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Unit Standard 24623

Cattle Breeding

Demonstrate knowledge of breeds and classes of cattle, identification and records for cattle

Version 2 Level 2 Credit 2

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Learning Objectives

Students credited with this unit standard will be able to:

- **Breeds of Cattle in New Zealand**
  Demonstrate knowledge of the breeds of cattle in New Zealand, being able to recognize them by their physical characteristics, and describe their productive characteristics.
- **Age and Gender Classes of Cattle**
  Identify age and gender (male, female etc.) classes.
- **Methods of Animal Identification**
  Describe types of cattle identification (tags, ear marks etc.) and the merits of each type.
- **Information required to be recorded**
  Describe information required to be recorded from individual animals in terms of its contribution to managing the farm.
- **Systems of recording and processing information**
  Describe systems of recording and processing of information from individually identified animals in terms of their features and benefits.

These learning objectives do not sound particularly interesting or exciting, but in fact they are. The twin themes in this book ("breed histories and characteristics", and "animal information systems") are in fact incredibly exciting.

Terminal and Maternal Breeds

Terminal Breeds

A terminal breed is a breed where a bull produces both male and female offspring and they are all sent to the works for slaughter. Some females are kept for replacement breeding stock.

Hereford Bull

Image by Nicke, 2006. Licensed under CC0 1.0

Terminal breeds are associated with the beef industry and include breeds such as Hereford, Angus, Simmental and Charolais. Other exotic breeds are also included as terminal breeds.

Maternal Breeds

A maternal breed is a breed where the females produced are kept as replacement stock. Maternal breeds are usually associated with the dairy industry, where young females are selected as replacements for the herd. Examples include Friesians, Jersey and Ayrshire. Ayrshire males are usually sold as bobby calves or to the beef industry for finishing.

Stud breed herds can also be classified as maternal breeds if the females are being selected as replacements for the herd. The female is required to meet the breed society specifications so the characteristics of the breed are maintained. Stud herds of Herefords, Angus, Simmental and Charolais could be maternal breeds in this situation.

Stud breeders also select replacement bulls to either better increase the genetic potential of their stud bull herd or to sell onto other farmers to use as a breeding bull.

Figure 1 A group of Friesian heifer calves – an example of maternal breed where the female calves are kept as replacement stock.

Image from http://farrellycalves.co.nz/calves-for-sale/

Breed Histories and Characteristics

The New Zealand Cattle Breeds

Introduction

While you may need only be acquainted with the most common breeds of cattle in New Zealand, it is worth your while to get to know just a little of the fascinating variety of breeds and their breeding histories. For example, the Shorthorn cow of Northern England was the first commercially dominant breed in the UK, and also the mainstay cattle breed of pioneer New Zealand. Its history is therefore essential to the understanding of the history of the New Zealand cattle herd.

We include along the way some statistical tables, and also a sample the human interest stories that are part and parcel of the history of the cattle breeds. We thus hope to make a dry topic into a treasure trove. This is just a short summary. If your appetite is whetted, the references at the end of this section will lead you on to many other interesting breeds and their stories.

Dairy Breeds

Holstein Friesian

The Holstein Friesian is the most common milking cow in the world. In 1884 Canterbury farmer, John Grigg, imported the very first Holstein Friesian into the South Island, followed closely by a group of Wairarapa farmers four years later. The majority of imported cows came from the United States.

Breed Origins

The Friesian cow originated in Europe. The major historical development of this breed occurred in what is now the Netherlands and more specifically in the two northern provinces of North Holland and Friesland which lay on either side of the Zuider Zee.

The Friesian, or Holstein cow originated from black animals and white animals of the Batavians and Friesians, migrant European tribes who settled in the Rhine Delta region about 2,000 years ago. For many years, Friesians were bred and strictly culled to obtain animals which would make best use of grass, the area's most abundant resource. The intermingling of these animals evolved into an efficient, high-producing black-and-white dairy cow for dual purpose (milk and meat).

