EID and Other Technological Advances in Small Ruminant Research

Electronic identification (EID) was investigated in the early 1980s to accurately monitor and track farm livestock movements from one holding to another. Within Europe, legislation governing traceability now requires the identification and registration of most livestock species. In the UK, EID became a mandatory requirement for sheep identification in 2010. Whilst all farmers EID-tag their animals, the potential for using EID technology to improve animal performance is scarcely exploited by small ruminant farmers in more extensive conditions. This article presents findings from studies exploring the possibilities of applying EID technology in small ruminant farming systems, particularly in extensive conditions.

Introduction

Prior to the mandatory requirement of EID, tagging of small ruminants had been used for over 60 years, most often in the form of self-piercing plastic ear-tags. Tagging is an important part of livestock traceability, not only for the consumer to be sure of the provenance of the end-product, but also for monitoring and controlling disease outbreaks. Much of the legislation regarding sheep movements and tagging was introduced after disease outbreaks, such as Foot and Mouth Disease in 2001 and 2007 in the UK, when issues surrounding tracking of animals were raised.

Various research programmes in Europe were initiated in the early 2000s to investigate electronic identification of ruminants[1], in particular small ruminants, leading to legislation at the European Union level. For sheep and goats, the current system for identification is based on Council Regulation (EC) No 21/2004[2]. In the UK, all breeding animals over 12 months require unique EID. In Scotland, Northern Ireland and England, younger slaughter animals (12 months old or less) also require an EID tag, whereas Wales is considering this for 2016[3].

The Technology

There are various forms of EID, which are a type of radio frequency identification (RFID). EID can be in the form of an ear-tag, a bolus in the stomach or an implant. However, in the UK the mandatory requirement is for an EID ear-tag that is *low frequency*. These tags have a relatively low read range (about 20cm) and work passively, which means that the information they contain can only be read[4]. The next generation of tags, known as *ultra high frequency (UHF)*, have read/write ability and information can be written directly to the tag[5]. The read range is also far greater. Feasibility studies are being carried out (e.g. in Norway and in the UK) with such tags to encourage better uptake by the supply chain (e.g. abattoirs, marts) and to allow better animal feedback to the farmers.

EID readers are used to read and collect the individual ID number stored on the EID tag or bolus. There are different types of tags, as well as different commercially available readers. Readers can be either handheld (mobile) or panels (fixed). Panel readers can be attached either to a race wall or fitted within a weigh crate.

Digital weigh heads have been developed to collect, store and use information about each individual EID tagged animal that passes through an automatic weigh crate. The information can then be stored by farm management software. More sophisticated weigh crates can also have an automatic animal sorting function, where information linked to the animal's EID number is stored within the weigh head and is used to automatically allocate animals into different pens via automatic gates.

The handheld readers are particularly useful when collecting a list of individual EIDs from animals in a race or a pen, as the readers are portable, robust and relatively affordable and simple to operate. The list of EIDs from these animals is stored in the reader, and can be printed or downloaded on a PC, tablet or smartphone. Some of the farm management software companies have developed mobile applications designed to be used on smartphones or tablets, so that information about animals can be entered live whilst on farm.

The Issues

Because of the mandatory aspect of EID tagging legislation, many small ruminant farmers have been reluctant to adopt the technology[6], as EID tags are more expensive than their non-EID equivalents, with no immediate obvious benefits. In addition, although some handheld EID tags readers are affordable, the costs of the sheep handling facilities required to realise the full potential of EID are currently high, requiring large capital expenditure that sheep farmers feel they cannot afford. There have also been some issues reported by the industry regarding the reliability and readability of the EID tags[7, 8]. However, the technology could still represent an ideal opportunity for improving or simplifying management of small ruminants on farms, especially in extensive conditions where animals are not handled frequently.

