

Review of Selected Cattle Identification and Tracing Systems Worldwide

Lessons for the New Zealand National Animal
Identification and Tracing (NAIT) Project

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Executive Summary

The purpose of the proposed National Animal Identification and Tracing (NAIT) system is to safeguard the New Zealand brand and farmers' income by protecting market access for New Zealand animal products through enhancing regulatory and consumer confidence in New Zealand's ability to manage biosecurity and food safety risks. NAIT is a system to enable the rapid and accurate tracing of animals from birth to slaughter, and to provide key information related to these animals and the properties on which they have resided.

New Zealand is not alone in having animal identification and tracing systems, including national schemes, and there are lessons to be learnt from the international experience. While ad hoc information on these systems have informed the provisional NAIT design, a more comprehensive and documented review was needed to satisfy the NAIT project team that the development of any solution for New Zealand will be fully informed by a more robust understanding of the benefits and constraints associated with similar systems overseas. The Ministry of Agriculture and Forestry Biosecurity New Zealand (MAFBNZ), as a NAIT partner organisation, has undertaken this review on behalf of the NAIT project.

REVIEW APPROACH

The approach taken has been to consider the international guidelines, including the World Organisation for Animal Health (OIE), and to develop an overall picture of a range of systems in use by countries and how they work with a focus on core design elements. An analysis of the main advantages and shortcomings associated with each system was considered and the main lessons for New Zealand were summarised. Information was gathered through internet search, peer reviewed scientific literature, interviews and e-mails with officials, reports and audit findings from national and multinational organisations, media releases, farming press articles, etc. The review team found there was a lack of readily available detailed design information and little cross-system comparative analysis. The review was also limited to what was available in English (and Dutch in the case of The Netherlands). Despite these limitations, a useful picture of the various system designs has emerged and the comparisons with New Zealand's current systems and the proposed NAIT design can be drawn.

COUNTRY SYSTEMS REVIEWED

The level of detail included for each country was dependent on information available. More comprehensive reviews were undertaken of Great Britain, Australia, Canada, The Netherlands, Switzerland and the United States of America. Other countries reviewed were Japan, South Korea, Argentina and Brazil. A table outlining the comparisons between the systems is summarised on page 45 of this report, with greater detail provided in country by country sections – summaries of the systems reviewed are provided below:

Great Britain

A computerised Cattle Tracing System (CTS) was launched in Great Britain in 1998 as part of further efforts to retain consumer confidence in beef. The system was introduced as part of the Government's strategy for eradicating bovine spongiform encephalopathy (BSE) and for lifting the European Community ban on exports. All bovine animals are required to be identified with a primary and secondary ear tag within 20 days of birth. Secondary tags may include radio frequency identification (RFID) chips at the owner's discretion. Cattle registration involves applying for a paper passport within seven days of tagging. Cattle are not permitted to leave their current location without a paper passport. Keepers of cattle must notify CTS within three days of a movement and within seven days of a death – many of these notifications are performed using paper forms.

Australia

The driver behind the development of the National Livestock Identification System (NLIS) has been the need to facilitate and ensure export access to European markets. NLIS became operational in 2000 and is run by Meat and Livestock Australia on behalf of SAFEMEAT, a joint industry and government partnership initiative. Recording of cattle movements became mandatory in all states and territories by 1 July 2006. NLIS rules require that all cattle must be tagged with an approved low-frequency RFID device prior to moving from the property of birth. The unique tag number incorporates the Property Identification Code (PIC) that links the tag to the property for which it was purchased. When cattle are moved, the recipient is required to notify the NLIS database of the movement, including the source property PIC, thereby allowing whole-of-life traceability to be established for each animal..

Canada

The Canadian system is primarily an animal identification system, linking animals back to the property of origin or tagging. The Canadian Cattle Identification program is managed by the Canadian Cattle Identification Agency (CCIA). The program was fully implemented from 1 July 2002 with legislation setting the requirements for cattle, bison and ovine species. The CCIA sets national standards for approval of bar coded and RFID tags into the program. From 1 September 2006, all cattle leaving their herd of origin are required to be tagged with CCIA-approved RFID tags except if going to an approved tagging site. Bar-coded tags are being phased out by December 2009. Tags are linked to a register and are associated with the animal until slaughter or export.

The Netherlands

The Netherlands is required to maintain a centralised computer database for recording the movements of individual cattle, as a member of the EU. The I&R ('Identificatie & Registratie' – identification and registration) system is operated and maintained by the Ministry for Agriculture, Nature and Food Quality. All cattle are required to be ear-tagged and registered on the database within three days of birth. Officially approved tags are required to include visual unique identifiers consisting of a country code and barcode. The I&R system does not incorporate provision for paper-based data submission. Approximately 95% of the 12 million annual data transactions are conducted by third parties such as the suppliers of farm management software, saleyards and meat processors.

Switzerland

The Swiss parliament passed legislation in 1999 establishing the Animal Tracking Corporation, renamed Identitas Ltd in 2006. Identitas is the entity responsible for the design, implementation and operation of the Swiss animal identification and tracing system. Under the Swiss system, cattle are tagged in each ear and are registered with Identitas from birth. Ear tags include country of origin and unique animal identification visual identifiers and a corresponding barcode designed to be compatible with EU requirements. When animals are

moved, the sender must prepare two copies of a movement document, one to be kept and the other provided to the recipient. These movement permits contain details of the animals that have been moved: the source and destination premises, the species and unique identification numbers, and health status.

The United States of America

The National Animal Identification System (NAIS) is administered by Veterinary Services, which is a division of the Animal and Plant Health Inspection Service, which, in turn, is an agency of the United States Department of Agriculture (USDA). The NAIS system has been structured as a Federal-State-industry partnership, with responsibility for implementation of NAIS being shared amongst industry groups, private companies, State and Tribal governments, and USDA. The NAIS program is moving through an initial implementation period where participation is currently voluntary, with full program implementation to be under a phased-in plan. Producers opting for registration of their animals under NAIS will have their animals identified either individually with a unique Animal Identification Number; or, if their animals are managed and moved through the production chain as a group, their animals will be identified with a Group/Lot Identification Number.

Japan

The *Law for Special Measures Concerning the Management and Relay of Information for the Individual Identification of Cattle* was introduced in June 2003. The system set up by this law links the identifier on an individual animal (bar-coded ear tag) to the final product, such as consumer packaged steak, and allows individuals to search an online web database (the Individual Cattle Identification Register) to find out information on the specific animal. Cattle owners, slaughterhouses, beef wholesalers, retailers and specific dish caterers all have obligations under the law. Cattle owners transferring or selling animals have obligations to immediately notify the National Livestock Breeding Centre of the details of ear tag identification, destination, and date of transaction; and the persons receiving animals have the equivalent obligation. The inspection system is overseen by the Ministry of Agriculture, Forestry and Fisheries.

South Korea

The South Korean Government is putting in place a mandatory beef tracing system by the first half of 2009. The South Korean Beef Tracing System (BTS) has evolved from an initial cattle farmer organisation trial that commenced in October 2004. The BTS system is led by government, and individual farming households and processors will have obligations to provide data from 2009. Under new laws, all cattle must be tagged and will not be able to be slaughtered without tags. RFID options are also being explored. Farming households must register with the National Agricultural Products Quality Management Service. Each calf must be identified within two weeks of birth with two ear tags. Cattle details recorded on the BTS system include ear tag identification, date of birth, sex, breed, dam's identification, feed consumed, medical administration data, movements to and from premises and reason for movement.

Argentina

In 2003, Argentina established a limited mandatory system of cattle tracing directed at the EU markets. This tracing system operated primarily through word-of-mouth and was based on the reputation of suppliers. Although the system was sufficient to maintain the confidence of the Argentine domestic market, as well as that of many of its foreign customers, it was inadequate to meet the needs of all foreign buyers of cattle and beef. The currently operating Argentine Animal Health Information System (SGS) is based on cattle movement permits, the permit being a legal requirement for cattle movement in Argentina. Permits under SGS are issued for a single (one way) movement within seven days, or a new permit will need to be obtained. In 2007, Argentina instituted a compulsory cattle identification program, requiring that all

calves born after September 2007 carry official tags. This identification program opens the way to make it possible to track cattle from birth to slaughter. The entire Argentine beef herd is expected to be tagged by 2017.

Brazil

In 2002, the Brazilian Ministry of Agriculture, Husbandry and Supply published Normative Instruction 1, introducing the Brazilian Bovine and Bubaline Identification and Certification System (SISBOV) for the identification and tracing of all cattle. Implementation of the new system focused initially on premises engaged in providing animals to slaughterhouses that supply products destined for the EU. Since 2003, successive audits of SISBOV, conducted by the Food and Veterinary Office (FVO) of the European Commission's Directorate General for Health and Consumer Affairs, have found the system to be unsatisfactory. A further FVO mission conducted in 2008 identified considerable shortcomings in the auditing of the system by the Brazilian authorities, and this led to severe restrictions being placed on the importation of beef from Brazil into the EU. The impact of these restrictions has cost the Brazilian beef industry at least \$600 million (NZD).

SUMMARY FINDINGS

Of the systems reviewed in detail the following observations can be made:

- all ten are implementing individual cattle identification requirements;
- two are deploying or phasing in RFID technology, three have this technology as optional, and two are considering this technology;
- eight are mandatory for cattle, one is partially mandatory (Brazil), and one is proceeding with the intention that it becomes mandatory in future (United States of America); and
- four are administered under industry-government partnership arrangements and six are administered by government.

Overall, the proposed NAIT system, (as set out in Biosecurity Discussion Paper No: 01/08^{*}) compares favourably with the systems that are reviewed and includes more robust whole-of-life tracing requirements than many existing schemes. However, some countries have taken the full value chain concept further than NAIT proposes. While NAIT will seek to close gaps in the live animal end of the value chain, it is also important that the interface between NAIT and the product-to-consumer part of the "paddock to plate" continuum is well understood and implemented to realise the full benefits of the proposed system.

^{*} Discussion Document: National Animal Identification and Tracing Implementation available at: <http://www.biosecurity.govt.nz/biosec/consult/nait-implementation>

1. Document Purpose

The National Animal Identification and Tracing (NAIT) project aims to develop and implement a system that will enable New Zealand to better manage biosecurity and food safety risks, ensure continued successful competition in premium livestock product markets, and will allow farmers realise on-farm benefits through more efficient stock management.

The Ministry of Agriculture and Forestry (MAF) is one of the partner organisations that is participating in NAIT. This document has been prepared by MAF Biosecurity New Zealand, on behalf of the NAIT partners, to inform the design and implementation of NAIT. A growing number of countries around the world have implemented systems for providing or improving existing livestock identification and tracing. Many of these systems are meeting similar objectives but are doing so with differing specifications and ways of operating. The purposes of this document are to:

1. Describe the most important attributes of a selected number of these systems.
2. Highlight key strengths or shortcomings associated with each system.
3. Make recommendations for how NAIT can make best use of this information in the design of a comprehensive identification and tracing system for cattle in New Zealand.

This review is not exhaustive, in that not every aspect of every relevant system in the world is discussed. The countries that have been selected for review are either recognised as being at the forefront of introducing these types of systems, have particularly well characterised systems, or are believed to be representative of the best systems that are in place in their particular geographic region. This review also includes coverage of advice, requirements or guidelines related to animal identification and tracing that have been published by international or supranational organisations.

The project team have endeavoured to use the most up-to-date sources available in the preparation of this report. However, it has been necessary to make use of reports, audit findings and other material that is now several years old. Inevitably, therefore, some of the observations and conclusions made within may now be obsolete – this is particularly the case for the systems where the majority of available information is not in English.

It should also be noted that the individuals and organisations responsible for the development and administration of the tracing systems reviewed in this document (with the exception of the Dutch I&R system) have not been asked at this point to provide comment or review of the relevant sections of this document.

Many sources reviewed and cited in the preparation of this report have not, on the whole, been directly representative of the system users. This is because much of the available information is provided by the scheme administrators, their governments or industry organisations. The authors of this report are, however confident that on the whole, objective assessments have been possible owing to the substantial amount of contributory evidence that has been sourced from independent national and supranational audits, performance reports, academic review papers and media articles.

2. Introduction

Identifying animals by way of including branding or other markings has been practiced for thousands of years. Initially, identification was applied to particularly valuable animals, for example horses used by the Chinese postal system or by Roman charioteers^{2.1}. Outbreaks of exotic veterinary diseases in eighteenth century Europe first led to various requirements for owners to present certificates recording the origin of livestock.

Following these early beginnings, animal identification and traceability have become widely recognised as essential tools for ensuring the safety of livestock products and facilitating veterinary disease surveillance and control^{2.2}. More recently, serious concerns associated with a large number of food safety and livestock epidemics, most notably bovine spongiform encephalopathy (BSE), have led to the intensification of legislative requirements governing animal identification and tracing in countries worldwide. Restoring key customer and consumer confidence in the safety of livestock products has been an acknowledged driver behind the introduction of some of these measures^{2.3}.

The elevated profile of animal and food safety issues described above has occurred in parallel, and in part has arisen owing to, the unprecedented expansion and diversification of world trade – the process commonly referred to as globalisation. For example, the world meat trade increased in volume by 300 percent between 1990 and 2005^{2.4}. In summary, the trade in livestock products has benefited from increased volumes of trade and unit prices^{2.5}, whilst at the same time it has become more volatile and uncertain owing to changing patterns of consumer preferences relating to global animal disease and food safety issues.

The demands of consumer preference have had considerable consequential impacts upon the attitudes towards animal identification and tracing adopted by large multinational customers of livestock products. For example, the beef burger retailer McDonald's has made a number of statements setting out its expectations regarding the traceability of the meat it is willing to purchase. These include setting a requirement in 2004 that 10 percent of ~ 500 million kg of meat purchased per year will be fully traceable^{2.6, 2.7} and further consolidation of this position by suggesting that at some (unspecified) point in the future, this expectation will increase to 100 percent^{2.8}.

From a livestock producer perspective, assertions such as those cited above, combined with the concomitant trend-setting effect that they may have in the market place, represent substantial incentives for maintaining or improving the livestock identification and tracing systems they operate.

There are other aspects of livestock production and disease prevention and control that can be foreseen to have potential impacts on the needs or requirements for individual identification and tracing. The application of emerging technologies such as genetic modification and cloning to livestock improvement may increase the need for more robust systems, as may the continuation of recent trends towards consumer preferences for produce from animals reared under assurance schemes, certified for example as organic or “animal welfare-friendly”.

In the animal disease prevention and control arena, technological advances and shifts in the perceived acceptability of mass culling have led to vaccination being seen as a realistic option for contributing to the control of large scale veterinary epidemics^{2.9}. The deployment of such vaccination efforts and the surveillance required to provide evidence of disease freedom following eradication would be particularly challenging without adequate systems for individual (vaccinated) animal identification and tracing^{2.10}.

3. International Guidelines

3.1 BACKGROUND

There are several multinational and supranational organisations that have published guidelines or regulations relating to the identification and tracing of livestock. The most prominent of these are the World Trade Organisation (WTO), the World Organisation for Animal Health (OIE), the Codex Alimentarius Commission for Food Safety, the Food and Agriculture Office (FAO) of the United Nations and the European Union (EU).

3.1.1 The World Trade Organisation (WTO) and International trade

The World Trade Organisation was established in 1995 as an umbrella organisation for governing world trade. Members of the WTO are also signatories to the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) which serves to prevent the imposition of unjustified barriers to trade between member territories – specifically with regard to the application of food, animal and plant health protection measures to international trade in these commodities.

The SPS agreement allows importing countries to take “SPS measures” considered necessary to protect the health of human, plant or animals from risk organisms potentially associated with imported commodities – for example, a rabies-free country may require that all dogs imported from other countries where rabies is endemic must receive documented vaccinations prior to export. Under the SPS Agreement, these measures must be no more stringent than necessary for this purpose, and must be fully supported by scientific risk assessment^{3.1}.

The WTO encourages member territories to develop such SPS measures with reference to international standards and guidelines. The recognised standards-setting organisation for food is the Codex Alimentarius Commission, and for animal health it is the World Organisation for Animal Health (OIE) (refer to sections 3.1.2 and 3.1.3).