Origin of the Name “Holstein”

The Holstein name derives from the North German province of Holstein, which imported American specialist milking Friesians after the Second World War.

The New Zealand Friesian

Stud Friesians are larger animals, having a significant component of recently imported genetics from Northern Europe and America or Canada.

Commercial Friesians are smaller, and are efficient grass to milk producers. This is due to intensive selection programs for milk production from pasture, and has come at some cost to the original meat production targets of the Frieslanders.

Figure 2 Holsteins are large, stylish animals with colour patterns of black and white or red and white

Image from Weller, 2002. Licensed under CC0 1.0

Physical Characteristics

Holstein Friesians are the largest of the milking breeds, with colour patterns of black and white or red and white.

Jersey

The Jersey, in its purebred form, is renowned for its smaller size and ease of handling as well as its ability to produce a higher quantity of milk solids per litre of milk.

Figure 3 Jersey cow

Image by Tlarson, 2007. Licensed under CC0 1.0

Physical Characteristics

A small milking cow with very marked refinement about their heads and shoulders. Light grey or mouse colour to a very dark fawn. It is also known that Jerseys are slightly more tolerant of hot weather than the Friesian cow.

Foundation of the Breed

The Jersey breed originated on the Island of Jersey, a small British island in the English Channel off the coast of France. The Jersey is one of the oldest dairy breeds, having been reported by authorities as being purebred for nearly six centuries.

Ayrshire

The red-and-white Ayrshire breed originated in Ayrshire, Scotland and came to New Zealand in 1848 with the first settlers to Otago. The breed society was formed in 1909, and Ayrshires or their crosses now number about 100,000. The breed performs well under all-grass, medium-intensity farming, with reliable calving, a strong constitution, good foraging abilities, strong legs and a well-shaped udder.

Figure 4 Ayrshire breed

Image by Friedrich, 2007. Licensed under CC BY-SA 2.5

Physical Characteristics

Ayrshires are red and white, and purebred Ayrshires only produce red and white offspring. Actually, the red colour is a reddish-brown mahogany that varies in shade from very light to very dark. On some bulls, the mahogany colour is so dark that it appears almost black in contrast to the white. They are a hardy breed, able to cope with poorer. Ayrshires are docile enough, but somewhat independently minded when it comes to mustering and yarding.

Foundation of the Breed

Prior to 1800 many of the cattle of Ayrshire were black, although by 1775 browns and mottled colours started to appear. Probably the improvement of the native stock began around 1750 when it was crossed with other breeds. The principal blood used in improvement was that of the Teeswater stock, which later was largely used in the formation of the Shorthorn breed in England. A majority of the breeding in the Teeswater was from Dutch or Flemish cattle that also were used in the formation of the Holstein breed. Jersey cattle and Shorthorns were also included in the mix.

Productive Characteristics of Dairy Breeds

Now that you have a good understanding of the origin and physical characteristics of dairy producing breeds in New Zealand, let's take a look at their *productive* characteristics in more detail.

The following section focuses on the cow's ability to produce milk, with particular emphasis on the Holstein Friesian – Jersey crossbreed. As stated in the DiaryNZ "New Zealand Dairy Statistics 2013-14" http://www.dairynz.co.nz/media/2255784/nz-dairy-stats-2013-2014.pdf , this breed makes up 42.6% of the total dairy breeds in New Zealand for the 2013/14 season.

Each breed of dairy cow also produces milk with slightly different composition, a summary of these differences is available from the about DiaryNZ link. Jersey breeds have a much higher fat and protein content in contrast to the Friesian breed. It is important to note that there are a number of factors which influence the composition of milk: genetics, the age of the cow, the stage of gestation and lactation, feeding, cow health, cow condition and the weather or climate.

Dairy breeds also vary in size and the DairyNZ stats illustrate the variation in live weight between Holstein-Friesian, Jersey and crossbreeds. Although this is a *physical* characteristic, it is also impacts on *production*.