The Research on Management Options

One of the main benefits for the farmer relates to mandatory record-keeping (medicine, deaths and movements), which is made easier by employing EID technology. However, there is further potential for EID to be used on farm, to streamline management. Supported by the Scottish Government's research programme, research conducted at the Scotland's Rural College (SRUC) Hill & Mountain Research Centre in the West of Scotland is focused on investigating the potential of using EID in automated livestock management. In this case, EID acts as a tool for precision livestock farming, where more precise management decisions are made on an individual animal basis, in terms of breeding, health and welfare,

productivity and labour. In particular the research focuses on:

- *Breeding*: EID is supporting data collection for performance recording and estimation of breeding values (EBVs). Breeding and pedigree information is stored and linked to the EID number of the animals, allowing easy retrieval for later use. The animals are identified and sorted into different mating groups using this technology.
- *Health and welfare:* EID is being used to ease and improve record-keeping of health treatments of individual animals. Any information relating to animal health or to a specific treatment given to an animal is linked to the EID tag and becomes readily available. One of the research projects, in collaboration with the Moredun Research Institute, focuses on lamb worming management to target individual requirements[9,10], which can contribute to slowing anthelmintic resistance.
- *Productivity and labour:* Weight data collection using EID electronic devices is being used to manage individual animals based on their weight change. Research at SRUC is testing a targeted approach to winter feeding of ewes, based on individual weight change recorded using this system[11]. Auto-sorting animals (via the combined use of an EID reader and weigh crate with 5-way automatic sorting gates) also eases farm handling and is saving labour on farm[12].

Data is being collected over a large-scale four-year project, encompassing each of these areas, and should produce evidence to derive recommendations for farmers and policy-makers on the use of EID for extensive sheep management.

Uptake by Farmers

Uptake of new technology on farms is often slow, especially in extensive livestock farms. Participatory research was conducted by research staff at SRUC's Hill & Mountain Research Centre to understand how livestock farmers (particularly extensive sheep farmers) view and use EID technology on their farms and to investigate potential barriers to uptake of this technology. Surveys with farmers were carried out at sheep shows and events on the use of EID within sheep farming. Although only a quarter of the 115 farmers surveyed had a handheld reader, and only a few had an EID weigh crate, over 90 % thought that using EID for sheep management could be useful. The main barriers to implementing the technology were the costs of equipment, the lack of financial help, and wariness of the technology itself. Similar conclusions have been found in France[13], another country with a large proportion of small ruminant farmers with comparable issues regarding the technology. A multi-media campaign has been launched by SRUC's research team and preliminary feedback suggests that these methods could be successful in changing opinions and encouraging uptake by farmers and policy-makers.

Conclusions

Key Benefits of Implementing an EID-managed System on Sheep Farms:

- **Ease and accuracy of data collection** – to benefit from EID, the only technology required is a reader and electronic numbers embedded in microchips within ear-tags. Reading the tag gives access to all the stored information relating to that particular animal, with few opportunities for errors to occur. Once recorded, the information can be easily transferred to farm management software for further use.
- **Speed of animal handling and labour savings** – using the technology greatly reduces handling time. A properly-calibrated automatic sorting weigh crate can simultaneously weigh and draft up to 500 animals per hour. At the whole farm level, this can lead to substantial labour savings.
- **New opportunities for animal management** – on larger, more extensive farms, management can potentially be altered and positively enhanced using individual EID data recording and utilisation. This offers a major opportunity for farmers to improve productivity, animal welfare, and efficiency of their system (e.g. worming strategy, targeting feeding, etc.).
- **Animal welfare and health and safety for staff** – decreased handling of individual animals through the use of an automated weigh crate can improve welfare and reduce stress, which can have negative effects on production, especially at key periods such as early pregnancy. Targeted health management (e.g. worming of lambs) also brings health and welfare benefits, including those linked to slowed anthelmintic resistance development and better economics. It can also reduce health and safety risks for those handling the animals.

Key Issues to Potentially Increase Farm Efficiency Across the Industry:

- More evidence is required to demonstrate any economic returns in using EID technology for sheep management. Lower costs or financial help to acquire the equipment would also help considerably.
- Initiatives to help share the costs of the technology are needed to improve uptake amongst sheep farmers.
- Specific training and/or readily available assistance with the technology on farm should be provided in the form of decision support programmes to help make use of farm data, and advice on how to improve returns through using such data.
- Face-to-face training and support and on-farm demonstration of how to use the technology are means of information dissemination that are valued by farmers, and therefore should be supported to encourage uptake, in particular to show that EID for farm management can reduce labour.

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