Animal identification and tracing are not specifically included in the SPS Agreement but may be required by importing countries as SPS measures if it can be shown that this is reasonable to protect the health status of the importing country^{3.1}. In reality, animal identification and tracing systems often form an integral part of a member territory’s veterinary infrastructure which in turn supports other purposes, e.g. official OIE recognition of BSE negligible-risk status.

The concept of equivalence is included in the SPS Agreement and allows countries to adopt different sanitary measures that result in equivalent risk-mitigation outcomes. It is partly owing to the provision for equivalence that explains why different approaches to achieving animal identification and traceability have been adopted by many countries, as there is no single “correct” way of achieving this. Instead, countries have built systems that meet their own individual needs and these may in future be guided by the non-prescriptive guidelines provided by the OIE – see section 3.1.2.

3.1.2 World Organisation for Animal Health (OIE)

In 2004, the OIE’s International Committee passed a resolution confirming the importance of animal identification and traceability for trade and animal and public health. It was agreed that the OIE should be active in this area and that a common definition of terms and some

guidelines for the development of identification and tracing systems should be prepared^{3.2}. This was subsequently achieved and in 2007 the OIE Terrestrial Animal Health Standards Commission accepted the first series of guidelines on identification and tracing as official OIE standards.

In addition, the OIE's Terrestrial Animal Health Code has recently been revised to include guidelines for zoning and compartmentalisation. Zoning and compartmentalisation are defined as "*procedures implemented by a Member under the provisions....with a view to defining subpopulations of distinct health status within its territory for the purpose of disease control and/or international trade*". The guidelines then go on to stipulate that "*the existence of a valid animal identification system is a prerequisite to assess the integrity of the zone or compartment*" and, therefore, regionalisation and the benefits that it can entail may only be implemented if supported by these systems^{3.3}.

The OIE guidelines concerning animal identification and tracing are not prescriptive but do suggest that the requirements of systems should be commensurate with the risks that are being managed and that linkages need to be established throughout the food chain. This "farm to fork" aspect of animal identification and tracing was reinforced in a statement by the President of the OIE, Bernard Vallat, in 2008 which called for progressive implementation of animal identification and tracing systems worldwide^{3.4}.

The OIE guidelines also place emphasis on the need for an approach focused on outcomes and strong collaboration between public and private sectors in developing and operating these systems. However, the guidelines also state that ultimate responsibility for animal identification and tracing in any country should rest with the government^{3.5}.

3.1.3 Codex Alimentarius Commission and the Food and Agriculture Office of the United Nations

The Codex Alimentarius Commission (CAC) was created in 1963 by the United Nations Food and Agriculture Office (FAO) and the World Health Organisation (WHO) to develop food standards, guidelines and related texts under the Joint FAO/WHO Food Standards Programme. As described in section 3.1, the CAC is the recognised standards-setting organisation for food under the SPS agreement.^{3.6}

In 2004, the FAO published an Animal Production and Health Manual entitled "Good Practices for the Meat Industry^{3.7}" for the purpose, *inter alia*, of providing guidance on the implementation of the CAC Code of Hygiene Practice for Meat^{3.8}. This manual contains separate sections pertaining to animal identification and traceability that are, in the main, not prescriptive but provide more detail and specifics on best practice than the guidelines released by the OIE.

The FAO manual reiterates the growing requirements for identification and traceability, for example:

"Identification is now associated not only with management needs, but also with market requirements. New standards in terms of traceability of the animal and its products are now becoming the norm, increasing the need for individual identification. Increasingly sophisticated veterinary disease surveillance and control measures also require identification based, if not on the individual, at least on the group".

and:

“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”.

In step with the OIE guidelines the FAO manual also specifies the need for animal identification and traceability systems to be under state supervision and administered within the context of defined standards and specifications. In addition to standards and specifications for data systems and animal identifiers, the manual suggests the need for accreditation standards and registers of approved organizations for livestock transporters, livestock marketing agents or traders and abattoirs. These organisations 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.”*^{3.7}

It is suggested that choices about enabling devices to be used in a given system should be informed by market and industry needs combined with economic and practical considerations. The FAO manual then describes the range of enabling technologies that can be used for individual animal identification (boluses, tattoos, ear tags etc.) and concludes that under most circumstances, ear tags are most suitable owing to problems associated with the other recognised alternatives. Considerations of appropriateness notwithstanding, the manual recommends that RFID tags are the most desirable option where economically viable and supporting infrastructure exists.

3.1.4 The European Union (EU)

The public announcement in 1996 of a likely association between new-variant Creutzfeldt-Jacob Disease (vCJD) in humans and BSE had a significant negative impact on consumer confidence in beef. In response, the Council of the EU introduced regulations concerning the identification and registration of bovine animals and the labelling of beef products^{3.9}. This was followed in 2000 by Regulation (EC) No 1760/00 which set out the elements of the European cattle identification and registration system^{3.10}. The key requirements of Regulation (EC) No 1760/00 are:

- Every bovine animal must be registered and individually identified using one ear tag in each ear.
- Individual paper passports are required for all bovine animals and passports must accompany the animals when they move.
- The governments of the Member States must be informed of each animal movement.
- Member States must maintain a computerised cattle tracing database
- Animal keepers must maintain up-to-date registers of on-farm bovine animals.

Supporting amendments and regulations concerning implementation have since followed^{3.11}.

The EU has introduced separate regulations requiring electronic individual identification for pets, horses, sheep and goats and is actively exploring the introduction of electronic identification for cattle within the EU^{3.12}. The feasibility of this was demonstrated by the EU-funded IDEA research project^{3.13} and making progress in this area, together with increasing the interoperability of national identification databases, are stated outcomes of the EU's Animal Health Strategy, released in 2007^{3.14}.

In 2008, the Commission of the EU imposed import restrictions on beef originating from Brazil owing to deficiencies in the Brazilian cattle identifications and tracing system which had been identified by previous EU audits^{3.15}.

3.2 WHAT ARE THE KEY ASPECTS OF THESE GUIDELINES THAT NAIT SHOULD BEAR IN MIND WHEN DEVELOPING AN ANIMAL IDENTIFICATION AND TRACING SYSTEM FOR NEW ZEALAND?

3.2.1 Collaboration between industry and government is required

The OIE and the FAO are explicit about the requirement for any national system to be under the supervision of the competent authority, and this is also an expectation of the EU. It is further recommended that a partnership approach between industry and government be adopted. From the outset, NAIT has been a joint government-industry project and it is strongly recommended that it continue to operate on this basis.

3.2.2 Systems need to be proportionate to the risks

The OIE and FAO guidelines indicate that a “one-size fits all approach” to animal identification and tracing is not necessary or appropriate. Instead, they recommend that the level of animal identification for any given species should be determined by the need to meet the desired outcomes, through consultation with parties including industry. Therefore, the enabling technologies and system requirements for NAIT should be species specific and defined according to the necessary level of tracing required to manage identified risks and key stakeholder outcomes.

3.2.3 Eartags are the devices of choice

The FAO has concluded that eartags are, on balance, the best devices for individual animal identification. This has been supported by the evaluations undertaken and decisions made by scheme operators throughout the world.

3.2.4 RFID technology is being increasingly seen as the gold standard enabling technology for individual animal identification

The FAO recommends that, where feasible, RFID transponders offer considerable potential benefits over visual identification alone. In addition, the EU is committed to the future implementation of electronic individual animal identification for a number of species and this may shape the context in which new national animal identification and tracing systems will be assessed internationally.

3.2.5 Animal identification and traceability is important for trade in livestock products

Animal identification and tracing systems may be considered to be SPS measures and, hence, a precondition of export of livestock products into some markets. The restrictions that the EU placed on the importation of beef from Brazil serve to highlight the need for the NAIT system to be robust, quality assured and capable of withstanding audits conducted by trading partners.

4. Great Britain



4.1 BACKGROUND

In 2007, Great Britain had a recorded cattle population of approximately nine million animals, located on approximately 80,000 premises^{4.1}. Individual cattle paper passports have been required for all cattle in Great Britain since 1996, when they were introduced as part of the Government's strategy for eradicating bovine spongiform encephalopathy (BSE) and for lifting the European Community ban on exports. Subsequently, a computerised Cattle Tracing System (CTS) was launched in Great Britain in September 1998 as part of further efforts to retain consumer confidence in beef. (The EU introduced a requirement for all member states to have computerised tracing systems by the end of 1999.)

The CTS, run by the British Cattle Movement Service (BCMS), is entirely funded by the UK Government. Cost recovery was planned but this was abandoned by the Government owing to the depressed state of the British cattle industry^{4.2}.

4.2 HOW DOES THE SYSTEM WORK?

4.2.1 Identifying animals

All bovine animals (including buffalo, bison and yak) are required to be identified with a primary and secondary ear tag within 20 days of birth and in the case of dairy animals, primary tags must be applied within 36 hours. Secondary tags may include RFID chips at the owner's discretion. Keepers are only permitted to maintain one year's worth of tags at any one time and must order eartags from government approved manufacturers. These manufacturers notify the CTS computerised Eartag Allocation System (ETAS) and are then allocated sequential numbers for each tag, incorporating the farmer's individual herd mark and unique farm address code (CPH). This process aims to ensure that duplicate tags cannot be produced.

Cattle are registered through the process of applying for a paper passport, which must be made within seven days of tagging.

4.2.2 Reporting animal movements

Cattle are not permitted to leave their current location without a paper passport, which makes moving unregistered calves illegal. Keepers of cattle are obliged to notify CTS within three days of a movement and within seven days of a death. Currently, keepers are only required to record half of each movement, i.e. the fact that an animal has moved either off of or onto their premises, without the requirement to specify the destination or source of the animal(s), respectively. This is achieved either by completing and submitting paper movement cards or by using CTS Online, which provides farmers with the ability to conduct many of the required functions, including birth and death registrations and movement reporting, using the internet. In addition, animal keepers are required to keep an on-farm record of all animals and their movements.

Slaughterhouses and markets have very similar requirements to farms in terms of the requirements to act as recipient or sender (for markets) of cattle.

4.2.3 Information Management

CTS represents a central database and is operated by BCMS, part of the Government's Department for Environment, Food and Rural Affairs (Defra). BCMS is also responsible for checking and maintaining the integrity and accuracy among CTS data and for reconciling inconsistencies that arise.

Property information is collected for all farms by the Rural Payments Agency (RPA – another part of Defra), and each location is allocated a unique identifier known as a CPH (county/parish/holding) number. It is this CPH number, present on cattle passports, that enables details about individual animals and movements to be linked to premises.

CTS was not designed to provide detailed reporting functionality for use in disease control, surveillance or contingency planning. To allow for this, Defra has developed a data warehouse and associated analysis environment called the Rapid Analysis and Detection of Animal-associated Risks (RADAR) system, that also receives and processes data from other sources, for example the GB Poultry Register. Outputs from RADAR have proved invaluable for supporting the Government's response to a series of animal health events, including avian influenza incursions (2006, 2007 and 2008), foot and mouth disease (2007) and ongoing problems associated with cattle-associated salmonellas and antimicrobial-resistant strains of *Escherichia coli*^{4.3}.

4.3 WHAT ARE THE MAIN ADVANTAGES AND SHORTCOMINGS ASSOCIATED WITH THE SYSTEM?

In 2003, an audit of livestock identification and tracing in England was published by the National Audit Office (NAO)^{4.4}. Particular emphasis was placed on the performance of systems in place for cattle. A further review of English livestock (specifically cattle, sheep and deer) movement controls was prepared by Bill Madders, chairman of the National Farmers Union (NFU) Animal Health Committee, and published in 2006^{4.5}. The relevant findings from these independent reports are summarised below.

4.3.1 Data are inaccurate

The partial reliance upon paper-based recording results in a large number of errors, omissions and anomalies being introduced into the centralised database. Other evidence suggests that the processes associated with the allocation and use of the unique property identifier (CPH number) also contribute significantly to problems of data quality^{4.1, 4.6}.

Issues associated with the prioritisation of data reconciliation tasks following the rollout of CTS led to a build up of erroneous movement records within the system. The provision of statements to keepers providing information about what the system has recorded about their activity and the associated provision for receiving feedback is intended to assist with cleansing the data of these errors.

Both the NAO and Defra reports also highlight that the requirement for senders and recipients of animals to record only half of the movement results in many movements which cannot be adequately paired, with significant effects on data quality.

4.3.2 The system is of limited use for fast moving diseases

The turn around time between completion of paper records in the field, postage, data input and data extraction is such that interrogating CTS during an incursion of a fast moving disease is not useful. Until the development of RADAR in 2005, this was compounded by the

fact that CTS was not designed to incorporate this sort of reporting functionality. RADAR now allows officials conducting field investigations or planning surveillance or disease control activities access to cattle population data that is sufficient for many purposes. During incursions, visits to high risk premises are still required however, as up-to-date movement data is not available for cattle, nor other species or risks of interest, such as feed trucks.

4.3.3 The system is expensive

The CTS is expensive to run owing to the level of inaccuracy and continued use of non-electronic methods of information transmission. The NAO report found that the reliance on paper recording increased costs of running the system by at least £15 million a year (approximately \$40 million NZD).

4.3.4 Risks associated with linked properties are not adequately managed

Under the CTS, keepers may apply to have different properties under their control to be “linked” in order to negate the requirement to record animal movements between them. This has resulted in the registration of thousands of such locations that are many miles apart from the primary property. Clearly, the lack of recording of movements between these properties represents a risk from the perspective of disease control, but also presents challenges for the successful undertaking of verification and enforcement activities.

4.3.5 Compliance with the regulations is generally good

The NAO found that compliance with the recording obligations of CTS is generally good, as it is a legal requirement and a pre-condition for receipt of subsidy payments under the EU Common Agriculture Policy (CAP). It was also observed that selling animals without adequate documentation is difficult.

4.4 WHAT ARE THE MAIN LESSONS THAT NAIT CAN TAKE FROM DEVELOPMENT, IMPLEMENTATION AND OPERATION OF THE CTS SYSTEM?

4.4.1 Do not rely upon paper-based data submission

Overwhelmingly, the most important lesson to draw from the British experience is that paper-based systems should be avoided because they are costly and error prone. Providing and supporting electronic data submission channels, which incorporate data validation on entry, should be a priority for NAIT.

4.4.2 Ensure that farmers and other participants are well informed

Perhaps unsurprisingly, the NAO (2003) recommended that users of the system needed to be well informed about requirements and support. The report also observed that ensuring keepers had easy access to their own data and providing feedback about transactions helped prevent errors accumulating in the system. NAIT must do the same.

4.4.3 Develop and enforce standards for animal identifiers

The review of livestock movement controls report^{4.5} found that there were problems associated with some licensed ear tags and recommended that BCMS should do more to tighten the performance specifications for identifiers, revoking authorisation where necessary. NAIT must ensure that robust standards for animal identifiers are developed and adhered to.

4.4.4 Use electronic identification

In considering the performance of the British livestock identification and tracing system, the official lessons learned inquiry into the FMD outbreak in 2001 recommended that the “Government develop a comprehensive livestock tracing system using electronic tags....”^{4.7}

4.4.5 The provisions for registering related premises should be developed carefully

On a day-to-day basis, farmers need to move stock between different locations within or in close proximity to the main premises. A balance must be developed within the requirements for NAIT so that administrative burdens associated with these movements are minimised, whilst still maintaining lifetime traceability and capturing epidemiologically significant movements.

4.4.6 Performance standards for data accuracy should be developed

The integrity and accuracy of data held by NAIT should be continually measured against a set of performance standards, with provision for remedial action where necessary. The experience of Great Britain shows that retrospectively “fixing” data problems can be particularly expensive – more so than ensuring good quality data is obtained in the first place.

4.4.7 Recording “half-movements” should be avoided

Requiring senders and recipients of animals to record only the “off” or “on” movements of animals, respectively, causes serious problems for data reconciliation. This is hugely expensive, and detrimentally affects data quality. NAIT must carefully consider the costs and benefits associated with the requirements for recording movements but should not adopt the half-movement recording approach employed by CTS.

4.4.8 An important role should be played by slaughterhouses and markets.

Reviews of the British system indicated that a more important role should be played by slaughterhouses and markets, which host large numbers of animals from many different locations and where infrastructure to support electronic data submission may be easier to maintain. NAIT should consider specifying more rigorous data submission requirements for these types of premises.