The Jersey cow, being smaller in size, does not require as much feed as a Holstein-Friesian. A Jersey cow produces almost 1,100 litres less milk than the Holstein-Friesian and only about 27 kilograms less of milk solids.

Holstein-Friesians are by far the largest breed of dairy cow in New Zealand. The Jersey cow is the smallest of the dairy breeds, weighing in at 414kg on average. The Holstein-Friesian also produces the largest amount of kilograms of milk solids with Jersey producing the smallest amount.

There are many factors which influence the composition of milk. These factors also play a part in the *production* of milk:

- Genetics
- Age of the cow
- Stage of gestation and lactation
- Feeding
- Cow health
- Cow condition
- Weather or climate

For further information on dry matter, please refer to the glossary provided at the end of this module.

The DairyNZ statistic also illustrate how a large 550kg Friesian cow producing 1.2kgMS/day would require 15.8kgDM of feed per day (with a feed quality of 10.5 MJME/kgDM). In contrast a 350kg Jersey cow producing 1.2kgMS/day would only require 13.4 kgDM of feed per day.

How do we select the highest producing cows for our herd?

In the dairy industry, replacement stock are selected on their Breeding Value (BV), Lactation Value (LV) and their Production Value (PV).

- The Breeding Value (BV) – ranks male and female animals for their genetic merit for individual traits;
- The Production Value (PV) – ranks female animals for their lifetime production ability;
- The Lactation Value (LV) ranks female aniamls for their current season production ability.

Included in these indices will be factors such a:

- The cows ability to calve easily
- High conception rates (to ensure a longer milking season)
- Their quiet temperament (an important consideration given they are to be handled by people almost all year round).

In Summary

Holstein-Friesian

- Patterned colourings in black and white
- Highest milk producer
- Largest of the dairy breeds
- Cows usually artificially inseminated to breed high producing replacement stock
- Can run less number of cows to the hectare in comparison to a Jersey herd (lessens the 'per head' costs of production)

Jersey

- Light grey or mouse colour to a very dark fawn
- High content of milk solids per litre of milk for their small size, can stock more Jerseys per hectare
- Smallest of the dairy breeds making them suitable for wetter areas
- Produce milk with a high fat and protein content in comparison to Holstein Friesians
- Cows usually artificially inseminated to breed high producing replacement stock
- Higher fertility than Holstein Friesians
- Some farmers claim that Jersey cows are more susceptible to disease

Beef Breeds

Angus (Aberdeen Angus)

The Angus breed originated from north-eastern Scotland. Angus cattle are hornless (hence sometimes referred to as Polled Angus). When they are mated to horned animals, their offspring are polled (hornless).

Figure 5 Angus (Aberdeen Angus)

Physical and Productive Characteristics

The coat colour is black, sometimes tinged with brown at birth and in winter. The animals are early maturing but are smaller than those of most other beef breeds. They are particularly popular as a small calving beef sire for mating with dairy heifers. The Aberdeen Angus is still the most popular beef breed in the North Island, where Angus and their crosses still make up approximately 50% of the beef steer kill (see table seven below). In summary, the Angus breed is known for:

- Rapid weight gain, earlier finishing
- Easy calving due to low birth weight calves
- Resilient to changes in climatic conditions and are well suited to New Zealand farming systems, from high country to irrigated flats

- High carcass yield and well-marbled meat
- High fertility
- Good mothering ability

Breed Origins

The county of Angus was early noted for its production of potatoes, grain crops and feed. This shire contains a fine expanse of highly cultivated land known as Strathmore, which is one of the very fine valleys in that part of Scotland and which has become famous in the history of the Aberdeen-Angus breed. The county of Aberdeen is the most productive agricultural region in Scotland and depends largely upon crops and livestock for income.

