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

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Summary

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 belongs to the owner of the animal, meaning that when an animal is bought, all previous information follows the animal to the new owner.

Artificial insemination data includes information on service dates and sire. The traceability requirement of registering the dam when a calf is born can help building pedigree information on maternal side for animals outside voluntary registration programmes and herd books. This, along with registration of sire, helps to expand the active breeding population.

Some data collected through the traceability system could be used for herd management and breeding programs. This could be fertility data (age at first calving, calving intervals, etc.), slaughter data (age at slaughter) and animal health related data (longevity, still births, deaths other than slaughter).

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

Introduction

Identification is a key element 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 (e.g. veterinary services) driven. Sometimes identification systems used in different programmes are not coordinated and animals have different identities in different programmes; for instance, the animal may have one tag from the herd book and another different tag from a tuberculosis eradication programme. When this animal moves to another herd, it might receive an additional identity administered by the new herd owner without being linked to the previous identity.

In recent time food safety issues, eradication programmes for contagious diseases, risk of feed borne diseases, and animals moving over long distances have forced countries or regions such as the European Union (EU) to introduce and / or strength traceability systems. 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 added value of modern traceability systems and lifetime identification (ID) numbers?

The unique lifetime identification

Without unique lifetime identity of animals it would 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 that different farmers use different owner defined identities as long as these identities refer in the databases to the unique lifetime identity. In theory, the owner of the animal should automatically have access to all information ever reported on that animal.

The active breeding population

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

Where artificial insemination (AI) is used, data on services including the identity of the serviced animal and the sire are 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 sire of the calf. In fact, this is the way to determine the sire of the calf in many herd books. In systems where one sire is used for natural mating in a group of cows or heifers, the mating period could be reported to a section of the AI database or the animal movement database with information about the sire and the females in the group and about dates of start and ending of the mating period. This is another way to determine the sire 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 such as culling reason etc., but also for tracing back heriditive diseases and genetic defects which do of course not affect only herd book animals.

Today in some countries, one can receive a complete and officially approved pedigree for a dairy cow, which has no milk records. Of course there would be no milk production records, but the ancestors and calvings would be there and other data recorded for the animals such as health data, could be used in breeding programmes.

The Dam ID requirement of the traceability system, in combination with information from artificial insemination database, will enable establishment of the pedigree of many non herd book animals. On top of that, the lifetime ID-number will secure that recorded data on the animal will not be lost when the animal moves between herds and countries.

Animal performance recording

Data from performance recording systems also benefit tremendously from the unique lifetime identification and the traceability systems. Firstly, the animal keeps the lifetime identification when moved between farms or regions. Secondly, 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.

Performance recording is not only voluntary recording of milk yield or body weight gain. It could also be for instance recording of slaughter data from abattoirs. Combining this information with information on the age and ancestry of the animals, would enable breeding value estimations of bulls for growth and quality of carcass without other efforts from the farmers than the identification and traceability of animals plus registration of the sires used.

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 and pedigree data, this could provide the basis for estimation of breeding values for some animal health traits.

Data from abattoirs could be the basis for estimated breeding values on growth and carcass related traits (e.g. 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

Data access and use

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 who decide on whom can access their data. Authorities only have access to legislative mandatory information. For example, the authorities have no access to veterinary treatment information considered to be farm management information. But where antibiotics or hormones are used, the information is accessible by the authorities because the use of these kinds of drugs is under strict authority control.

The availability of data on pedigree, performance, functional traits 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 1.000 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 the herd. Such data are 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 of the data sources mentioned might not be accessible (artificial insemination, abattoirs or veterinarians). Access to data is a big issue / concern, and data access policies (private and public) might hinder a good application in the future.

Future options

When used in electronic identification devices, the lifetime numbers can be used in automatic identification of animals whenever needed provided that 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 keep his computer system updated, so the lifetime identification takes a cause for errors away.

A pretty new aspect is the identification with ear tags that collect 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.