4.4.9 Industry – government partnership is important

Reports about the Government-run British system indicated that other stakeholders should be more involved. The NAIT project is a joint venture between industry and government agencies and will continue to operate as such.

4.4.10 Ensure reporting functionality is included in the design of the system

The British system was designed and implemented under considerable time pressure. As a result, adequate systems for accessing and analysing data were not included and had to be retro-fitted at a later date (RADAR), at considerable cost. NAIT should actively consider requirements in this area and include these within the original system design.

4.4.11 Incentives are important for ensuring a high level of compliance with the system requirements

Reviewers of the British system noted that compliance among keepers was generally good, owing to positive incentives arising from preconditions for subsidy payments. The mandatory nature of the scheme and the enforcement activities of local authority and other inspectors also contribute to encouraging co-operation – a secondary effect is that “non-compliant animals” are difficult to sell. NAIT will be operating in an environment where subsidy payments are not available and enforcement officers are not currently abundant. Therefore, the design of NAIT needs to incorporate adequate incentives for users to comply with requirements.

5. Australia



5.1 BACKGROUND

Australia has a recorded cattle population of approximately 29 million, located on approximately 74,000 properties^{5.1}. The cattle identification and tracing system operating in Australia is known as the National Livestock Identification System (NLIS). NLIS became operational in 2000 as part of the Federal Government's European Union Cattle Accreditation Scheme (EUCAS), introduced to facilitate and ensure export access to European markets^{5.2}.

The NLIS is run by Meat and Livestock Australia (MLA) on behalf of SAFEMEAT, Australia's joint industry and government partnership initiative responsible for red meat safety and hygiene and for providing strategic direction to the red-meat industry^{5.3}.

Developing and implementing NLIS has progressed incrementally, owing to the federal structure of Australia, with the different states and territories introducing progressively more stringent requirements over time. Recording of cattle movements was mandatory in all states and territories by 1 July 2006, but state-specific differences in other requirements were still in existence in 2008. NLIS has also been extended to sheep and goats^{5.4}.

5.2 HOW DOES THE SYSTEM WORK?

5.2.1 Identifying animals

NLIS rules require that all cattle must be tagged with an approved device (ear tag or rumen bolus) prior to moving from the property of birth, otherwise there is no requirement to apply the device. NLIS devices incorporate low-frequency (LF) radio frequency identification (RFID) chips enabling them to be read electronically.

RFID devices can be purchased from approved suppliers prior to application to an animal. Each device is allocated a unique number, encoded in the RFID chip and repeated on the surface of the device as a visible identifier, hence for ear tags the number can be read both visually and electronically. Rumen boluses cannot be read visually and are unpopular and less commonly used as approved devices than ear tags. There is no requirement to inform the NLIS database that devices have been applied to an animal.

The unique tag number incorporates the Property Identification Code (PIC), which links the tag to the property for which it was purchased (see below).

5.2.2 Reporting animal movements

When animals are moved, the recipient is required to notify the NLIS database of the movement, including the source property, identified by the PIC. In the case of animals purchased at saleyards, the saleyard is required to notify NLIS rather than the recipient. The majority of movements therefore, involve either saleyards or slaughterhouses performing the required reporting. The different Australian states and territories have differing requirements in terms of the timeframes within which various types of notification to the system are required.

Parties can interact with the system using the online NLIS database into which movement details can be manually entered. Alternatively, information captured by electronically

scanning the RFID devices of the moving animals can be fed directly to the NLIS database, considerably reducing the administrative burden and errors associated with movement recording – this is predominantly how saleyards and abattoirs interact with NLIS.

Not all recipients of animals have the ability to make use of the online NLIS database, and for this reason NLIS also accepts notifications on paper forms submitted by fax. A further alternative is to electronically scan the devices of animals and to transfer this information from the reader to a Bluetooth enabled mobile telephone, which in turn can send the information direct to NLIS. Any of the functions above may be performed on behalf of the animal keeper by an approved agent.

There is no requirement to report the deaths of tagged animals to NLIS unless the death occurs at a saleyard or slaughterhouse or in transit between either of these types of premises^{5.5}.

5.2.3 Information management

Keepers can update and maintain their details by registering for an account linked to the centralised on-line NLIS database, administered by MLA. PICs are issued by the states and territories and the associated systems are administered separately at the regional level, often for additional purposes such as local tax revenue collection.

System performance standards have been developed which set out the functional tracing and reporting requirements for NLIS in the event of a biosecurity, food safety or other emergency situation. These National Traceability Performance Standards were endorsed by the Primary Industries Ministerial Council in 2004^{5.6}. Following endorsement, the system has been tested in the context of these standards in two crises simulation exercises, Cowcatcher 1 (2004) and Cowcatcher 2 (2007)^{5.7}.

5.3 WHAT ARE THE MAIN ADVANTAGES AND SHORTCOMINGS ASSOCIATED WITH THE SYSTEM?

A number of exercises and independent reviews into the performance of the NLIS system have been conducted, including the Cowcatcher exercises, a review of the NLIS database^{5.8} and a review of the operation of NLIS conducted in 2006^{5.9}. These reports, together with personal communications^{5.10} have contributed to the observations set out below.

5.3.1 The administrative burden is relatively low

The fact that animals do not have to be registered and only recipients are required to record movements means that the system requires very little engagement from many animal keepers. This is particularly the case for keepers who have chosen to invest in and use electronic data capture technology.

5.3.2 The NLIS system accurately captures and processes information supplied to it

An audit of the NLIS database conducted in 2004 found that the system accurately captures and processes information that is supplied to it.

5.3.3 Erroneous data, once entered tends to accumulate within the database

The lack of user scrutiny of their own records combined with the absence of third-party data cleansing means that once errors are added there is a low likelihood that they will be corrected. The audit conducted in 2006 also noted that there was evidence of farmers “clearing out” their accounts by reporting all animals as deceased, irrespective of the true status of the animals.

5.3.4 There is continued under reporting of events leading to NLIS data being incomplete. During the non-mandatory phase, many movements were not reported to NLIS. Despite movement reporting since becoming mandatory, approximately 6 percent of movements still go unrecorded.

Reasons cited for failure to notify included:

- lack of financial incentive;
- deliberate evasion;
- confusion over requirements (compounded by differing requirements between states);
- lack of familiarity with technology; and
- incompatibility of requirements with existing management practices.

5.3.5 The nature of the system makes it unable to provide accurate population estimates and may encourage illegal movements.

NLIS records the number of RFID tags that have been purchased by keepers at any particular PIC but is not able to distinguish those that have been applied to animals and those in storage awaiting use. It is therefore not possible to accurately calculate the number of animals present on properties at any given time, information that is of considerable use for surveillance, disease control and statistical purposes.

It is also possible that the lack of a requirement to register animals within a defined interval following birth, and the resultant situation where there are many untagged animals on farms, allows illegal unrecorded movement and sale of adult animals to proceed undetected.

5.3.6 Tagging adult animals can be difficult.

Attaching RFID ear tags to full grown animals prior to first movement, as opposed to juveniles, may be considered challenging under some operational circumstances.

5.3.7 RFID technology enables accurate and rapid data capture for use in emergency situations

The Cowcatcher exercises demonstrated that the system could meet rigorous, defined performance standards in a simulated emergency exercise, such as determining the location(s) where a specified animal was resident during the previous 30 days within 24 hours. This level of performance is not practically achievable without electronic recording and submission of data enabled by RFID or technology with equivalent functionality.

Teething problems were associated with the introduction of RFID enabling technology, particularly with panel readers. Over time, these issues were resolved and the read failure rate of RFID ear tags is currently estimated to be below 1 percent – this is considered to be acceptable at an operational level in Australia.

5.3.8 The lack of a centralised property database prevents spatial analysis of NLIS-registered and other properties at a national level

Unique property identifiers (PICs) are issued and managed at the state / territory level, hindering epidemiological analyses of this information.

5.4 WHAT ARE THE MAIN LESSONS THAT NAIT CAN TAKE FROM DEVELOPMENT, IMPLEMENTATION AND OPERATION OF THE NLIS SYSTEM?

5.4.1 RFID technology is cost-effective and fit-for-purpose

The Australian experience has clearly demonstrated the benefits of using RFID enabling technology for cattle in comparison to other systems, such as paper records or barcodes. These benefits are primarily due to speed of data capture and data accuracy. NAIT can expect to encounter teething problems when or if similar systems are introduced, with knock-on adverse effects on data quality.

5.4.2 Ear tags are preferred to rumen boluses for use as animal identifiers

Visually marked RFID ear tags are recommended in preference to rumen boluses, as boluses cannot be visually read in the event of chip failures, unlike ear tags. The benefits associated with boluses, i.e. improbability of becoming detached either via accident or theft; do not sufficiently outweigh the constraints.

5.4.3 Registration of animals soon after birth is advantageous

NAIT should consider requiring the registration of animals on farm, as opposed to merely before first movement, thereby allowing the estimation of accurate animal population numbers and assisting with compliance and enforcement activities – there should then be no unregistered adult cattle in New Zealand, making the undetected illegal movement of animals much more difficult. Accurate population numbers are of considerable value for business planning and development in the livestock industry and for biosecurity surveillance and response activities.

Animal registration may prove to be moderately administratively demanding on-farm, but the burden could be mitigated by the fact that applying tags to juveniles is operationally much easier than to adult cattle.

Including active reporting of animal deaths is a necessary co-requirement to registering births to prevent the build up of “phantom” cattle in the database.

5.4.4 Processes to prevent the accumulation of erroneous data should be developed

Reviews of the Australian system have proposed that providing data validation on entry, giving direct feedback to keepers about their recorded activity and using third-party scrutiny and reconciliation all represent approaches to reducing the accumulation of errors into an identification and traceability database. NAIT must consider these and other solutions to this issue.

It may also be suggested that requiring animals to be registered would help to familiarise keepers with using NAIT.

5.4.5 Performance standards are needed to ensure the system delivers the intended benefits

The NLIS performance standards set out the minimum performance that is expected of the system as a whole and have been used as the benchmark against which the operation of the system has been tested in several exercises. An analogous set of standards will be required for the NAIT system and will need to be developed in the context of the costs and benefits associated with increasing stringency of the standards.

5.4.6 Incentives for complying with system requirements are important

Reviews of NLIS found that one of the reasons cited for non-compliant behaviour was a lack of incentive for doing so. Failure to notify the system of farm-to-farm movements was seen as a particular area of concern. The design of NAIT will need to take account of this observation, which might best be approached by requiring both the sender and recipient to record the movement and the destination of the animals.

5.4.7 Educating users about system requirements and using technology are important

Reviews of NLIS reported a significant need for better training and education of system users, for example how to correctly apply ear tags and what the reporting obligations are under the regulations. NAIT will need to ensure that sufficient resources are allocated to informing all participants about system requirements and how to satisfactorily meet these.

6. Canada



6.1 BACKGROUND

The Canadian Cattle Identification Program is managed by the Canadian Cattle Identification Agency (CCIA). CCIA is a not-for-profit industry established to promote beef consumption through assurance of efficient traceback and containment of serious bovine health and food safety problems. The program was “fully implemented” from 1 July 2002 with a small budget of \$4 million per annum, but has a number of other enhancements now under development. The program is regulated and enforced by the Canadian Food Inspection Agency (CFIA)^{6.1}.

A key driver for Canada to develop identification and tracing was the impact of BSE on its key market with the United States of America (USA). In May 2003 a single BSE test-positive cow from a farm in Alberta was confirmed during a targeted, ongoing surveillance program. While the animal did not enter the human food chain, the rendered carcass became a component of animal feed linked to some 1,800 farms and pet food. A further eight BSE cases were investigated, concluding in each case that no infective material had entered the food chain for human or animal consumption. In 2002, the USA imported 1.7 million live cattle (mainly for slaughter) and 85 percent of Canada’s 1.2 million metric ton beef exports. As a result of the BSE scare, the USA placed Canada under its BSE restriction guidelines and was critical of the time it took Canada to trace links to the BSE case.

“CCIA is led by the Canadian cattle industry for the benefit of the Canadian cattle industry”^{6.1}. Its Board of Directors is made up of representatives from all sectors of the industry – cow/calf, feedlot, auction market, packing plant, veterinary and dairy. The Canadian Food Inspection Agency and Agriculture and Agri-Food Canada are represented through ex-officio status. Wider supply chain initiatives are supported via Can-trace^{6.2}.

There is also some identification of deer in respect of velvet (antler tagging) and post-slaughter under other regulations and systems.

Following the success of the introduction of the cattle scheme, Canada has established a multi-species Canada Livestock Identification Agency (CLIA) in 2004, with an overarching coordination role around major animal identification schemes (sheep, goat, pig, cattle/dairy, poultry, equine, etc.). There is little, however, yet to report on this initiative, although a strategic plan was developed in 2005.

6.2 HOW DOES THE SYSTEM WORK?

6.2.1 Identifying animals

The Canadian system is primarily an animal identification system^{6.3}, linking animals back to the property of origin or tagging (similar in that respect to the current situation in New Zealand). Legislation sets requirements for cattle, bison and ovine species. The CCIA sets national standards for approval of bar-coded and RFID tags into the Canadian Cattle Identification Program. From 1 September 2006, all cattle leaving their herd of origin are required to be tagged with CCIA-approved RFID tags except if going to an approved tagging site. There are six approved types of RFID tags that farmers can purchase in accordance with the standards. CCIA also publishes lists of verified readers; an up to 50 percent subsidy on

readers could be reimbursed to eligible purchasers from April 2005 to December 2007. Bar-coded tags are being phased out by December 2009. Farmers are encouraged to replace lost tags and to keep records of the replacement identification (ID) numbers. Tags are linked to a register and are associated with the animal until slaughter or export.

6.2.2 Reporting animal movements

Traceability is not currently a feature of the system, although some provinces (Ontario and Quebec) are entering into information sharing agreements^{6.4} moving towards the goal of traceability. An animal cannot be moved from the farm of origin unless it has an approved ID tag.

6.2.3 Information management

A key focus of animal identification is to support (currently voluntary) verification of age through linking a tag ID to an animal's birth date. Farmers can log onto the CLTS resource centre via the internet www.clia.livestockid.ca (or use a third party if they do not have access) to access documentation to support tagging of animals and verifying age.

The tag supplier, rather than the producer, has responsibility for submitting within 24 hours: address details, date tags sold or distributed, unique tag ID numbers and the total number of tags purchased^{6.5}. The operator of an abattoir must report the death of the animal and its ID within 30 days, and must retain the ability to identify the animal carcass until the animal is either approved for human consumption or condemned.

Premises identification is currently under development on a provincial basis (via law)^{6.6} and producers are being encouraged on a voluntary basis^{6.7} to apply for premises identification based on legal land parcels.

6.3 WHAT ARE THE MAIN ADVANTAGES AND SHORTCOMINGS ASSOCIATED WITH THE SYSTEM?

6.3.1 Low compliance requirements / low direct benefits

The Canadian system was introduced quickly but at a relatively low level of compliance (seeking 80 percent coverage^{6.8}). However uptake has been fostered by the severe impacts to the cattle industry in general arising from ongoing detection of BSE in animals and closure of international markets (particularly with Canada's high reliance on the USA market. This has reduced initial producer opposition to the scheme.

The initial focus has therefore been around animal identification to enable traceback for low probability/high consequence events, e.g. BSE surveillance purposes. Traceability on other factors is being phased in over time at province level, starting with age verification (61 percent achieved 2008^{6.9}). This would imply that the wider whole-of-lifetime traceability benefits will not be captured until complete coverage across all provinces can be achieved. This will require agreements to be put in place for sharing information between provinces. Independent tracing systems over and above this are being developed, and efforts at providing mechanisms for national coordination (including across provinces) and standardisation are seen as important^{6.10}.

6.3.2 Lack of animal movement records

The movement records of animals do not appear to be held nationally, although animals cannot by law be transported or received on properties if not tagged. There is no information about the compliance level achieved by these rules. Disease outbreaks can be linked via CCIA identifiers to the animal's herd of origin and current property. There does not appear to be an equivalent requirement for animal status declarations to provide supporting information.