Polled (hornless) cattle apparently existed in Scotland before recorded history because the likeness of such cattle is found in prehistoric carvings in the counties of Aberdeen and Angus. Historians state that there were hornless cattle in Siberia centuries earlier. Some historians feel that the Aberdeen-Angus breed and the other Scottish breeds sprang from the aboriginal cattle of the country.

Foundation of the Breed

Apparently little attention was given to the breeding of cattle before the middle of the 18th century. As farming practices were improved, people likewise sought to improve the livestock on their farms. It was only natural that breeders, in improving their cattle, would use cattle of similar kinds from adjacent areas, and as a result, the cattle of the Angus Doddie strain and the Buchan Humlie strain were crossed. Crossing and recrossing these strains of cattle eventually led to a distinct breed that was not far different from either type, since the two strains were originally of rather similar type and colour pattern.

Hereford

Hereford cattle, bred in Herefordshire in Wales, have distinctive red-and-white body markings and a white face.

In 1868, R. and E. McLean imported Herefords to their Auckland farm. The Holm family founded New Zealand's first Hereford stud at Waimahaka, Southland, in 1877.

Since the 1950s, Herefords have been second to the Angus in popularity in the New Zealand beef herd. In 2006, pure Hereford cattle made up 9% of the national beef herd, and

Figure 6 Hereford

Image by Merkel, 2006. Licensed under CC0 1.0

Angus–Hereford crosses another 9%. Herefords are also crossed with other breeds. This figure has not changed greatly (see table 1).

The Hereford is hardy and can be run in a wide range of environmental conditions. The cows are fertile and calve easily. Herefords convert feed to meat efficiently, and produce a high-quality carcass. The traditional Hereford is horned, but a polled type was bred in the US and imported into New Zealand in 1929.

Physical and Productive Characteristics

- Herefords have white heads, necks, dewlaps, and underlines; the colour of the remainder of the coat ranges in intensity from a deep cherry-red to yellow-red
- The cattle are docile in nature
- In New Zealand the Angus and Hereford are often crossed to produce offspring with the desirable qualities of both. The progeny of this cross are black with white faces and are polled
- Great foragers
- Long life (some breeding cows have been still producing calves beyond 15 years of age)
- Great meat producers
- Hardy animals that can handle changes in climatic conditions

Foundation of the Breed

The Hereford breed was founded about AD 1742. Thrifty and enterprising farmers near Hereford in the County of Herefordshire, were determined to produce beef for the expanding food market created by Britain's industrial revolution. To succeed in Herefordshire, these early-day cattlemen realized they must have cattle which could efficiently convert their native grass to beef and do it at a profit.

Beginning in 1742 with a bull calf from the cow Silver and two cows, Pidgeon and Mottle, inherited from his father's estate, Benjamin Tomkins is credited with founding the Hereford breed. (This was 18 years before Robert Bakewell began developing his theories of animal breeding). From the start, Mr. Tomkins had as his goals economy in feeding, natural aptitude to grow and gain from grass and grain, rustling ability, hardiness, early maturity and prolificacy, traits that are still of primary importance today.

Herefords in the 1700's and early 1800's in England were much larger than today. “Cotmore”, a winning show bull and noteworthy sire, weighed 3,900 pounds (that is 1 and ¾ tons!) when shown in 1839. Gradually, the type and conformation changed to less extreme size and weight to get more smoothness, quality and efficiency.

An article published by Stuff.co.nz at
http://www.stuff.co.nz/business/farming/beef/10037458/Selection-key-to-reaching-top-productionon
15 May 2014 outlines the breeders approach to terminal versus maternal beef breed.

Shorthorn

County Durham (in North Humberland) is regarded as the cradle of the Shorthorn breed. The first real development of the Shorthorn breed took place in the valley of the Tees River. This river lies between Durham and York counties, and the large cattle that inhabited this fertile valley early became known as “Teeswater cattle”. Later, two separate types, beef Shorthorns and milking Shorthorns were developed.

