Aspects requiring central control include:
 - standards for identification, and the issuance of animal identification codes to producers;
 - codes of conduct for role-players, and the accreditation and inspection of role-players and their activities (this includes farmers, traders, transporters and abattoirs);
 - movement recording and tracing/verification.
- These controls could be assigned to a single body, or split among two or three controlling authorities to enable cross-checking.
- There must be a register of accredited farms/holdings linked to a register of animal identifications allocated to these holdings.
- Other role-players such as traders, transporters and abattoirs must also be registered with the traceability scheme.
- Animal identification must be safe, readable, fraud-protected and tamper-resistant.
- Provision must be made for loss of identification devices.
- Producers must record each application of an identification device and report these to the central authority on a regular basis.
- Producers must record all movements to and from their farms and report these transactions (with dates and identification numbers of animals involved) to the central authority.
- Other role-players involved with movement of animals along the chain of production (traders and transporters) must record all transactions (giving dates and animal identification codes) and report these regularly to the central authority.
- Abattoirs must record details of all arrivals and report these to the central authority. The identification of animals must be linked to the identification of carcasses so that tracing is possible from the meat to the animal or group of animals from which it was derived.
- Holdings or farms that have lost their status within the system must be recorded and any animals that originate from such farms must be denied access to slaughter facilities.
- Provision must be made for legislation to enforce the system (where it is obligatory on a national basis); otherwise those who break the rules of a voluntary scheme must be denied marketing rights.
- Traceability requirements are increasingly seen as means of gaining and maintaining market access. Countries may apply traceability criteria to imports provided that these do not exceed requirements applied at the domestic level.

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