6.4 WHAT ARE THE MAIN LESSONS THAT NAIT CAN TAKE FROM DEVELOPMENT, IMPLEMENTATION AND OPERATION OF THIS SYSTEM?

6.4.1 A crisis can lead to rapid adoption and acceptance but limited functionality

Animal Identification is linked to market access, trade and consumer confidence. Uptake of the Canadian Cattle Identification Program was rapid from 2002 onwards. There was little apparent debate on the need for the system prior to its introduction, and particularly after the crisis of losing the USA market in 2003. The system put in place was simple. However, this has led to a relatively limited system and the wider tracing opportunities are being left to provinces or individual schemes, albeit with some standardisation, to implement at present.

6.4.2 Keeping systems simple from producer perspective may reduce wider traceability benefits of the data

While there are few requirements for the Canadian system, these are outlined online so that producers can see their requirements, and are linked to online templates and instructions. Many of the requirements are tied to the scheme administrators to perform or administer. For example, the tag suppliers must seek to approve a tag, and then to provide information to purchasers relevant to the scheme (this is not dissimilar to New Zealand). However, countering this is that there are few requirements to support wider traceability objectives and long lead times to get these implemented through voluntary initial uptake.

6.4.3 Standards and cooperation should be encouraged and incentives provided

Canada places a strong emphasis on the standards for animal identifiers as well as readers, and provides templates to ensure consistency of data entry. The CCIA sets the standards for devices and approves devices and readers (maintaining a list at its web-site). Bar codes are being phased out by 2009.

Canada supports a mix of voluntary uptake and compliance, but supports clear guidelines around the former. A reader subsidy program is in place to encourage infrastructure uptake using RFID. Documentation is made available on-line to ensure conformity with requirements and the requirement for all cattle to be tagged is mandatory.

It is suggested that uptake may be slow on new initiatives where there are not strong individual incentives for voluntary compliance.

6.4.4 Premises Identification is important for realising system benefits

Current initiatives are underway to improve premises identification on a province-by-province basis in recognition of the importance of this data. This has also required the development of inter-province agreements to share data.

7. The Netherlands



7.1 BACKGROUND

The Netherlands has approximately four million cattle on 45,000 properties. The I&R (“Identificatie & Registratie” – identification and registration) system was introduced in 1992 and was substantially overhauled in 2006 at a cost of approximately € million. As a member of the EU, the Netherlands is required to maintain a centralised computer database for recording the movements of individual cattle.

I&R is operated and maintained by the Ministry for Agriculture, Nature and Food Quality (LNV) on a yearly budget of €5.5 million, and at present only cattle are included in the system. There are plans to introduce sheep and goats into I&R in 2010, in line with pending EU legislation.

7.2 HOW DOES THE SYSTEM WORK?

7.2.1 Identifying Animals

All cattle are required to be ear-tagged and registered on the database within three days of birth, including recording stillborn animals. Officially approved tags are required to include visual unique identifiers consisting of a country code and barcode. There are currently no plans to adopt electronic tagging, owing primarily to considerations of cost versus benefit^{7.1}.

The registry which allocates unique identifiers is also maintained by the LNV and animal keepers may also purchase tags online from preferred suppliers.

7.2.2 Reporting Animal Movements

Movements of animals between different properties^{7.2} (see below) are required to be registered within three days of the event, and both the sender and the recipient are obliged to record details of either the source or destination, respectively. However, the I&R system allows both locations to be recorded in each movement transaction and this practice is encouraged by exempting keepers from maintaining paper records (another EU requirement) if this option is chosen.

All transactions with I&R are verified on entry and any errors presented to the user for correction before data is stored and assigned a status. If, despite the error messaging, the record contains an inconsistency, then the status is set to “*Inconsistent*”. For example, this could happen if the dates do not match with the other part of the two-legged movement. If there are no irregularities, the status is set to “*Temporary*”. If a transaction is set to “*Inconsistent*”, the animal keeper receives a status report which specifies the reasons for any inconsistencies and urges the keeper to make corrections. In addition, animals which have this status are not allowed to be moved until the correction has been made. The user has up to four months to correct any data at which point the status is set to “*Final*”.

There are special instructions when it comes to recording deaths on farm; stillborn animals are required to be registered under the dam’s unique identification, and movements of dead

animals going for rendering, incineration or post-mortem examination are also required to be recorded.

The I&R system does not incorporate provision for paper-based data submission, and interactions between animal keepers and the database are conducted via an online interface or interactive telephone line. Approximately 95 percent of the 12 million annual transactions are conducted by third parties such as the suppliers of farm management software, saleyards and meat processors^{7.3}. Only animals that are exported require an additional paper passport. There are no exemptions to the tagging and movement recording regulations.

7.2.3 Information Management

Each property, farm, saleyard, processor, showground and so on, where cattle are located must be associated with a unique identification number known as a UBN (UBN – Uniek bedrijfsnummer)^{7.4}. Each UBN has a one-to-one relationship with a keeper of animals. If there is more than one keeper registered at any one address, this address will have more than one UBN. Co-owned and co-managed properties may be linked under the same UBN, thus removing the requirement to record movements between each land parcel. UBNs are validated against the chamber of commerce database and council property ownership information.

All UBNs are stored in a central database, also run by the LNV, and is GIS based. It is the UBN that is used to link properties to the details of individual animals and movements that are stored in the I&R system. Animal keepers can see all the data belonging to their animals and prospective buyers may apply for a “pre-purchase” report by unique animal identity. This report states whether there are any irregularities associated with the animal.

As described above, all transactions with I&R are subject to data validation on entry, and any errors presented to the user for correction before data is accepted. Status reports are sent to keepers which serve as reminders to correct any outstanding inconsistencies or anomalies. Failure to make timely corrections to a keeper’s data results in the accrual of charges varying from €1 to €25 depending on the nature of the anomaly.

In addition to costs for corrections, the farmer must also pay €2.26 yearly per farm unit (UBN), €2.11 per calf born, €0.092 per bought-in animal, €1.02 for a bought-in imported animal and a nominal charge per report that is sent out via mail. Reports accessed through the internet application, email or web service are free. The LNV sets the fees yearly using the “user pays” principle. In practice this means that the keepers of the animals are entirely responsible for meeting the costs of running the system.

A series of standard reports have been developed for both animal keepers and the LNV. The LNV uses these in the event of an incursion of exotic animal disease where data about at-risk properties can be combined with animal population and movement data to inform surveillance or control measures where required.

The data held in I&R may be anonymised and used for statistical purposes and for commercial purposes, provided keepers have given consent for the specific purpose. In addition, data from the property database and I&R is used for purposes including stock improvement, milk production, veterinary intervention, health planning and subsidy provision.

7.3 WHAT ARE THE MAIN ADVANTAGES AND SHORTCOMINGS ASSOCIATED WITH THE SYSTEM?

The information cited in the following sections was obtained through a series of telephone interviews and email exchanges kindly provided by the I&R account manager from the Dutch Ministry of Agriculture, Nature and Food Quality.

7.3.1 Data stored on the central database are accurate

The Dutch system achieves a very low error rate – that is, where an animal ends up with an “untraceable” flag and is therefore not fit for export. By placing a lot of emphasis on corrections, nearly all transactions are verified as being correct.

7.3.2 The system is cost efficient

By adopting electronic data submission the system avoids inefficiencies associated with paper-based systems. The emphasis on using disincentives for allowing the accumulation of errors means that the system does not require large resources to be devoted to data cleansing and error reconciliation.

In addition, reducing compliance costs for businesses and citizens is considered a priority resulting in an “ask once, use many times” policy when it comes to collecting data. From the animal keepers’ perspective it is seen as advantageous that this data can also be used for many purposes, thereby reducing the requirement to submit the same information on multiple occasions. Widespread acceptance of this is probably also due in part to the process being bedded in well for a number of years and the Dutch in general being used to having to be formally registered for many purposes.

7.3.3 The system is equitable

The I&R system operates on a user-pays basis, which can be seen as potentially more equitable than direct subsidy from central public funds.

7.2 WHAT ARE THE MAIN LESSONS THAT NAIT CAN TAKE FROM DEVELOPMENT, IMPLEMENTATION AND OPERATION OF THE I&R SYSTEM?

7.4.1 Data verification is invaluable

Perhaps the single most effective measure in the Dutch system is the combination of placing emphasis on corrections, and rules which specify that animals cannot be moved if the correction has not been applied, which ensure that there are a minimal number of animals that end up with an untraceable status.

7.4.2 Data validation on entry is important and cost-effective

By placing emphasis on validation of data on entry, inaccurate information is prevented from entering the system in the first place, preventing downstream requirements for reconciliation of errors.

7.4.3 Comprehensive development of system definitions is recommended

The NAIT project was informed that the Dutch experience indicated that devoting significant resources to discussing and developing definitions was crucial for successful implementation of the system. (For example, circumscribed definitions of a farm, users and roles, user authorisation, what constitutes a movement and so on.)

7.4.4 System-wide focus is necessary

It was also stressed that NAIT should adopt a holistic approach and that getting it right with regards to communication and organisation should be considered equally important as IT development.

7.4.5 Keep the user requirements simple

Advice from the Dutch system administrators was to keep the NAIT system as simple for users as possible, although it could be suggested that this is perhaps not entirely consistent with some aspects of I&R.

7.4.6 Incentives and disincentives are effective but need to be phased in

As described above, I&R incorporates a clever series of incentives and disincentives for encouraging user behaviours that positively influence data quality and operating costs. The design of NAIT might be particularly well informed by keen scrutiny of this aspect of I&R, although it was suggested that any regime of incentives and disincentives is likely to be most effective if introduced gradually.

8. Switzerland



8.1 BACKGROUND

Switzerland has approximately 1.5 million cattle resident on 48,400 properties^{8.1}. In 1990, Switzerland became the first country on continental Europe to record a native case of BSE, believed to have arisen from the use of infected feed imported from the UK^{8.2}. In order to restore domestic and international consumer confidence in Swiss beef (shaken by the announcement in 1996 of a link between human vCJD and BSE), the authorities decided to implement an improved animal identification and tracing system.

The approaches taken by other countries were reviewed in 1998 and found to be unsuitable. The main reasons cited for this were that existing systems were either too costly, too complicated or did not reflect the realities of the livestock industries^{8.3}. Initially, there was no agreement among the interested parties on how the future system should look, but leadership shown by the Swiss authorities ultimately drove the formation of a consensus view that a private company governed by a range of public and private parties was the preferred option.

Industry organizations are believed to have arrived at this position from the belief that a new, neutral company would be best placed to ensure the interests of all parties were represented. It is also suggested that agricultural organizations were willing to place more trust in a system run by a private company as opposed to direct control by a government agency^{8.3}.

Cooperation was also facilitated by shared fears of the loss of external market access to Swiss producers unless a suitable system was implemented quickly.

The Swiss parliament subsequently passed legislation in 1999 establishing the Tierverkehrsdatenbank AG (TVD AG, the Animal Tracking Corporation). The TVD AG, renamed Identitas Ltd in 2006^{8.4}, is the entity responsible for the design, implementation and operation of the Swiss animal identification and tracing system.

Identitas Ltd operates as a private company, with the Swiss Government represented as the majority shareholder with sixteen other livestock industry organizations. The board of directors has wide representation from among the shareholders^{8.4}.

8.2 HOW DOES THE SYSTEM WORK?

8.2.1 Identifying animals

Under the Swiss system, cattle are tagged in each ear and are registered with Identitas from birth. Ear tags include country of origin and unique animal identification visual identifiers and a corresponding barcode. The unique animal number scheme is designed to be compatible with EU requirements. Ear tags must correspond to set of standards and may only be purchased from officially approved suppliers^{8.5}.

Ear tags applied to cattle cost US\$2.00 per calf in 1999 and US\$4.00 since January 2004. In 2003, a slaughter levy of US\$4.00 per animal was also introduced to provide funding for the system operating costs^{8.3}.

8.2.2 Reporting Animal Movements

When animals are moved, the sender must prepare two copies of a movement document, one to be kept and the other provided to the recipient. These movement permits contain details about the source and destination premises, the species and unique identification numbers of

the animals and information on the health status of the animals that have been moved. These documents must be retained for three years^{8.5}.

In addition, cattle births, deaths and movements must be notified to the national database. The nature of the transaction dictates what information is required to be provided:

- **For birth notifications:** holding code and identification number of the animal, date of birth, breed, sex, colour, dam and sire identification numbers.
- **For exit and death “movements”:** identification number of the animal, holding code of the holding and date of leaving/death.
- **For entry movements:** identification number of the animal, holding code, date of entry and holding code of the previous holding.
- Slaughterhouses notify entry and death (and associated particulars) in a single transaction.
- **Transitory movements:** Movements to properties where animals are present for less than 24 hours are not required to be recorded on the database.

System users can interact with the database and supply notifications of movements and births through three separate channels: using pre-printed postcards, via a telephone using a voice response system or via the internet. Notifications are required to be submitted within three working days of the relevant transaction occurring.

8.2.3 Information Management

In addition to retaining copies of individual movement permits, farms are required to maintain a holding register that contains the following information:

- identification code, date of birth and sex for animals born on farm;
- date of arrival and previous holding for purchased animals (entry of animals);
- date of departure and holding of destination in case of exit; and
- date of death for fallen animals.

This requirement is similar to that required by EU legislation, and although not a member state, Switzerland conducts a large proportion of its trade with the EU and has even agreed to observe food directives from Brussels^{8.6}.

The central database was designed from the outset to be able to capture and exchange data with existing sources, including the incorporation of existing identification systems. It was also developed to be flexible and able to accommodate further enhancements and expanded functionality. The system has been described as “constantly evolving” with plans to offer additional services, more focus on food safety, and increased use of RFID ear tags and automation introduced on a iterative and cost effective basis^{8.3}.

Several facets of the system have been reported to have positive impacts on the quality of the information held in the central database^{8.3}:

- Focus on streamlined processes.
- Data is used to support value-added services (see below), providing users with an incentive to participate.
- The system incorporates financial incentives for good quality data and penalties for missing or false data.
- Mandatory regular user validation of holding inventories.
- Official audits by cantonal authorities, with at least 10 percent of the users checked per year.

The recognition that the data collected by the system would be of great value acted as a further incentive for organizations to participate. Data access rights are provided to users

according to their particular circumstances. For example, data about animals are available to owners and prospective purchasers, whereas data on premises are accessible only by users having a contract with the premises.

In addition to producers and system partners, data is made available to providers of value-added services and other commercial organizations, provided the owners of the data agree. This provides a source of external revenue which contributes to meeting the operating cost of the system. Ultimately, this has contributed to the Swiss system being characterized by an elaborate system for determining data access rights^{8.3}.

For animal health and welfare purposes, the Federal Veterinary Office extracts data from Identitas for use in its Kodavet disease surveillance and control system, which also contains data gathered from other sources^{8.5}.

8.3 WHAT ARE THE MAIN ADVANTAGES AND SHORTCOMINGS ASSOCIATED WITH THE SYSTEM?

8.3.1 The Swiss system is based on collaboration and is self-funding

The collaborative approach adopted by Switzerland has produced a system that meets the needs of a wide variety of stakeholder organisations. Funding for setting up the system was provided by the government but operating costs are met by the users, i.e. producers, traders and slaughterhouses. These costs are recovered from revenue generated by the sale of eartags and from slaughter levies. It is suggested that this is equitable, as the principle beneficiaries contribute directly to financing the system. The Identitas system has been entirely self-funding since 2004^{8.3}.

8.3.2 The system may place excessive demands on users

Several aspects of the Swiss system may be considered to place excessive demands upon system users. For example, the recording of dam, colour and gender at the individual animal level may not be sufficiently useful from a biosecurity perspective to justify the considerable resulting administrative burden associated with capturing this information. In addition, all movement recording is required from both sender and recipients of animals, including the retention for three years of the associated documentation. The requirement to submit all transactions within three days of the movement or other event (such as birth or death) also may not be practical for users under some circumstances.

8.3.3 The use of paper recording and reporting leads to problems

As described in the analysis of the British CTS, the fact that Swiss system is partially paper-based leads to problems of data accuracy and is costly to maintain and manage. An audit of the system conducted in April 2004 by the Swiss Federal Audit Office recommended that a price differential be introduced into the system to discourage the use of paper-based submissions in favour of internet reporting^{8.7}.