The first dairy cows to arrive in New Zealand were Shorthorns, (known at that time as "Durhams"). They were introduced in 1814 by missionary Samuel Marsden for mission stations in the Bay of Islands. The cows came from the New South Wales Crown herd, and were a gift from Governor Lachlan Macquarie. Shorthorns were useful draught animals, which also gave milk and provided excellent meat. Shorthorn herds were well established by the early 1840s, and for a long time Shorthorns were New Zealand's most popular cattle breed. Farmers mainly kept cows to provide milk, butter and other dairy products, and grazed them on pastures cut out of native bush. Initially, herds were small, but were larger near towns where there was a ready market for dairy produce.

Figure 8 Beef Shorthorn bull.

Image by Scarth, 2007. Licensed under CC BY-SA 2.0

Figure 7 Milking shorthorn cow.

Image by Scarth, 2006. Licensed under CC BY-SA 2.0

Physical and Productive Characteristics

- The beef Shorthorn can be of three main coat colours; red-roan, white, or cherry-red
- The modern animals of this breed are more compact and have an outline more nearly like that of the Aberdeen Angus
- Milking Shorthorns are an average-sized breed (fairly large by New Zealand standards)
- They are all red, red with white markings, all white, or roan
- Average production for the breed is approximately 7000 kg of milk in 305 days.

Foundation of the Breed

As early as 1580 there existed a race of superior short-horned cattle on the estates of the earls and dukes of Northcumberland.

The early breeders of Shorthorn or Teeswater cattle left a heritage with which later breeders could work. The cattle that they developed were usually of considerable size and scale, with wide back and deep, wide forequarters. Their hair and hide were soft and mellow. In addition, they were cattle that had ability at the pail and laid on fat readily under conditions of liberal feeding. It is not to be inferred that these were perfect or ideal cattle as compared to modern standards. They lacked uniformity and symmetry and were often quite prominent at their hooks and shoulder points; other faults, such as narrowness of chest, lack of spring of rib, short rumps, long legs, and unevenness of fleshing, left much to be desired. The ability of these cows to produce a good flow of milk has always been an asset to the breed, and size and scale have never been without merit. Breeders, of course, have striven through the centuries to correct some of the

deficiencies that were prevalent in this Tees River stock, and at the same time to retain the most valued characteristics that the breed possessed.

South Devon

This breed was developed in Devonshire and Cornwall, where they have been a distinct breed since the 16th century. The South Devon has been brought to New Zealand in small numbers. South Devon cattle are horned, large in size (the largest of the British breeds), and their coat colour varies from light to dark red or copper. They became popular in the 1960's for their ability as a meat producer and are renowned for their quiet temperament. This breed ranks fourth for numbers of registered (stud) purebred cows – perhaps this is a testimony to their lovely quiet temperament (see table eight below that follows). The New Zealand Rare Breeds website: (www.rarebreeds.co.nz) describes South Devons (or otherwise known as Red Devons) as having "characteristics of hardiness, docile temperament and excellent foraging ability make them ideal for small holdings".

Figure 9 South Devons

Image by Charlesdrakew, 2008. Licensed under CC0 1.0

Foundation of the Breed

The South Devon originates from the counties of Devon and Cornwall in Southwest England. They are the largest of the British breeds and are not related to Devon cattle. Over 100 years of selection for performance have given the South Devon its outstanding qualities of beef and maternal characteristics.

Physical and Productive Characteristics

South Devon cattle are:

- Polled
- Large in size
- Coat colour varies from light to dark red
- Docile nature
- Ability to handle hotter climate
- The South Devon is known for its ability to produce milk and meat therefore has an excellent ability to rear young stock.

Other Traditional Breeds

Murray Grey

The Murray Grey is a refinement upon its Angus and Shorthorn parentage.

