

# How can traceability systems influence modern animal breeding and farm management?

*by Ole Klejs Hansen, Livestock Registration and Milk Recording (RYK), Agro Food Park 15, DK-8200 Aarhus, Denmark.*

## Abstract

Unique lifetime identification number is the key component to join data from different databases and different herds during the animal's entire lifetime. In principle data on each animal should be owned by the owner of the animal, meaning that when an animal is bought, all previous information follows the animal to the new owner.

Information from artificial insemination supplies information on service dates and sire. Requiring registration of dam at birth can help building pedigree information on maternal side for animals outside voluntary registration programmes and herd books with registration of sire, helping to expand the active breeding population.

More data and better data forms the basis for better herd management and breeding programmes.

---

## Introduction

Identification is a key factor in everyday herd management, animal recording systems and disease control systems. Recording systems such as herd book and milk recording are driven by breeder organisations. Disease control systems are normally authority driven. Sometimes identification systems used in different programmes are not coordinated and animals have different identities in different types of programmes. Maybe the animal has one tag from the herdbook and different tag from a tuberculosis eradication programme. When animals move to another herd they might receive an additional identity administered by the herd owner and maybe without links to the previous identity.

In recent time food safety issues, eradication programmes for contagious diseases, feed borne disease agitators, and animals moving over long distances have caused countries or regions such as EU to introduce traceability.

Identification of animals can be done without traceability, but traceability cannot be done without identification of animals and herds. Coming from EU, where it is mandatory for all countries to have such systems in place, it is hard to imagine how we could do without it.

Herd books and recording systems have been in place since more than 100 years using the identification systems available at any time. What is then the importance of modern traceability systems and lifetime ID-numbers?

## The unique lifetime identification

Without unique lifetime identity of animals it could be difficult or impossible to connect data from different parts of the animal's life or from different programmes in which the animal was involved. In this way valuable information might be lost not only for traceability but also for management and breeding.

The unique lifetime identity enables all data recorded on a specific animal during its full lifetime to be accessible provided that this identity is used in all databases. It is still possible to use owner defined identities as long as those are referring in databases to the unique lifetime identity. Provided that you are the owner of the animal, you should in theory automatically have access to all information ever reported on that animal.

Animal breeding programmes have typically been built on animals registered in herd books. In some countries animals have to be actively registered in the herd book implying a registration fee. Only herd book animals will receive official pedigrees. However, animals outside the herd book are also considered in the breeding programmes. In other countries the approach has been that any animal with a specified portion of ancestry coming from one breed have been automatically considered herd book animals without paying registration fees.

Such different regimes of course have effect on the proportion and number of animals in herd books and might also affect the number of animals with known pedigree, - in what we call the active breeding population.

Production traits, conformation traits, milkability and temper have in general relatively high heritabilities ( $>0,2$ ). The hereditary effects are relatively easy recognised in individual animals so the effects of breeding activities are obvious. Such traits can be assessed with a moderate number of animals but of course the reliability increases with the number of animals in the group.

Functional traits, fertility and health traits have relatively low heritabilities ( $<0,1$ ). The hereditary effects are more or less invisible on individual animals, but still data collected from large numbers of animals are able to reveal useful information. If the active breeding population could be increased, it might improve the possibilities of breeding values for such traits.

### **The active breeding population**

When a calf is borne EU legislation requires that the identity of the calf and its mother are reported along with the calving date and the sex of the calf to the national animal movement database. So for all cattle the mother is now identified and this could open for half the ancestry of the animal.

Where artificial insemination is used, data on services including the identity of the serviced animal and the sire is reported to the database of the AI organisation. So when a calf is borne the AI service information in combination with the calving information could provide reliable information about the father of the calf. This is in fact in many herd books the way to determine the father of the calf.

In systems where one bull is used for natural mating in group of cows or heifers the mating period could be reported to the database with information about the bull and the females in the group and about dates of start and ending of the period. This is another way to determine the father of the calves.

So it is possible to establish after some years full ancestry for a lot of cattle that might not have been registered in the herd books and might not participate in milk or beef recording systems. This information can be useful not only for the herd owner when choosing animals to breed or slaughter and for breed organisations collecting other types of data, but also for tracing back hereditary diseases which do of course not affect only herd book animals.