8.3.4 Transitory movements are not recorded

Movements to properties where animals are present for less than 24 hours are not required to be recorded on the database. From a biosecurity perspective, this represents a serious shortcoming, for obvious reasons. Unsurprisingly, the audit of the system conducted in 2004 recommended that this weakness be addressed^{8.7}.

8.3.5 The system makes good use of incentives

The Swiss system appears to make good use of a series of incentives and disincentives to encourage users to comply with the system requirements. It also requires users to scrutinise their own data, thereby encouraging self correction of errors and anomalies that have been introduced.

8.4 WHAT ARE THE MAIN LESSONS THAT NAIT CAN TAKE FROM DEVELOPMENT, IMPLEMENTATION AND OPERATION OF THIS SYSTEM?

Some of the lessons that the NAIT project can learn from the Swiss system can be concluded from the description and analysis provided above. Complementary to this is the testimony of the former Chief Executive Officer of TVD AG (now Identitas Ltd) to the USA Senate Committee tasked with holding an oversight hearing on the development of a national animal identification plan for the USA^{8.3}. As part of his contribution to the hearing, Dr Schmitz-Hsu provided what he saw as the key lessons that could be learned from the Swiss experience, and these are reproduced below.

8.4.1 Government and industry collaboration is needed to produce the best system

It can reasonably be suggested that Identitas, with its well developed system of incentives and data access provisions, has benefited considerably from the ongoing input and governance provided by a variety of stakeholder organisations. Using this approach, the Identitas system has become self-financing. According to Schmitz-Hsu:

“Maintain trust in the solution. The government is the protector of the interests of agriculture, and of public health, rather than a dictator and cost generator. Involve the end users in the decision making process. An end user must for example be involved in decisions regarding access to his data. Communication to all involved is vital. A process for handling end-user feedback is also vital.”

8.4.2 Ensure adequate resources are directed towards refining business processes

Dr Schmitz-Hsu emphasised the importance of developing robust business processes to support identification and tracing systems. In his opinion, these are crucial to success and even more important than the IT elements of the solution.

8.4.3 Make the system as useful as possible to a wide variety of interested parties

The Swiss system provides outputs that are useful to a wide range of organisations. This has the effect of providing an incentive to comply with the system requirements and also provides opportunities for generating revenue from third parties that wish to make use of the data, ultimately allowing the maximum benefit from the system to be realised.

According to Schmitz-Hsu

“Set-up a central database which serves not only for fighting animal diseases but as a tool for all organizations interested in animal identification. Allow the maximum value to be made from the data collected. Regulate access rights to protect the rights of the data owners, but impose no more data access restrictions than really necessary. Make sure the benefit goes to the owners of the data – that means to the end users. Involve third parties such as supermarket chains early in the process in order to add to the value for the end users. Reward the good end users.”

8.4.4 Training and support for end users is essential for maintaining user acceptance and data integrity

The NAIT project must make adequate provision for user training and support. This need was spelled out by Scmitz-Hsu:

“Provide adequate training and support for the end users. The end-user domain is where the problems will occur. End users who are well supported by a help desk accept the solution much better. We initially underestimated the size of this need in Switzerland.”

8.4.5 Using existing data sources to feed a central database is cost-effective

Efficiency savings have been realised in Switzerland by the use of existing data sets. Similar opportunities may exist within New Zealand and might usefully be considered by the NAIT project. Developing standardised interfaces between different systems was also recommended by Scmitz-Hsu, whilst recognising the need for one centralised database:

“Use a single central database to reduce costs and minimize response time for impact analysis. Start with a new database but minimize extra costs by taking over existing data. But be careful not to make things too complicated and costly by catering to everything, which already exists in order to satisfy certain groups. There must be common procedures and standard interfaces.”

8.4.6 Develop the system on an iterative basis but do not under resource the project

A further lesson from the Swiss experience is the recommendation that development of NAIT should proceed on a step by step basis and should be adequately resourced:

“Do not try to do things too cheaply. The costs of correction are greater than the costs of prevention. But gain experience before making major investments. Use a step-by-step process, and examine the results after each step. Be practical. Avoid the dominance of theory and technology. The key success factors are the processes, training and acceptance.”

9. The United States of America



9.1 BACKGROUND

The National Animal Identification System (NAIS) has been described as a modern, streamlined information system that helps producers and animal health officials respond quickly and effectively to animal disease events in the United States^{9.1}.

The conception of the National Animal Identification System (NAIS) can be traced from 2002 when the National Institute of Animal Agriculture (NIAA) initiated meetings that led to the progressive development of the United States Animal Identification Plan (USAIP). That work, in turn, provided the foundation data standards for NAIS.

NAIS is administered by Veterinary Services (VS), which is a division of the Animal and Plant Health Inspection Service (APHIS), which, in turn, is an agency of the United States Department of Agriculture (USDA).

The driving force for the progressive development of NAIS is the risk of an outbreak of a foreign or domestic animal disease. The long-term goal of NAIS is to be able to identify all animals and premises that have had contact with a foreign or domestic animal disease of concern, within 48 hours after discovery^{9.2}.

The NAIS system has been structured as a Federal-State-industry partnership, with responsibility for implementation of NAIS being shared amongst industry groups, private companies, State and Tribal governments, and USDA. NAIS is designed with a view to enhancing ongoing State-level animal health protection programs through offering national standards and increasing the level of participation beyond the requirements of existing animal disease programs^{9.3}.

The NAIS program is moving through an initial implementation period where participation is currently voluntary, with full program implementation to be under a phased-in plan. The implementation process is based on the rationale that stakeholders will obtain experience with the system and provide feedback as successful and practical solutions evolve. USDA will follow the normal rulemaking process in the course of eventually changing the status of NAIS from voluntary to mandatory, with the public having the opportunity to comment on any proposed regulations^{9.4}.

9.2 HOW DOES THE NAIS SYSTEM WORK?

9.2.1 NAIS guiding principles

APHIS believes the NAIS system must follow several core binding principles in order to achieve the long-term goal of identification of all animals and premises that have had contact with a foreign or domestic animal disease of concern within 48 hours after discovery. These NAIS guiding principles aim to progress the development of an animal identification system that:

- is **uniform** in terms of NAIS being based on national data standards;
- is **flexible** in terms of allowing producers to use NAIS in coordination with production management systems and marketing incentives;

- is **inclusive** in terms of NAIS being developed for animals that will benefit from rapid tracing in the event of a disease concern;
- is **co-operative** in terms of both public and private funding being required for NAIS to become fully operational; and
- has **secured, reliable, confidential information** in terms of what is essential and sufficient for animal identification and tracing^{9.5}.

NAIS will be established gradually through the integration of the following three components.

9.2.2 Premises Registration – identification of the geographic location where animals are raised, housed, or boarded

Identifying locations that manage or hold animals, referred to as premises, is the starting point of NAIS. Producers opting for registration of their premises under NAIS will have them identified with a unique seven-character Premises Identification Number (PIN).

9.2.3 Animal Identification – individual or group identification that remains with the animal for its lifetime

Producers opting for registration of their animals under NAIS will have their animals identified either individually with a unique Animal Identification Number (AIN); or, if their animals are managed and moved through the production chain as a group, their animals will be identified with a Group/Lot Identification Number (Group/Lot ID).

9.2.4 Animal Tracing – access to timely, accurate animal movement records to quickly locate at-risk animals in the event of a disease outbreak

Producers opting for tracing of their animals' movements from one premises to another, under NAIS, will need to report the following information to the national animal records repository:

- the AIN or Group/Lot ID;
- the premises number of the receiving location; and
- the date of the event being reported^{9.6}.

9.3 WHAT ARE THE MAIN ADVANTAGES AND SHORTCOMINGS ASSOCIATED WITH THE NAIS SYSTEM?

9.3.1 Multispecies approach adopted from the outset

Unlike similar systems in other countries, NAIS has been developed with the stated intention of covering the majority of production livestock species – poultry, pigs, sheep, cattle and horses. From a purely epidemiological perspective, this is encouraging although it has contributed to difficulties with respect to implementation and communication (see below).

9.3.2 NAIS has proceeded as a partnership project from the outset

A key advantage of NAIS is that industry organisations are partnering with USDA to promote the value and importance of premises registration – an effort to identify all the locations in the United States where livestock and/or poultry are raised or housed. Industry partners are non-profit organisations that represent the livestock, poultry, or equine industries or work in the field of agriculture education^{9.7}. Their goal is to provide education about NAIS and encourage the registration of premises. Industry partnerships have been forged with IDairy, The U.S. Animal Identification Organization (USAIO), The National Pork Board, IMI Global, and the American Sheep Industry; along with the National FFA Organization. These organizations, and others to be announced as cooperative agreement partners in the future, see the need for NAIS^{9.8}.

9.3.3 NAIS has been well resourced

NAIS adds an additional layer of protection to the USA's animal agriculture production system. Disease outbreaks are costly. Since 2002, detections of bovine tuberculosis (Tb) in six states have required the destruction of more than 25,000 cattle. USDA has spent about \$90 million on owner indemnification and control activities. The current response to Tb in a few infected herds in New Mexico will add to that total. The 2003 BSE discovery cost \$5 million for the initial response, and the USA lost 80 percent of its foreign beef trade^{9.9}.

Over several years through to the 2007 financial year, USDA invested approximately US\$117.3 million per annum in the NAIS program. An additional US\$9.8 million was appropriated for NAIS in 2008, although this was well below the US\$33.2 million that USDA had requested for that financial year^{9.10}.

APHIS has recently selected Kansas State University to lead a multi-institutional benefit-cost analysis of NAIS^{9.11}.

9.3.4 A voluntary system may lead to inconsistencies at a national level

The current voluntary status of NAIS allows USDA, producers, and industry to work out the system details of the NAIS program and to measure ongoing progress. However, States may choose to individually implement components of NAIS at the State level and any resulting inconsistencies between States may potentially erode stakeholder confidence in the effectiveness of NAIS and promote concerns about equitable sharing of responsibilities^{9.12}.

The USA Government Accountability Office has criticised the lack of planned approach to integrating NAIS into existing USDA and State animal identification requirements^{9.13}.

9.3.5 Voluntary status will lead to a lack of coverage and loss of credibility

Some producers are not convinced that NAIS will improve animal health oversight. They fear that NAIS will impose costly and intrusive regulations on their operations without adding any significant value^{9.14}. The current voluntary status of NAIS poses a significant disadvantage in terms of the inherent risk exposure for USA livestock producers in the event of an animal disease emergency, given that NAIS animal identification and tracing coverage is, as yet, far from complete. NAIS registrations have varied widely between States, with APHIS reporting that, as of mid-July 2008, less than 500,000 animal premises had been registered, out of an estimated 1.4 million livestock and poultry farms in the USA (2002 Census of Agriculture data).

9.3.6 Not all animals or important data are included in NAIS

In addition to the voluntary status of NAIS, the latest version of the NAIS user guide states that some animals do not need to be identified; for example, animals that never leave the farm or are only moved directly to slaughter.

It is suggested that this component of NAIS design poses a significant risk if such animals have died from an un-diagnosed disease event^{9.15}. This will also make the calculation of on-farm populations impossible and may facilitate the illegal movement of unregistered animals between premises.

The failure to require that some types of critical data, such as species or age, be provided to NAIS has been identified as a key shortcoming by the USA Government Accountability Office^{9.16}.

9.3.7 NAIS has progressed too slowly

Even supporters of NAIS have criticised USDA for moving too slowly and not setting a clearer path towards universal coverage.

The original key milestones proposed in the NAIS strategic plan 2005 to 2009 were as follows:

- July 2005: all States capable of premises registration.
- July 2005: AIN system operational.
- April 2007: premises registration and animal identification "alerts".
- January 2008: premises registration and animal identification required.
- January 2009: reporting of defined animal movements required; entire program mandatory^{9.17}.

These original key milestones were based on recommendations made by key industry organisations in 2003 and 2004. However, these dates were estimates that incorporated estimated possible mandatory implementation of individual components of NAIS. Given that input from stakeholders is still being received and that the process of obtaining input and funding has taken longer than anticipated, NAIS has not achieved the above original key milestones proposed for mandatory implementation^{9.18}.

USDA has since produced "A Business plan to Advance Animal Disease Traceability", setting out animal traceability objectives to 2010, in terms of key benchmarks and target dates for meeting the objectives. Since progressively developing and implementing NAIS from 2004 onwards, USDA reported that, as of August 10, 2008 approximately 33.2 percent of livestock premises had been registered under NAIS^{9.19}.

9.3.8 NAIS has failed to prioritise effectively

The USA Government Accountability Office concluded, in a July 2007 report, that NAIS had failed to prioritise among the nine animal species to be covered to focus on those species of greatest concern. This has had knock-on consequences for the progress of implementation (see above) and has led to considerable confusion among the myriad of stakeholder organisations across all the relevant livestock industries.

9.3.9 NAIS is continuing to encounter significant resistance arising from concerns about data access and civil rights

Some producers are concerned that access to and misuse of their animal identification records held under NAIS could be gained through the federal Freedom of Information Act (FOIA). However the FOIA provides safeguards in the form of exemptions that prevent access to confidential material that might harm the provider, such as certain types of business information^{9.20}.

The FOIA can be used to obtain information from a Federal agency when that agency has custody and control of a record. USDA is very much aware of producers' concerns about the confidentiality of information collected as part of the NAIS and is taking them very seriously as officials explore the most effective means for collecting animal identification information. At the same time, it is important to keep in mind that the national information repositories will only include information for animal and disease tracking purposes. Accordingly, USDA is pursuing various options for appropriately protecting the information in the NAIS from public disclosure^{9.21}.

9.4 WHAT ARE THE MAIN LESSONS THAT NAIT CAN TAKE FROM DEVELOPMENT, IMPLEMENTATION AND OPERATION OF NAIS?

9.4.1 Proceed in a step-wise fashion

A clear lesson from the USA's approach is that NAIT should be developed step-by-step and in keeping with the resources available. It can be reasonably suggested that those involved in NAIS under-estimated the magnitude of undertaking the simultaneous development of a system for all livestock species. This has also led to considerable confusion among stakeholders as to what is required and why. The scope of NAIT currently extends to cattle and deer alone, and the project is fortunate from an administrative and legislative perspective that it is proceeding in the absence of the complexity introduced by a Federal constitution.

9.4.2 The system must be mandatory

NAIS has encountered significant stakeholder resistance, both because of and despite the voluntary nature of the scheme. Unless compliance with the requirements of NAIT is mandatory, the coverage of the system will not be complete, potentially leading to a loss of credibility.

9.4.3 RFID ear tag technology is effective in the field

From the NAIT perspective, perhaps the most valuable lessons that can be learned from the USA's experience come from the extensive trialling of RFID technologies under field conditions. Specific details are cited below, but the overwhelming conclusion is that a high degree of confidence can be accorded the choice of RFID technology for NAIT, given the successful USA field trial results.

The key lessons learned from NAIS pilot projects and field trials that have been cited and have relevance for NAIT are as follows^{9.22}:

Specific lessons relating to RFID ear tag technology

- the animal retention rate of radio frequency identification (RFID) button-button ear-tags was found to be significantly higher than expected;

- proper tag application and placement has a direct and significant impact on the retention and electronic readability of the tags;
- the use of RFID tag technology at auction markets can reduce the need to restrain animals when recording unique Animal Identification Numbers (AINs);
- RFID technology is not a “plug-and-play” application and must be customised to individual locations – the needs of which vary tremendously;
- RFID ear tags used for NAIS can support value-adding opportunities in terms of the potential to yield source-verified monetary premiums at sale;
- the cost effectiveness of animal applications of RFID technology must be evaluated according to species;
- workable options are available for producers who want to identify their animals electronically without the added expense of RFID electronic reader equipment; and
- calves can be tagged successfully with RFID devices at a very young age.

Generic lessons relating to electronic identification of animals

- in certain environments, the automated recording of animals’ identification as they are loaded on and off trucks is critical for successful animal tracing;
- the use of electronic identification allows for more accurate and efficient recordkeeping; and
- producers’ access to technology – or lack thereof – is a key factor impacting participation in animal identification and tracing systems.