About 1957 a demand for them developed, and butchers paid a premium price for the Greys because of their consistent high cuttability and less wastage. Breeder after breeder turned to them and in 1962 fifty breeders banded together to form the Murray Grey Beef Cattle Society of Australia. The Murray Greys began to win carcass competitions in the early 1970's and have continued to dominate the steer and carcass classes at the Royal Shows in Australia. Murray Greys are one of the two breeds preferred by the Japanese for importation, due to their easy fleshing and high-quality meat production.

Figure 10 Murray Grey

Physical and Productive Characteristics

- Small birth weight calves
- Cows are good mothers and milk well
- Calves have good rates of growth
- Docility seems to be a genuine asset of the breed
- The cattle have relatively small heads and bone and are polled
- Their survival and reproductive rate has been very satisfactory under a wide range of climatic and management conditions.

Foundation of the Breed

The Murray Grey originated from the region of the river Murray that divides New South Wales and Victoria (Australia). In 1905, on the Thologolong property of Peter Sutherland, a particular roan Shorthorn cow, when bred to various Aberdeen Angus bulls, dropped only grey calves, 12 of them by 1917.

Exotic Breeds

Simmental

The Simmental originated in western Switzerland, and is the second most common European cattle breed worldwide. Although pure Simmental cattle make up only 1% of the New Zealand beef herd, the bulls are popular as terminal sires and are widely mated with Angus, Hereford, and Angus–Hereford-cross cows.

The Simmental was initially bred for milk, meat, and for use as a draught animal. Specialised breeding in different countries has led to variations.

Physical and Productive Characteristics

- Large framed (cows weighing between 700-900kg on average), well-muscled cow
- Horned or polled
- Light straw to dark red in colour, often with white patches on the head, underside and legs, dark patches around eyes with a heavy dewlap (fold of loose skin hanging from the neck region)
- The cows have good maternal qualities and a docile nature
- Excellent milk yield for a beef cow , they therefore produce well-grown weaners

Foundation of the Breed

The name Simmental was derived from the name of the area they were first bred, the Simme Valley in Switzerland (www.thebeefsite.com). As early as 1785, the Swiss Parliament limited exports because of a shortage of cattle to meet their own needs. The Swiss "Red and White Spotted Simmental Cattle Association" was formed in 1890.

Since its origin in Switzerland, the breed has spread to all six continents. Total numbers are estimated between 40 and 60 million Simmental cattle world-wide. The spread was gradual until the late 1960s.

Limousin

Limousin cattle arrived in New Zealand in the mid-1970s. They have become popular for their hardiness, docility and meat quality, and are widely used as terminal sires.

Figure 11 Limousin

Image by Ben23, 2008. Licensed under CC BY-SA 2.0

Limousin cattle are an ancient breed from the Massif Central in France, where they had to cope with poor-quality pasture.

Originally a draught animal, they have been used for meat production from the late 19th century.

The modern Limousin is a medium-sized, well-muscled animal with a rich golden-brown coat. Limousins mature earlier than most European breeds and are renowned for their high-quality carcass, with a high meat-to-bone ratio.

Charolais

The Charolais was the first exotic breed introduced into New Zealand. It was developed in the Charolles district of central France, where it was used as a draught animal and noted for its meat quality. Charolais semen was imported for trials at Lincoln and Ruakura in 1965, and by a commercial farmer the following year.

Figure 12 Charolais cow with calf

Image by Ben23, 2010. Licensed under CC BY-SA 4.0

Live cattle were later imported. A 'New Zealand Charolais' has also been developed by mating Angus or Hereford cows with Charolais sires over five successive generations.

Early in its New Zealand history, the considerably smaller New Zealand cows had problems birthing a massive Charolais calf, so it's now not commonly used as a terminal sire. Their high growth rates and meat quality have however made them popular among some as purebred stock.

Physical and Productive Characteristics

- Large (cows can weigh up to 900kg, bulls 1100kg), well-muscled cattle, horned
- Coats coloured white or very light-straw
- Known for their high growth rates and early maturing
- Commonly used as a terminal sire for beef production.