Today in some countries you are able to receive a complete and officially approved pedigree for a dairy cow, which has no milk records. Of course there would be no production records, but the

ancestors and calvings would be there and data recorded for the animals could be used in breeding programmes.

So the requirements from the traceability requirements can in combination with information from artificial insemination or mating periods help open the pedigree of many non herd book animals. On top of this the lifetime ID-number can help secure that recorded data can be related to the animal and will not be lost when animals move between herds and countries.

### **Animal production recording**

Data from production recording systems also benefit tremendously from the unique lifetime identification and the traceability systems. First the animal keeps the lifetime identification when moved between farms or even from one end of the country to another. Second the traceability system ensures knowledge of the whereabouts of the animal. So it will always be possible to link information in databases across geography, production recording systems, disease control programs etc. etc.

Without unique lifetime identification the animal might receive a new identity every time it is moved, and the new owner might not know the previous identity of the animal. Without traceability the new owner might not even know where the animal came from, so he might not be able to link to information from the previous farm.

Production recording is not only voluntary recording of milk yield or weight gain. It could also for instance recording of slaughter data from abattoirs and combining this information with information about the age and ancestry of the animals. This would enable breeding value estimations of bulls for daily weight gain and quality of carcass without other efforts from the farmers than identification and traceability of animals plus registration of the bulls used.

### **Access to data.**

Veterinary treatments are reported by veterinarians to their invoicing systems. Normally information is reported about patient, date, diagnosis, treatment, and maybe medicine administered. In combination with the animal identification data this could provide the basis for estimation of breeding values for animal health.

Data from abattoirs could be the basis for estimated breeding values on growth and carcass conformation. This could be of special interest for beef cattle with relatively low proportion of on farm weighing.

Data from artificial insemination could form not only the basis for establishing the pedigree but also to establish estimated breeding values for fertility traits

All of this is of course only possible when data is available for scientists to be used in this type of calculations. In some cases it might be that the database owner is not willing to provide data to be used by others or will not do it free of cost. In some cases it might be that regulations restrict data access.

In some countries all types of data mentioned are in one national database owned by the farmers. Data belong to the farmer and the farmer decides who can access his data. Data required for mandatory animal movement registration all pass through the national cattle database on their way to the authority section of the database and to the authority backup database. Authorities only have access to information from legislative mandatory information. For example authorities have no access to veterinary treatment information considered to be farm management information. But

where antibiotics or hormones are used the information is available for authorities because the use of these kinds of drugs is under strict authority control.

### **Use of data**

The availability of data on pedigree, performance, conformance and also veterinary treatment is important for the farmer, his veterinarian and his advisers. The importance of data access increases with herd size. If the farmer has 10 cows, he will probably remember much about each of them. If the farmer has 100 cows he might still remember something, but if he has 1000 cows it is impossible to remember. So with increasing herd size detailed reporting of any observation or event becomes more and more important. But recorded data have little value if it cannot be accessed.

Data on performance, reproduction and health are important in everyday management of individual animals and of herd. Data is indispensable for the farmer and his advisers at periodical check ups on feeding and management at herd level, at least in bigger herds.

The national cattle organisation may have the right to use data for breeding value estimation or for general data analyses, but never to publish results in a way that they can be traced back to one farm, unless with the consent of the farmer.

In some countries some data sources mentioned might not be accessible (artificial insemination, abattoirs or veterinarians). Access to data really is a big issue and data access policies (private and public) might hinder a good application in the future.

### **Future options**

When used in EID devices the lifetime numbers can be used in automatic identification of animals whenever needed provided the barn equipment is prepared for it. On farm it can be in feeding devices, milking parlours, robotic milking systems, sorting gates, weighing stations etc. The farmer would no longer need to shift neckband transponders between animals and to also keep his computer system updated about it, so the lifetime identification takes a cause for errors away.

A pretty new aspect is the identification with ear tags that allow a body tissue sample from the ear. When the tissue sample tube integrated in the ear tag has already from the tag manufacturer the exact same identification code printed on it as the rest of the tag, the identity of the animal sampled is unique and secure. When the tissue sample is analysed there is no cross reference needed regarding the identity of the animal because the animal ID is printed on the test tube. Perhaps this type of sample material could be used for DNA parentage testing and in genomic selection.