Generic lessons relating to stakeholder buy-in for animal identification

- buy-in for animal identification and tracing must extend beyond producers to include others involved in the production chain;
- participants at all levels of production need to be well informed about basic procedural matters related to animal identification;
- the level of training received by equipment operators directly impacts the data collection process and, ultimately, the success of the NAIS system;
- effective producer-focused outreach and education is critical to the success of an animal identification system; and
- information collection for NAIS can be achieved effectively through existing programs in which producers are already engaged for management and/or marketing.

10. Japan



10.1 BACKGROUND

Japanese tracing systems are driven by the needs to provide consumer confidence in food safety and traceability for the control of animal disease^{10.1}. Following the discovery of BSE in Japan in 2001 and a beef mislabelling case in 2002, a number of measures were introduced and the Japanese government accelerated the implementation of uniquely identifying all bovines (4.5 million animals) beyond a dairy trial. This was achieved by March 2003.

10.2 HOW DOES THE JAPANESE SYSTEM WORK?

The Cattle Traceability Law was introduced in June 2003 (full name: The Law for Special Measures Concerning the Management and Relay of Information for the Individual Identification of Cattle). The law enables a system of tracing of cohort and offspring animals of a BSE case within 24 hours of disease confirmation. The system links the identifier on an individual animal (bar-coded ear tag) to the final product, such as consumer packaged steak, and allows individuals to search an online web database (the Individual Cattle Identification Register) to find out information on the specific animal. Cattle owners, slaughterhouses, beef wholesalers, retailers and specific dish caterers all have obligations under the law. Cattle owners transferring or selling animals have obligations to immediately notify the National Livestock Breeding Centre (NLBC) of the IDs, destination (name and address) and date of transaction, and the persons receiving animals have the equivalent obligation (that is, it is a two-legged transaction)^{10.2}.

The inspection system is overseen by the Ministry of Agriculture, Forestry and Fisheries. In addition, samples from all animal carcasses are taken and stored so that samples collected from retailers or caterers can be DNA tested to ensure that the product can be traced back to the identified animal.

10.3 WHAT ARE THE MAIN ADVANTAGES AND SHORTCOMINGS ASSOCIATED WITH THE JAPANESE SYSTEM?

10.3.1 “Farm-to-fork” traceability is a focus of the system

The Japanese system is linked via the ear tag identifier to product consumer packaging. DNA samples are taken of each carcass to assist full traceback if required. The benefit to cost ratio associated with this level of rigor has not been widely assessed.

10.3.2 Population coverage is high

The system is mandatory and all cattle are covered without exception.

10.4 WHAT ARE THE MAIN LESSONS THAT NAIT CAN TAKE FROM DEVELOPMENT, IMPLEMENTATION AND OPERATION OF THIS SYSTEM?

10.4.1 Expectations for importers may be higher than for domestic industry

Japan is net importer of animal products and system coverage appears to be more stringent for imported animal products than for domestically produced animal products.

10.4.2 Links to product tracing need consideration

Japan stores DNA samples (from domestic animals only) to manage issues (e.g. fraud in source of product). The link back from the consumer to the producer (via the internet) is a key feature of the system.

11. South Korea



11.1 BACKGROUND

The South Korean Government is putting in place a mandatory beef traceability system by first half of 2009^{11.3}. The South Korean Beef Traceability System (BTS)^{11.5} has evolved from an initial nine Korean cattle farmer organization trial starting in October 2004, as part of a wider trial covering a number of agricultural products, including rice.

Korean consumers have a strong interest in the safety of the food they eat. While they produce beef, they also import substantial quantities. Prior to December 2003, South Korea represented the third largest market for USA beef (US\$815 million per annum)^{11.1}. Following BSE scares, however, a ban on USA imports was introduced (relaxed for boneless beef for cattle less than 30 months age in September 2006) and bone-in imports were only reinstated in 2008 (associated with public protests and riots in South Korea). Country of origin labelling is also important^{11.2}. There is general distrust by consumers of imported beef products which are less than half the price of Korean beef, with an assumption that there is a lot of false labelling. This does not appear to be widespread however – of 284,000 samples tested in July 2008, only 315 were found to have falsified country of origin labelling, including USA beef sold as Australian beef^{11.3}.

The system is led by government, which runs the BTS database. Individual farming households and processors will have obligations to provide data from 2009. Deer are not included.

11.2 HOW DOES THE SYSTEM WORK?

Under new laws, all cattle must be tagged and will not be able to be slaughtered without tags. Information is made available on the internet (producer, cultivation, out-shipment) and matched to product labelling (paper labels and bar-codes). RFID options (to reduce problems of alteration and counterfeiting of labels and barcodes) are also being explored. Traceability is implemented at a farming household level and via producer associations. Farming households must register with the National Agricultural Products Quality Management Service (NAQS)^{11.4}.

Information retained under BTS includes producer information (farm owner's name, telephone number, address, identification number, and geographical location). Each calf must be identified within two weeks of birth with two ear tags. Information associated with animal includes animal ID, date of birth, sex, breed, dam's animal ID, feed consumed, and medical administration data. Movements to and from premises are recorded with animal ID, data and reason for movement within one week. Local government inspectors enter animal ID, post-mortem inspection results, date of slaughter, quality and yield grades. Consumers can also access data from BTS^{11.5}.

11.3 WHAT ARE THE MAIN ADVANTAGES AND SHORTCOMINGS ASSOCIATED WITH THE SYSTEM?

11.3.1 A system-wide approach to product traceability has been developed

Cattle tracing is part of a wider traceability framework for agricultural products (common standard and requirements). Producer/ premises registration is required on commencement of participation.

11.3.2 “Farm-to-fork” traceability is a focus of the system

Bar-coded tags are used and, as with Japan, South Korea links live animals to products and consumers can look up information on-line. The South Korean system does not include DNA verification.

11.4 WHAT ARE THE MAIN LESSONS THAT NAIT CAN TAKE FROM DEVELOPMENT, IMPLEMENTATION AND OPERATION OF THIS SYSTEM?

11.4.1 Links to product tracing need consideration

Like Japan, South Korea makes a strong link between product identification and labelling and live animal identification. New Zealand will need to consider, as a minimum, links between NAIT information and product tracing (currently via processor systems to e-cert).

12. Argentina

12.1 BACKGROUND

Export markets have had a growing influence on the beef industry in Argentina over the past decade. Exports account for around 20 percent of Argentina's production, with the bulk of production oriented to meeting the demands of its beef-loving domestic market^{12.1}.

In 2007, Argentina's cattle herd was estimated at 51.2 million head. Argentina is under pressure from its major trading partners to control disease outbreaks – among these, foot and mouth disease (FMD) has been particularly important^{12.2, 12.3, 12.4}.

The USA and the EU require beef export certification, each with respective beef import requirements. The need to meet the demands of these markets has motivated Argentine beef producers to adopt production practices designed to allay international concerns about animal disease and residual growth hormones in beef.

Since the most recent outbreak of FMD in 2006, Argentina is currently able to export only thermo-processed beef (heated to a specific temperature for a specified amount of time) to the USA. In addition, importing nations' concerns about FMD have prevented Argentina from making inroads in major Asian markets. As a consequence, animal identification and traceability has become a priority in Argentina^{12.5}.

12.2 HOW DOES THE SYSTEM WORK?

In 2003, Argentina established a limited mandatory system of traceability directed at the EU markets. This tracing system operated primarily through word-of-mouth and was based on the reputation of suppliers. Although the system was sufficient to maintain the confidence of the Argentine domestic market, as well as that of many of its foreign customers, it was inadequate to meet the needs of all foreign buyers of cattle and beef.

The Argentine Animal Health Information System (or *Sistema de Gestión Sanitaria* SGS in Spanish) that is currently operating, is based on cattle movement permits, the permit being a legal requirement for cattle movement in Argentina.

The date recorded against the movement is the day the permit is issued. Permits under SGS are issued for a single (one way) movement and the intention is that movement events should occur within seven days, after which time a new permit needs to be obtained.

The following data is required to be verified before a permit issued:

- sanitary conditions of premises of origin and destination, in particular foot-and-mouth disease vaccination status;
 - the age category of animals being moved must exist in the records of the premises of origin; and
 - type of movement – if animals are moved directly for finishing purposes, the destination premises should be identified as a finishing farm in the national farm database.
- The following data is required to be recorded for SGS for each permit:
- date of movement;
 - unique identifier of premises initiating the movement;
 - destination premises;

- species;
- number of animals per age category; and
- reason for movement.

Once animals arrive at the destination premises the recipient must declare to details of the incoming movement including:

- date of arrival;
- number of animals by age category; and
- premises of origin^{12.6}.

In 2007, Argentina instituted a compulsory cattle identification program, requiring that all calves born after September 2007 carry official tags. This identification program opens the way to make it possible to track cattle from birth to slaughter. The entire Argentine beef herd is expected to be tagged by 2017^{12.7}.

Quality reference material for animal identification and tracing in Argentina is not readily accessible in the English language, making a robust assessment of the system performance, merits and shortcomings difficult.

13. Brazil



13.1 BACKGROUND

Brazil has an enormous cattle population of approximately 200 million animals located on 2.75 million premises^{13.1}. The combination of concerns about the control of foot and mouth disease (endemic in neighbouring countries) and facilitating market access for beef, led the authorities to seek to improve the Brazilian animal identification and tracing systems.

In 2002, the Brazilian Ministry of Agriculture, Husbandry and Supply (MAPA) published Normative Instruction 1, introducing the Brazilian Bovine and Bubaline Identification and Certification System (SISBOV, now renamed ERAS) for the identification and tracing of all cattle.

Implementation of the new system focused initially on premises engaged in providing animals to slaughterhouses that supply products destined for the EU, which represents approximately 35 percent of the Brazilian beef export market^{13.2}.

13.1.1 Problems with SISBOV

Since 2003, successive audits of SISBOV, conducted by the Food and Veterinary Office (FVO) of the European Commission's Directorate General for Health and Consumer Affairs (DG SANCO), have found the system to be unsatisfactory^{13.3}. In particular, serious compliance failures associated with requirements for premises registration, animal identification and movement recording were observed, together with failures on behalf of the Brazilian authorities to honour commitments to take remedial action^{13.4}.

A further FVO mission conducted in 2008 identified considerable shortcomings in the auditing of the system by the Brazilian authorities, and this led to severe restrictions being placed on the importation of beef from Brazil into the EU^{13.4}. The impact of these restrictions has cost the Brazilian beef industry at least \$600 million (NZD)^{13.5}.

13.2 WHAT ARE THE MAIN LESSONS THAT NAIT CAN TAKE FROM THE BRAZILIAN EXPERIENCE WITH SISBOV?

13.2.1 Livestock identification and tracing systems must be able to withstand inspection from trading partners.

Undoubtedly, the most significant lesson that can be drawn from the Brazilian experience is that tracing systems must be robust, quality assured and capable of withstanding rigorous, international audit. Failure to achieve this can lead to the imposition of legitimate and severely damaging restrictions on export market access for livestock products.

14. Conclusions and summary of lessons

A range of cattle identification and tracing systems have been set up around the world to meet broadly similar needs. This review has sought to provide a summary of the most important facets of the systems in the USA, Japan, Argentina, Brazil, South Korea, Great Britain, Switzerland, Canada, Australia, and the Netherlands. The role and position of international organisations, such as the OIE and the EU, with respect to animal identification and tracing has also been summarised. Table 1 shows a comparison between the design elements of the systems reviewed.

In addition to providing a description, a variety of sources were examined in an attempt to critically analyse the strengths and weaknesses of these systems with a view to providing information that could assist with the development of enhanced livestock identification and traceability within New Zealand. The ‘lessons’ arising from reviews of each system have been brought together and summarised into nine high-level recommendations for the design and operation of the prospective NAIT system.

1. **Ear tags are the most suitable device for animal identification and the considerable additional benefits associated with RFID technology mean its use is becoming increasingly common worldwide – NAIT should proceed with RFID eartags for cattle.**

Practically all of the other animal identification and tracing systems reviewed exclusively use ear tags as the enabling device for animal identification. A review conducted by the Food and Agriculture Organisation concluded that, on balance, ear tags are better than any of the known possible alternatives. Regulated standards will be required to ensure that official ear tags meet defined specifications and levels of performance, e.g. tag retention, uniqueness of number etc.

Experience in Canada, Australia and the USA has indicated that RFID technology ear tags can be used successfully in the field and that the benefits associated with RFID tags, versus solely visual or bar-coded alternatives, considerably outweigh the marginal extra costs of the devices. For these reasons the EU is actively considering introducing RFID identification of cattle and has already made this compulsory for other livestock species.

2. **Government and industry collaboration is needed to produce the best system – NAIT should continue to operate as a joint industry-government partnership initiative.**

Continued government involvement in NAIT is required to ensure credibility internationally and that the wider interests of New Zealand are met. The review of other systems overseas shows overwhelmingly that where industry and government work together, more functional, useful and equitable systems result.

3. **Ensuring that there are sufficient incentives for participants to comply with the NAIT regulations will be particularly important.**

The coverage and completeness of the data held and managed by NAIT will be strongly dependent upon the level of user compliance with the regulations. Systems overseas have developed a range of effective incentives and disincentives to encourage participants to align their behaviours and practices with system requirements. These include subsidy payments, reduced obligations or annual fees for users with high compliance. Users must also feel confident that their data will not be used inappropriately and that the objectives of the system are valid and are being met cost effectively.

In addition to incentives, it is also necessary that participation in NAIT be mandatory, supported by a visible and effective compliance and enforcement regime to deter behaviours contrary to successful system operation. Any non-regulated system is likely to suffer from incomplete coverage and may lack credibility from an international perspective.

Over time, it is expected that the lack of lifetime traceability may reduce the slaughter value of animals for which the requirements have not been met, thereby providing a market-based incentive for compliance.

4. Information about places where animals are present is particularly important – Ensuring NAIT gets this right is highly recommended.

Some of the animal identification and tracing systems overseas are, or have been, constrained by inadequate or cumbersome approaches to the collection and management of location information. The FarmsOnline Project is the currently proposed solution to this general requirement. In addition, the development of NAIT will need to make practical and sensible provision, within FarmsOnLine, for the inclusion of linked locations and run-offs.

5. NAIT must be developed step by step and have the flexibility to be able to be enhanced if required. Establishing a national framework for animal identification and tracing is recommended.

The development of NAIT should proceed as a series of steps or phases where additional functionality or user activities are added incrementally, if required. This has been recommended by those in charge of rolling out the Swiss system and other countries, in particular the USA, have experienced difficulties in trying to accomplish too much all at once.

Ensuring that the NAIT system is flexible enough to be able to incorporate other species of livestock, groups of animals and other functional requirements that are not included initially means that maximum value can be obtained from the system if the scope of NAIT expands in future.

Other countries have tackled the issue of livestock identification and tracing by implementing a framework that can incorporate multiple species of livestock if required, each with their own differing sets of requirements defined according to needs. This allows for a strategic approach to be taken to issues such as governance, standard setting and communication, and is consistent with the NAIT objectives of enabling the overarching framework to be extended to other species over time.

6. NAIT must be designed to be fit for purpose and the requirements of the system proportionate to risks.

The design of NAIT should be flexible but this should not divert attention from ensuring that the initial roll-out of the system is fit for purpose. Other tracing systems overseas were introduced following crises and the urgency involved resulted in solutions that met only very limited needs. In particular, international experience indicates that the following needs should be taken into account during system design:

- The ability to link animal identification to the end product is a feature of systems overseas and is fundamental to the ‘farm to fork’ view of traceability.
- Reporting functionality is essential to realising the full benefits from an animal identification and tracing system – adequate provision for getting information out of the system is as important as making sure that good information is captured in the first place.

Balancing the requirement to ensure that NAIT is fit-for-purpose is the recognition that requirements must not be ‘gold-plated’. The OIE and FAO recommend that the system

requirements for any given species should be determined by the need to meet the desired outcomes and defined according to the necessary level of tracing required to manage risk. A “one size fits all” is therefore inappropriate.

7. The quality of the data collected and held by NAIT will be strongly influenced by the business processes that characterise the system.