Other breeds

Many breeds of beef cattle have been imported into New Zealand since the 1960s, mostly from Europe, but some from Australia, the US and Japan. Many are represented by only a few herds and have had little influence on beef production. Some of the following are listed at: http://www.teara.govt.nz/en/beef-farming

Figure 13 Belgian Blue (left) Maine-Anjou (centre) Wagyu right)

Image by Barbarossa, 2005. Licensed under CC BY-SA 3.0

Image by Bernizet, 2005. Licensed under CC BY-SA 3.0

Image by Hartwig, 2007. Licensed under CC BY-SA 3.0

Other New Zealand cattle breeds are listed and described at:
http://www.rarebreeds.co.nz

Figure 14 Salers

Crossbreds and Hybrid vigour

Hybrid vigour is the term given to the extra productivity or performance that occurs when two breeds are crossed. Hybrid vigour may lead to as much as 15% more productivity over and above the average of the sire and dam breeds. Common crossbreds in New Zealand include:- Santa Gertrudis

Dairy Crossbreds

Jersey-Friesian crossbreed, also known as the "KiwiCross"

New Zealand dairy farmers want medium-sized, fertile, easy-calving cattle that will not suffer leg and foot problems when travelling from paddock to parlour. In the late 20th century Friesians were bred with Jersey cows to produce the KiwiCross, which has a dark-brown coat with white or black accents. Hybrid vigour boosts its milk-solids production, conception and calving rates. According to DiaryNZ Stats Report 2013-14, in the 2013/14 season, 43% of dairy herd in New Zealand were made up of KiwiCross.

References

Breed History and Physical Characteristics

http://www.teara.govt.nz/ ; http://www.ansi.okstate.edu/breeds/cattle/
http://www.rarebreeds.co.nz/list.html

Production References

www.beef.org.nz; www.dairynz.co.nz; www.lic.co.nz

Self-Test Questions 1

1. How would you recognise a Friesian cow?

2. Angus cattle - “doddie” and “humlie” are Scottish words used to describe a special characteristic of the Angus cattle beast. What do the two terms mean?

3. Fill in the gaps:
   As beef breeds go, the Angus is s_____ than most and m_____ earlier.

4. How would you recognise a Simmental?

5. Name two very useful production characteristics of the Simmental:

6. Describe the markings of the Hereford beast:

7. Name two useful production characteristics of the Hereford beast:

8. Identify beef breeds that are often used as terminal sires:

9. The Charolais is not now commonly used as a terminal sire in New Zealand. Why?

Classes of Cattle

Cattle can be distinguished upon the basis of breed. They can also be distinguished upon the basis of "class". A class of stock can be defined as:

- A category of cattle beast that requires to be managed in a certain way

Thus, you wouldn't manage a calf the same way you would a bull, and neither would you manage a newly calved cow the same as a lactating cow in the main herd. Classes of Cattle on the farm may include:

Class	Description
Calf	Any animal under about 9 months of age
Calf on the mother	Any animal up to about 9 months of age, still taking milk from its mother
Calf on artificial rearing	Any animal being fed on milk via bucket, teat etc.
Weaned Calf	Any animal up to about 9 months of age that has been removed from mother's milk (these ones are particularly susceptible to worms, and are growing very rapidly)
Rising One year old (R1)	Any animal from 9 to 12 months of age (these ones are beginning to be less susceptible to worms)
Rising 2 year old (R2)	A cattle beast that is between 18 and 24 months of age.
Heifer	A young female cattle beast, usually from 1 to 2 years of age (younger than that, it would be called a heifer calf)
Bull	A male cattle beast, from 9 months and older (younger than that, it would be called a bull calf)
Steer	A bull that has been castrated, and therefore can no longer make cows pregnant. Sometimes referred to as a 'bullock'.
Dry cow	A cow that is not currently giving any milk (sometimes this term is specifically narrowed down to those cows that should have produced a calf and started to milk, but who didn't)
Newly calved cow	A cow newly calved (worth knowing and monitoring closely, because newly calved cows are prone to various illnesses; also you must never put their colostrum milk in the vat for human consumption)
Springing Cow	A cow (usually within the last two weeks of pregnancy) who is developing an udder, and showing other signs of readiness to calf
Lactating Cow	Cow producing milk

Livestock Identification

Why the Need for Livestock Identification?

