WYSIWYG EID for cattle: a ScotEID proposal

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Introduction

1. The European Commission's report on bovine electronic identification[1] (EID) noted stakeholders' preferences for electronic tags to have the same ID written on the outside as is encoded internally: so-called What You See Is What You Get (WYSIWYG).

2. The report also stated that it is not possible to achieve WYSIWYG whilst retaining the ID coding currently used for (non-electronic) cattle identification. This assertion is repeated in the Commission's Impact Assessment,[2] together with acknowledgement that changing the ID coding would incur significant costs and add further complexity in terms of adjusting databases and tags.

3. Yet the stated incompatibility of existing IDs with WYSIWYG is based on an assumption that there is insufficient electronic storage space (measured as number of bits) on a tag. This neglects technical possibilities for alternative allocations of available space which could allow retention of the existing ID coding and thus avoidance of adjustment costs.

More efficient ID storage

4. An ID is stored electronically within a tag in binary form (0,1) with the space (bits) required to represent a given ID depending both on the length (number of characters) of the ID and how many bits are used to represent each character. For example, an eight-bit system uses more space per character than a six-bit system, with the difference multiplying up for each character represented.

5. However, choice of the number of bits to use per character also depends on the number of unique characters that may need to be represented. For example, a six-bit system can only represent 64 (two to the power of six, 2^6) unique characters whilst the perhaps more familiar eight-bit system can represent 256 (2^8).

6. Although there is some variation in terms of overall length[3], non-electronic cattle IDs in use across the EU27 are all constructed as two-letter country codes followed by no more than 12 numbers – as suggested by EC 911/2004[4] - giving a maximum length of 14 characters. In addition to the digits 0 to 9, some IDs contain spaces and letters (but no other punctuation marks) and all letters used are uppercase.

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[1] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2005:0009:FIN:EN:PDF
[2] http://ec.europa.eu/food/animal/identification/bovine/docs/bov_id_ia.pdf
[3] See MS information at http://ec.europa.eu/food/animal/identification/bovine/id_bovine_animals_en.htm.
[4] See EC 911/2004, Implementing Regs for EC 1760/2000 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:163:0065:0070:EN:PDF

7. This suggests that only 37 unique characters actually need to be represented in order to encode any cattle ID compatible with the current arrangements. Hence a six-bit system would be sufficient, and would require only 6x14=84 bits of storage space.

Available storage space

8. The storage space available on a tag is constrained by either physical capacity of the transponder and/or established standards for how different bits on the transponder are to be used. For livestock EID, ISO11784 & ISO11785 are two of the relevant standards referred to by the European Commission.

LF

Although at one stage limited to 64 bits by physical constraints, modern LF transponders do have sufficient physical space to accommodate six-bit WYSIWIG representation of IDs, plus some further information.[5] However, partly reflecting historical physical constraints, ISO11784 stipulates how bits on a LF tag are allocated – specifically, 10 for country code[6] and 38 for animal ID. As such, although feasible from a technical perspective, six-bit WYSIWYG representation of current IDs would not be ISO-compliant (i.e. the 48 bits specified by ISO is less than the 84 bits required using six-bit coding).

UHF

10. International standards have yet to be agreed for bit allocation on UHF tags, but emulating ISO11784 would not be compatible with WYSIWYG representation of current IDs. However, all UHF tags have an "EPC" (electronic product code) data block which typically offers 96 bits of available space. This would be sufficient to store current IDs as WYSIWYG using a six-bit system, with surplus bits remaining for some limited additional information such as retagging status or encoding system. Hence, again, WYSIWYG IDs are feasible from a technical perspective, but not from a compliance-with-current-standards perspective.

Reading IDs

11. Provided that an ID can be read from a tag and that the method of encoding and reading is readily apparent such that it can be repeated by other users, the precise methods used are arguably relatively unimportant. That is, it is the ID itself that is of interest. Standardisation

[5] Indeed LF manufacturers are seeking to expand physical storage space even further meaning that more expansive (e.g. 8-bit) coding could be used – although as noted above this is not actually needed.

[6] 10 bits are, via a base-16 hexadecimal conversion, sufficient to hold a three (strictly four) digit decimal value compliant with country codes under ISO3166-1 numeric - hence the Commission's assertion that a 3+12 numeric ID would be needed for WYSIWYG. Importantly, ISO3166 also specifies two-letter country codes, meaning that 2+12 IDs are perfectly acceptable.

of encoding and reading methods may be desirable to reduce the scope for confusion and/or costs of duplication, but different systems can co-exist. This is self-evident for external visual written and barcode representations of IDs but also applies to electronic systems.

12. Specifically, one or more bits on a tag can be used as flags to indicate which coding and bit allocation method have been used and readers can be programmed to use this information to identify how to read the rest of a tag. This applies to both LF and UHF readers (although neither would be ISO compliant, and adapting LF readers would be more of a technical challenge), and hence six-bit WYSIWYG could operate alongside another encoding system if not adopted as *the* standard.

Conclusion

13. The preference for WYSIWYG EID cattle tags could be accommodated within existing technology whilst also retaining the existing cattle ID coding if a simple six-bit system was utilised. This would avoid disruptive and expensive adjustment to current databases and the installed base of existing IDs, and could be implemented for both UHF and LF tags. A suitable six-bit standard would need to be agreed, but examples do already exist.[7]

14. However, the allocation of bits required to implement this would not be compatible with current ISO stipulations for tags or read protocols. Specifically, irrespective of the storage physically available, the prevailing ISO standards only allow 48 bits to be used for animal identification (the rest being left idle or used for something else) and even six-bit coding would require 84 bits.

15. This highlights the need to consider updating ISO11784 & ISO11785 to better reflect technical advances since the standards were first drafted and changes in the purposes to which the technologies are now being put. Alternatively, other standards could be adopted – either as substitutes or complements.

16. Given the limited volumes of live cattle exports and the possibility for co-existence of different encoding/reading methods, standardisation to a single method is arguably disproportionately restrictive when such adherence may itself impose significant costs in terms of disruption to existing systems and/or constraints on usage. Hence, six-bit coding merits serious consideration.

[7] See http://en.wikipedia.org/wiki/Six-bit_character_code.