How information is collected is hugely influential in determining its quality, i.e. accuracy, timeliness, completeness etc. In particular, the following specific observations should inform the design of NAIT:

- The development of system performance standards against which data accuracy (among other attributes) can be measured and adhered to acts as a driver for ensuring that data quality and system performance remains high.
- Similarly, it is recommended that sufficient resources be allocated to discussing and developing definitions for system entities and roles, for example ‘premises’ and ‘person in charge of animals’.
- Correcting inaccurate data is more expensive than making sure that it is entered accurately in the first place. This can be achieved by requiring data validation on entry and by preventing the submission of information via paper forms. Empowering and expecting users to be responsible for the accuracy of their own data has also been seen to be very effective.
- Imposing requirements to submit information on those in the system best placed to do so is likely to increase its accuracy – for example, it is recommended that meat processors and saleyards should play an enhanced role in data recording and submission, owing to the infrastructure and processes available and the volume of animal movements involving these premises. Saleyards in particular represent a heightened biosecurity risk for the potential onward dissemination of animal diseases making accurate recording of movements associated with these types of premises important.

The importance of ensuring high data quality and assurance is highlighted by the trade restrictions imposed on Brazil as a result of failings perceived by EU auditors.

8. Training and support for the end users of NAIT will be essential for maintaining user acceptance and data integrity. Keeping the requirements for producers and processors as simple as possible is recommended.

Formal reviews of the British and Australian systems indicated the importance of ensuring producers and other users understand and accept their obligations under the regulations. NAIT must make adequate provision for initial and ongoing training and communications materials necessary to enable users to comply with the requirements of the system. Real-time support from call centres is also likely to be required.

Aside from the fact that it is generally easier to comply with simple requirements, users are more likely to accept their roles and responsibilities under NAIT if the requirements are simple and represent as small as possible a deviation from ‘business as usual’. Operation of the NAIT system must achieve an appropriate balance between ensuring adequate functionality to meet system objectives whilst placing minimum possible inconvenience on users.

The overseas experience confirms that the number of exemptions should be limited as far as possible to maintain system continuity, coverage and to avoid complexity.

9. Building off existing systems and making most use of the data collected will be cost-effective and ensure that the greatest benefit is realised from the operation of NAIT.

It is unsurprising that opportunities for efficiency savings exist by making best use of existing data sets and that these have been realised in other countries, notably in Switzerland and the Netherlands. In the latter, particular emphasis is also placed on reducing the administrative burden on users by using data supplied to the system for multiple, clearly defined and agreed purposes.

Furthermore, it is suggested that producing outputs that are useful to a wide range of organisations has the effect of providing an incentive to comply with the system requirements. In Switzerland, a revenue stream has been created through the regulated sale of data to third parties, ultimately reducing the costs incurred by system users and allowing the maximum benefit from the system to be realised.

Table 1: Animal Identification and Tracing Systems – Summary by Country

ATTRIBUTE	Great Britain	Australia	Canada	Netherlands	Switzerland	USA	Japan	S. Korea	Argentina	Brazil	Current NZ
System name	CTS (Cattle Tracing System)	NLIS	CCIP Canadian Cattle Identification Programme	I&R (Identificatie & Registratie)	Identitas	National Animal Identification System (NAIS).	Cattle Traceability Law	BTS South Korean Beef Traceability System	Argentina Animal Health Information System - Sistema de Gestion Sanitaria (SGS).	ERAS (formerly SISBOV)	Various
Organisation (administrator)	British Cattle Movement Service (BCMS part of Defra)	Meat & Livestock Australia	Cattle Identification Agency	LNV (MAFF equivalent)	Identitas Ltd	Veterinary Services (VS) – a division of the Animal & Plant Health Inspection Service (APHIS), US Dept of Agriculture (USDA).	National Livestock Breeding Centre	Ministry of Agriculture and Forestry	Agency of Argentine Government	Ministry of Agriculture, Husbandry and Supply (MAPA)	AHB, LIC, MAF
Date commenced	1998	2002?	2002	1992	1999	Conception in 2002 and framework for implementation in 2004.	2003	2004 (9 selected enterprises)	Compulsory identification of cattle calves introduced September 2007 – aim is for all cattle to be individually tagged by 2017.	2002	1999 (for Tb)
Drivers for Establishment	BSE control and restore consumer confidence in beef	Residue tracing, biosecurity, enhance market access	BSE and closure of US Market for live animals and meat products	Disease control, FMD and EU requirements	BSE control and restore consumer confidence in beef	Potential rise of an outbreak of a foreign or domestic animal disease.	BSE, food safety	Consumer food safety concerns, BSE, FMD, agri-residues	Several phases of foot & mouth disease over past two decades.	Control of FMD, market access to EU.	Tb management, production management (dairy)
Mandatory	Yes	Yes	Yes	Yes	Yes	NAIS implementation moving through initial voluntary participation period under phased-in plan towards full programme implementation and aiming for eventual mandatory participation.	Yes	From 2009	Yes – for cattle calves from September 2007.	Initially only for export certified holdings / animals. Unclear about the rest of the industry.	Yes for Tb, otherwise voluntary

ATTRIBUTE	Great Britain	Australia	Canada	Netherlands	Switzerland	USA	Japan	S. Korea	Argentina	Brazil	Current NZ
Cattle	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Deer	No	No	No (velvet)	No	No	Yes	No	No	No	No	Yes
Other species (country framework)	Most livestock species require mob-level movement recording at the local authority level	Sheep – pigs actively considered	Yes, under development	No	Unknown	Yes – intention to cover majority of production livestock species.	Unknown	Agricultural products, pilot programme	Not as yet	No	No (except ASDs)
Cattle Individual ID	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes for calves from 09/07	Yes	Derived (herd no. farm ID)
Type of identifier (ear unless specified)	Visual; RFID optional	RFID	Barcodes (phase out); RFID	Visual and barcode	Visual and barcode; considering RFID	Pilot studies confirm RFID to be technology to deliver NAIS requirements; RFID optional.	Barcodes (DNA samples of carcasses kept)	Barcode; considering RFID	Unknown	Requires some form of identification (various options); RFID optional.	Barcodes; RFID in voluntary schemes
Animal Registration required	Yes	Yes	Yes	Yes	Yes	Yes – currently voluntary	Yes	Yes in pilot, anticipated		Yes	Tag registers on purchase
Animal Registration (when)	with 30 days of birth	When moved	Prior to leaving herd of origin	Within 3 days birth	Within 3 days of birth	Yes – currently voluntary	Newborn calves	Within 2 weeks birth	Cattle calves from birth	Unknown	When moved >30 days old
Animal Registration (who)	Producer	Salesyard, slaughter premises	Producer	Producer	Keeper	Producer - by individual animal or by group if moved through production chain by group.		Household	Producer	Certifying company on behalf of keepers	Farmer/producer
Property registration	Yes through Rural Payments agency allocated CPH number	Yes (States)	Under development	Yes – UBN numbers	Yes – AGIS	Yes – currently voluntary	No	Yes, National Agricultural Products Quality Management Service	Not specified in available reference documents.	Yes – actions carried out by private 'certifier' companies	No (individual schemes run own identifiers for properties)
Movements recorded electronically	Paper telephone and electronic data submission	Yes	No (bookend system)	Yes	Yes	Yes	Yes	Yes	Not specified in available reference documents.	Yes	No
Movements recorded other	Yes	Yes	No	Telephone – no paper	Paper and telephone	No	No	No	Not specified in available reference	Unknown	Yes, paper ASD

ATTRIBUTE	Great Britain	Australia	Canada	Netherlands	Switzerland	USA	Japan	S. Korea	Argentina	Brazil	Current NZ
Responsibility for recording movement	Sender and recipient – '2x ½ legged'	Recipient – emphasis placed on slaughterhouses and saleyards.	N/A	Sender and recipient – 2x ½ legged with option for full two legged	Sender and recipient	Whenever moved from one premises to another (i.e. person/agent responsible for movement).	Sender, Receiver	Sender, receiver	Not specified in available reference documents.	Performed by certifying third party	Sender
Other Data collected at animal level (in addition to unique ID)	DOB, breed, country of origin	No	DOB	DOB, Colour, Dam ID, Gender	DOB, sex, breed, colour, sire and dam, import status	Various industry programmes, marketing alliances, verification programmes, breed registries, and performance recording.	Health, feed, sex, production process, imported animal	DOB, Sex, dam, feed, medication, slaughter info	Not specified in available reference documents.	farm of origin, individual ID, month of birth or entry on farm, sex and aptitude (dairy or beef), system of production, movements, sanitary data	Tb status, HGP status, imported animal
Linked to product	At slaughter(?)	At slaughter	At slaughter	At slaughter	at slaughter	At slaughter – currently subject to NAIS voluntary participation in traceability.	Yes, DNA samples kept, At slaughter, consumers can access, specified dish caterers	At slaughter (linked to product labelling – consumers can access)	Not specified in available reference documents.	Unknown	At slaughter where Tb found
Database management centralised	Yes	Yes, NLIS	Yes, CIA	Yes	Yes	Yes	Yes, NLBC	Yes, Beef traceability database MAFRoK	Not specified in available reference documents.	Yes	No (various databases)
Governance	Government	Federal-State-industry partnership.	Industry (State regulated)	Government (fully cost recovered)	Industry-Government-owned company	Federal-State-industry partnership.	Government	Government	Government	Government	Industry (Government-approved official schemes)
Current status	RFID being actively considered at EU level	Real time recording, extending attributes	Age verification	No plans to adopt RFID unless required by EU.	Considering RFID and other species(?)	As of 10/8/08, approximately 33.2% of livestock premises registered under NAIS.	Operational	Mandatory pending for whole of life tracing	Aim is for all cattle to be individually tagged by 2017.	Operational but facing a number of challenges. System failures have led to import exclusion by the EU	Introduction of NAIT under consideration

15. References

INTRODUCTION

- 2.1. Blancou J. (2001). A History of the traceability of animals and animal products. OIE Scientific and Technical Review, Vol. 20, pp 420 – 425.
- 2.2. Caporale V., Giovannini A., Di Francesco C. and Calistri P. (2001). Importance of the traceability of animals and animal products in epidemiology. OIE Scientific and Technical Review, Vol. 20, pp 372 – 378.
- 2.3. McGrann J. and Wiseman H. (2001). Animal traceability across national frontiers in the European Union. OIE Scientific and Technical Review, Vol. 20, pp 406 – 412.
- 2.4. Morgan N. and Prakash A. (2006). International livestock markets and the impact of animal disease. OIE Scientific and Technical Review, Vol. 25, pp 517 – 528.
- 2.5. The Beef Site. (2008). Meat and Meat Products: A Global Market Analysis. Web page available at: <http://www.thebeefsite.com/articles/1756/meat-and-meat-products-a-global-market-analysis>
- 2.6. Beef Magazine. (2004). McDonald's sets beef traceability goal. Report available at: http://beefmagazine.com/mag/beef_mcdonalds_sets_beef/
- 2.7. Reuters. (2005). McDonald's says 10% U.S. beef traced. Report available at: <http://www.reuters.com/article/Food/idUSN1651057420050316>
- 2.8. Beef Magazine. (2005). Committed to traceback. Report available at: http://beefmagazine.com/mag/beef_committed_traceback/
- 2.9. The Royal Society. (2002). Infectious diseases in animals – Royal Society inquiry commissioned by the UK Government. Report available at: <http://royalsociety.org/inquiry/index.html>
- 2.10. Roth J.A, (2004). Foot-and-Mouth disease 'vaccination-to-live': possibilities and constraints. Developments in Biologicals. 119. pp 267 – 272.

INTERNATIONAL GUIDELINES

- 3.1. Wilson D. W. & Beers P.T. (2001). Global trade requirements and compliance with World Trade Organisation agreements: the role of tracing animals and animal products. OIE Scientific and Technical Review, Vol. 20, pp 379 – 384.
- 3.2. OIE (2004). Animal identification and traceability RESOLUTION No. XXX Adopted by the International Committee of the OIE on 27 May 2004
http://www.oie.int/eng/OIE/textfond/en_selection_resolution_mandats.htm
- 3.3. OIE (2008). Zoning and Compartmentalisation. (*In*) Terrestrial Animal Health Code 2008. Chapter 4.3, Article 4.3.3.
- 3.4. OIE (2008). Animal identification and product traceability from the farm to the fork must be progressively implemented worldwide. Editorial from the Director General.
http://www.oie.int/eng/Edito/en_edito_apr08.htm

- 3.5. OIE (2008). General principles on identification and traceability of live animals. *In* Terrestrial Animal Health Code 2008, Chapter 4.1. Article 4.1.1
http://www.oie.int/eng/normes/mcode/en_chapitre_1.4.1.htm
- 3.6. FAO & WHO (2006). Understanding the Codex Alimentarius. Third Edition. Available at:
http://www.codexalimentarius.net/web/index_en.jsp
- 3.7. FAO (2004). Good Practices for the Meat Industry. FAO Animal Production and Health Manual. Sections 3 and 4. Available at:
<http://www.fao.org/docrep/007/y5454e/y5454e00.htm>
- 3.8. CAC (2005). Code of Hygienic Practice for Meat (CAC/RCP 58-2005). Available at:
www.codexalimentarius.net/download/standards/10196/CXP_058e.pdf
- 3.9. EU (1997). Council Regulation (EC) No 820/97 of 21 April 1997 establishing a system for the identification and registration of bovine animals and regarding the labelling of beef and beef products. Available at:
http://eur-lex.europa.eu/smartapi/cgi/sga_doc?smartapi!celexapi!prod!CELEXnumdoc&numdoc=31997R0820&model=guichett&lg=en
- 3.10. EU (2000). Regulation (EC) No 1760/2000 of the European Parliament and of the Council of 17 July 2000 establishing a system for the identification and registration of bovine animals and regarding the labelling of beef and beef products and repealing Council Regulation (EC) No 820/97. Available at:
http://eur-lex.europa.eu/smartapi/cgi/sga_doc?smartapi!celexapi!prod!CELEXnumdoc&lg=EN&numdoc=32000R1760&model=guichett
- 3.11. Defra (2008). Livestock movements, identification and tracing: legislation. Web page available at: <http://www.defra.gov.uk/animalh/id-move/legislation/index.htm>
- 3.12. European Commission (2008). Electronic identification of bovine animals. Presentation from the Commission at the Meeting of the Animal Health Advisory Committee (19 May 2008). Presentation available at:
http://ec.europa.eu/food/animal/identification/bovine/elec_id_bovine_en.htm
- 3.13. European Commission (2005). Report from the Commission to the Council and the European Parliament on the possibility of introduction of electronic identification for bovine animals - COM/2005/0009. Available at:
http://ec.europa.eu/food/animal/identification/bovine/elec_id_bovine_en.htm
- 3.14. European Commission (2007). A new Animal Health Strategy for the European Union (2007-2013) where “Prevention is better than cure”. Report available at:
http://ec.europa.eu/food/animal/diseases/strategy/index_en.htm
- 3.15. European Commission (2008). Commission Decision Of 17th January 2008 amending Annex II to Council Decision 79/542/EEC as regards the imports of bovine fresh meat from Brazil – 2008/61/EC. Available at: <http://eur-lex.europa.eu/JOHtml.do?uri=OJ:L:2008:015:SOM:EN:HTML>

GREAT BRITIAN

- 4.1. Defra (2008). The Cattle Book 2007. Descriptive statistics of cattle numbers on the 1st of June 2007. Report available at:
<http://www.defra.gov.uk/animalh/diseases/vetsurveillance/species/cattle/dataset.htm>
- 4.2. Defra (2007). Livestock movements, identification and tracing: Cattle Tracing System. Web pages available at : <http://www.defra.gov.uk/animalh/id-move/cattle/cts.htm>
- 4.3. Defra (2008). Personal Communication.
- 4.4. NAO (2003). Livestock identification and tracing in England: Report by the Controller and Auditor General. Report available at: http://www.nao.org.uk/publications/nao_reports/02-03/02031144.pdf.
- 4.5. Defra (2006). Review of livestock movement controls. Report available at:
http://www.defra.gov.uk/animalh/id-move/pdf/livestock_movement_controls-review.pdf
- 4.6. Defra (2008). Personal Communication.
- 4.7. Anderson (2002). Foot and mouth disease 2001: Lessons to be learned inquiry. Report available at: <http://archive.cabinetoffice.gov.uk/fmd/index.htm>

AUSTRALIA

- 5.1. MLA (2007). Fast Facts 2007. Meat and Livestock Australia. Report available at:
<http://www.mla.com.au/NR/rdonlyres/F74B4CFB-AD86-4708-BD47-68EF9FAF107D/0/FastfactsBeef2007.pdf>
- 5.2. DAFF (2007). European Union Cattle Accreditation Scheme: Questions Answered. Web page available at: <http://www.daffa.gov.au/aqis/export/meat/elmer-3/eucas/questions-answered>
- 5.3. SAFEMEAT (2008). Web pages available at: <http://www.safemeat.com.au/English/>
- 5.4. MLA (2008). National Livestock Identification System – Meat and Livestock Australia web pages. Available at:
<http://www.mla.com.au/TopicHierarchy/IndustryPrograms/NationalLivestockIdentificationSystem/default.htm>
- 5.5. NSW DPI (2007). NLIS Cattle: questions and answers. Web page available at:
<http://www.dpi.nsw.gov.au/agriculture/livestock/nlis/cattle/faqs>
- 5.6. AHA (2006). NLIS web page - Animal Health Australia available at:
<http://www.animalhealthaustralia.com.au/aahc/index.cfm?F26691D6-03AF-CF13-E4FE-57ECCF767109>
- 5.7. DAFF (2007). Exercise Cowcatcher. Web page available at:
http://www.daff.gov.au/animal-plant-health/emergency/exercises/exercise_cowcatcher
- 5.8. MLA (2004). NLIS database review. Report available at:

www.mla.com.au/NR/rdonlyres/41EB3C04-CFB2-4D03-80E2-BDB5111DBDF9/0/DeloitteNLISDatabaseReview.pdf

- 5.9. DAFF (2006). Report of findings from a review of the operation of the National Livestock Identification System. Report available at:
http://www.daff.gov.au/about/publications/national_livestock_identification_system_report
- 5.10. MLA (2008). Personal Communication from the NLIS Manager

CANADA

- 6.1 Canadian Food Inspection Agency <http://www.inspection.gc.ca/english/agen/agene.shtml>
- 6.2 Can-Trace
<http://www.can-trace.org/AboutCanTrace/tabid/73/Default.aspx>
- 6.3 Canadian Cattle Inspection Agency, main website <http://www.canadaid.com/>
- 6.4 News Release, CCIA congratulates ATQ and OnTrace on their first Inter-provincial traceability agreement, September 4 2008,
http://www.canadaid.com/Media/documents/PressRelease_04-09-08.pdf
- 6.5 Health of Animals Regulations (section 174), Department of Justice/Ministere de la Justice, Canada
<http://laws.justice.gc.ca/en/C.R.C.-c.296>
- 6.6 Alberta Premises Identification (PID) programme
[http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/trace12354](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/trace12354)
- 6.7 Premises Identification with the CCIA
http://www.canadaid.com/documents/PremiseHowTo_01-30-08.pdf
- 6.8 Animal Identification Systems in North America, Murphy R.G., Pendell D., Morris D., Scanga J., Belk K. and Smith. (2008) Professional Animal Scientist.
http://findarticles.com/p/articles/mi_qa4035/is_200808/ai_n29492956/print?tag=artBody:coll
- 6.9 Ibid.
- 6.10 Sanderson, Kim and Hobbs, Jill E. (October 2006) Traceability and process verification in the Canadian Beef industry, Department of Agricultural Economics, University of Saskatchewan
http://www.canfax.ca/beef_supply/Traceability%20&%20Process%20Verification-Final%20Report-Oct06.pdf

NETHERLANDS

- 7.1. Landbouw, natuur en voedselkwaliteit (March 2008) Explanation of Dutch Eartags (in English)
http://www.hetInVloket.nl/portal/page?_pageid=122,1780509&_dad=portal&_schema=PORTAL&p_file_id=19359

- 7.2. Landbouw, natuur en voedselkwaliteit (September 2008) Brochure I&R Runderen: instructie veehouder
http://www.hetInvloket.nl/portal/page?_pageid=122,1780509&_dad=portal&_schema=PORTAL&p_file_id=19416
- 7.3. Landbouw, natuur en voedselkwaliteit (undated) Informatie voor softwareontwikkelaars (Link to information for Software developers)
http://www.hetInvloket.nl/portal/page?_pageid=122,1780613&_dad=portal&_schema=PORTAL&p_document_id=288602&p_node_id=1856978&p_mode=BROWSE
- 7.4. Landbouw, natuur en voedselkwaliteit (undated) Melden/wijzigen gegevens houder en bedrijf (Information for acquiring an UBN)
http://www.hetInvloket.nl/portal/page?_pageid=122,1780613&_dad=portal&_schema=PORTAL&p_document_id=288602&p_node_id=1856955&p_mode=BROWSE
- 7.5. LNV (2008). Personal Communications from the Dutch Ministry of Agriculture, Nature and Food Quality.

SWITZERLAND

- 8.1. OIE (2008). World Animal Health Information Database (WAHID). Accessible at:
http://www.oie.int/wahis/public.php?page=country_population&year=2007&selected_species=3
- 8.2. Schwermer H., Forster K., Brulisauer F., Chaubert C. and Heim D. (2007). BSE, feed and cattle in Switzerland: Is there a spatial relation? Veterinary Research, 38, pp 409 – 418.
- 8.3. Schmitz-Hsu F. (2004). Evidence to the Review of national animal identification plan hearing of the Subcommittee on Marketing, Inspection, and Product Promotion of the USA Senate Committee on Agriculture, Nutrition and Forestry. Available at:
<http://agriculture.senate.gov/Hearings/hearings.cfm?hearingid=1070&witnessId=3036>
- 8.4. Identitas Ltd (2008). Website available at:
<http://www.identitas.ch/index.php?subl=4§ion=4&lang=EN>
- 8.5. Morris R., McKenzie J. and O’Leary B. (2007). Livestock Traceability System: System Design Requirements for Epidemiological Analysis. Massey Epicentre Report for MAF Biosecurity New Zealand (unpublished).
- 8.6. EC (2008). Get your facts straight: National Sausage Crisis Pits Swiss against EU. Report available at: http://ec.europa.eu/dgs/communication/facts/fact_056_en.htm
- 8.7. SFAO (2004). Tracking and identifying system to control livestock - Evaluation of the benefit and the implementation of the legislative guidelines, Report available at:
<http://www.efk.admin.ch/english/prüfungsberichte.htm>

THE UNITED STATES OF AMERICA

- 9.1 United States Department of Agriculture, Animal and Plant Health Inspection Service (2007). National Animal Identification System (NAIS) – A User Guide and Additional Information Resources. Version 2.0 - December 2007. Report available at:
<http://animalid.aphis.usda.gov/nais/naislibrary/documents/guidelines/NAIS-UserGuide.pdf>

- 9.2 United States Department of Agriculture, Animal and Plant Health Inspection Service (2005). National Animal Identification System (NAIS) – *A State-Federal-Industry Cooperative Effort*. Draft Strategic Plan 2005 to 2009. April 25, 2005. Report available at: http://wlsb.state.wy.us/brands/Premises/brochure/NAIS_Draft_Strategic_Plan_42505.pdf
- 9.3 United States Department of Agriculture, Animal and Plant Health Inspection Service (2007). National Animal Identification System (NAIS) – A User Guide and Additional Information Resources. Version 2.0 - December 2007. Report available at: <http://animalid.aphis.usda.gov/nais/naislibrary/documents/guidelines/NAIS-UserGuide.pdf>
- 9.4. United States Department of Agriculture, Animal and Plant Health Inspection Service (2005). National Animal Identification System (NAIS) – *A State-Federal-Industry Cooperative Effort*. Draft Strategic Plan 2005 to 2009. April 25, 2005. Report available at: http://wlsb.state.wy.us/brands/Premises/brochure/NAIS_Draft_Strategic_Plan_42505.pdf
- 9.5 Ibid.
- 9.6 Ibid.
- 9.7 United States Department of Agriculture, Animal and Plant Health Inspection Service - Website information on NAIS available at: http://animalid.aphis.usda.gov/nais/about/industry_partnerships.shtml
- 9.8 Cattlenetwork – The Source for Cattle News (2007). Five Minutes with Bruce Knight, Undersecretary, USDA. Jolley - September 11, 2007. Report available at: <http://www.cattlenetwork.com/Content.asp?ContentID=174975>
- 9.9 Ibid.
- 9.10 Becker, G. S. (2008). Congressional Research Service (CRS) Report for Congress – Animal Identification: Overview and Issues. Order Code RS22653; Updated July 14, 2008. Report available at: <http://www.nationalaglawcenter.org/assets/crs/RS22653.pdf>
- 9.11 United States Department of Agriculture, Animal and Plant Health Inspection Service - Website information on NAIS available at: http://www.aphis.usda.gov/newsroom/content/2007/07/ksu_benefitcost_nais.shtml
- 9.12 United States Department of Agriculture, Animal and Plant Health Inspection Service (2005). National Animal Identification System (NAIS) – *A State-Federal-Industry Cooperative Effort*. Draft Strategic Plan 2005 to 2009. April 25, 2005. Report available at: http://wlsb.state.wy.us/brands/Premises/brochure/NAIS_Draft_Strategic_Plan_42505.pdf
- 9.13 Becker, G. S. (2008). Congressional Research Service (CRS) Report for Congress – Animal Identification: Overview and Issues. Order Code RS22653; Updated July 14, 2008. Report available at: <http://www.nationalaglawcenter.org/assets/crs/RS22653.pdf>
- 9.14 Ibid.
- 9.15 United States Department of Agriculture, Animal and Plant Health Inspection Service (2007). National Animal Identification System (NAIS) – A User Guide and Additional

Information Resources. Version 2.0 - December 2007. Report available at:
<http://animalid.aphis.usda.gov/nais/naislibrary/documents/guidelines/NAIS-UserGuide.pdf>

- 9.16 Becker, G. S. (2008). Congressional Research Service (CRS) Report for Congress – Animal Identification: Overview and Issues. Order Code RS22653; Updated July 14, 2008. Report available at: <http://www.nationalaglawcenter.org/assets/crs/RS22653.pdf>
- 9.17 United States Department of Agriculture, Animal and Plant Health Inspection Service (2005). National Animal Identification System (NAIS) – *A State-Federal-Industry Cooperative Effort*. Draft Strategic Plan 2005 to 2009. April 25, 2005. Report available at: http://wlsb.state.wy.us/brands/Premises/brochure/NAIS_Draft_Strategic_Plan_42505.pdf
- 9.18 Becker, G. S. (2008). Congressional Research Service (CRS) Report for Congress – Animal Identification: Overview and Issues. Order Code RS22653; Updated July 14, 2008. Report available at: <http://www.nationalaglawcenter.org/assets/crs/RS22653.pdf>
- 9.19 United States Department of Agriculture, Animal and Plant Health Inspection Service (2008). A Business Plan to Advance Animal Disease Traceability. Version 1.0 - September 2008. Report available at:
http://animalid.aphis.usda.gov/nais/naislibrary/documents/plans_reports/TraceabilityBusinessPlan%20Ver%201.0%20Sept%202008.pdf
- 9.20 Becker, G. S. (2008). Congressional Research Service (CRS) Report for Congress – Animal Identification: Overview and Issues. Order Code RS22653; Updated July 14, 2008. Report available at: <http://www.nationalaglawcenter.org/assets/crs/RS22653.pdf>
- 9.21 APHIS Services (2004). Questions and Answers on the National Animal Identification System. September 2004.
http://www.aphis.usda.gov/lpa/pubs/fsheet_faq_notice/faq_ah aids.html
- 9.22 United States Department of Agriculture (2007). The National Animal Identification System (NAIS) – Pilot Projects/Field Trials Summary. 2004 Initial Pilot Projects Final Report; 2005-07 Project Descriptions. May 2007. Report available at:
http://animalid.aphis.usda.gov/nais/naislibrary/documents/plans_reports/PilotProjectReportFINAL05-01-2007.pdf

JAPAN

- 10.1 Katsuaki Sugiura and Takashi Onodera (2008), Cattle Traceability system in Japan for bovine spongiform encephalopathy, *Veterinaria Italiana*, Vol 44 (3), 519-526
- 10.2 Search service of individual identification information of Cattle
www.id.nlbc.go.jp/english/category/trace_system.html

SOUTH KOREA

- 11.1 Batra, Karen (18 April 2008) Cattlemen's Capital Concerns: Farm Bill, South Korea Beef Trade, Animal ID www.cattlenetwork.com
- 11.2 Korean Ministry to test meat tracking system (circa 2005), www.traceabilitynews.com

- 11.3 USDA, Foreign Agricultural Service (November 2008), Republic of Korea Livestock and Products Annual 2008, www.thebeefsite.com
- 11.4 Cheol-Hi Lee (20 May 2007), Traceability for Agri-Products in Korea, FFTC Publication database, www.agnet.org/library/bc/54015
- 11.5 Bowling, MB et al (August 2008), Identification and Traceability of Cattle in Selected Countries outside of North America, Professional Animal Scientist Vol 24 (4) 287-294

ARGENTINA

- 12.1 McConnell, M. and Mathews, K. H. Jr. (2008). Global Market Opportunities Drive Beef Production Decisions in Argentina and Uruguay. In Amber Waves – United States Department of Agriculture Economic Research Service. April 2008. Report available at: <http://www.ers.usda.gov/AmberWaves/Scripts/print.asp?page=/April08/Features/GlobalMarket.htm>
- 12.2 EMPRES Transboundary Animal Diseases Bulletin (2003). Foot and Mouth Disease - FAO Corporate Document Repository. Bulletin No. 24-2003. Report available at: <http://www.fao.org/docrep/007/y5292e/y5292e03.htm>
- 12.3 Agriculture and Agri-Food Canada (2006). The Beef and Cattle Industry in Argentina. Agri-Food Trade Service, August 2006. Report available at: http://www.ats.agr.gc.ca/latin/4212_e.htm
- 12.4 McConnell, M. and Mathews, K. H. Jr. (2008). Global Market Opportunities Drive Beef Production Decisions in Argentina and Uruguay. In Amber Waves – United States Department of Agriculture Economic Research Service. April 2008. Report available at: <http://www.ers.usda.gov/AmberWaves/Scripts/print.asp?page=/April08/Features/GlobalMarket.htm>
- 12.5 Ibid.
- 12.6 Leon, E. A., Stevenson, M. A., Duffy, S. J. Ledesma, M. and Morris, R. S. (2006). A Description of Cattle Movements in Two Departments of Buenos Aires Province, Argentina. Preventative Veterinary Medicine, 76, 109-120. <http://cat.inist.fr/?aModele=afficheN&cpsidt=18024325>
- 12.7 McConnell, M. and Mathews, K. H. Jr. (2008). Global Market Opportunities Drive Beef Production Decisions in Argentina and Uruguay. In Amber Waves – United States Department of Agriculture Economic Research Service. April 2008. Report available at: <http://www.ers.usda.gov/AmberWaves/Scripts/print.asp?page=/April08/Features/GlobalMarket.htm>

BRAZIL

- 13.1. OIE (2008). World Animal Health Information Database (WAHID). Accessible at: http://www.oie.int/wahis/public.php?page=country_population&year=2007&selected_species=3

- 13.2. Germain C. (2005). Traceability implementation in developing countries, its possibilities and its constraints: A few case studies. Report available at:
<ftp://ftp.fao.org/es/esn/food/traceability.pdf>
- 13.3 European Commission (2008). Commission Decision Of 17th January 2008 amending Annex II to Council Decision 79/542/EEC as regards the imports of bovine fresh meat from Brazil – 2008/61/EC. Available at: <http://eur-lex.europa.eu/JOHtml.do?uri=OJ:L:2008:015:SOM:EN:HTML>
- 13.4. European Commission (2008). Final report of a mission carried out in Brazil from 23 February to 13 March 2008 in order to evaluate the traceability system for cattle eligible to be slaughtered for export of their meat to the EU. Report available at:
http://ec.europa.eu/food/fvo/ir_search_en.cfm
- 13.5. The Beef Site (2008). EU Brazilian beef ban hits hard. Report available at:
<http://www.thebeefsite.com/news/22279/eu-brazilian-beef-ban-hits-hard>