Current methods of livestock identification, in New Zealand, include but are not limited to:

- Ear marking
- Ear tagging
- Chalk raddle, aerosol spray marker or paint
- NAIT approved RFID tags (cattle and deer only)

Livestock identification systems are based on recognized industry needs, including:

At the national level:

- For disease surveillance and monitoring (e.g. Animal Health TB tagging)
- To control and eradicate disease (e.g. Animal Health TB tagging)
- For emergency response to foreign animal diseases
- To meet the requirements of global trade and individual trading partners

On the farm:

- For livestock production efficiency (age identification, recognition of animals destined for slaughter)
- To assist with emergency management programs
- To derive the origin of animal (through the food chain) and consumer concerns over food safety and animal welfare

To read about the origin and history of animal identification, please refer to the 'Additional Readings' section of this module.

Ear Marking

Ear marking (or Livestock Branding) is a common practice throughout sheep and beef farming operations in New Zealand. Ear marks and brands can be used to identify age or sex but the main purpose of the ear mark is flock identification. Quite often stock can venture into neighbouring properties and the ear mark is a more permanent method of identifying ownership (in comparison to an ear tag, which we will discuss in the next section).

Figure 15 Ear marking tools

Image from http://www.electrotek.co.nz/

The allocation, to farmers, of ear mark and brand designs is currently managed by AsureQuality New Zealand Limited. The following information is the registration and application form which a farmer is required to complete in order to obtain a unique ear mark for their farming operation. The third page shows the designs currently available, it also shows the positioning of the ear mark (punch hole, rimcut,

quarters or tips). The ear marking tool, as pictured above, is used to pierce/mark the animal's ear. This is usually carried out before the animal is two months of age (for sheep farmers, ear marking is standard practice at tailing/docking time).

Ear marking is also an effective means of identifying ewe lambs from ram lambs (bull calves from heifer calves). Ewe lambs may be marked in the left ear, ram lambs in the right or vice versa.

AsureQuality

LIVESTOCK BRAND REGISTRATION FACT SHEET

BACKGROUND

This service has been developed to **replace** the previous Brand Registration Service provided by the Ministry of Agriculture and Fisheries under the Animals Act 1967. **Its purpose is to facilitate proof of ownership of livestock.**

The new service is in operation as at 1st July 1995 for the registration of new marks.

Marks registered under the olds cheme have stautory protection under the provisions of the Animal Identification Act 1993 until 30th June 1998.

KEY FACTS ABOUT THE NEW SERVICE

The new service is voluntary and discretionary.

We are offering it in response to identified farmer demand.

Marks registered under the new service are backed by the integrity and quality systems of the AsureQuality organisation, rather than by statute.

AsureQuality will maintain the new register as a service to the farmer, and will provide independent verification of any mark's registered status to whom it may concern at the owner's request.

Whilst every attempt will be made to ensure that marks registered are as unique from others in the neighbourhood as possible, the nature of earmarking technology is such that no guarantee of uniqueness can be given.

It is planned to computerise the Register within 18 months. This will enable enhanced benefits to clients in terms of ease of registration and enhanced search facilities. It will also enable automatic notification of marks coming up for re-registration.

The fee for registration of a mark is $60 (GST inclusive) per registration. Certified Copies of the original Advice of Registration are available for a fee of $20 (GST inclusive) per application.

Registrations are current for 5 years. On expiry, they may be renewed on payment of a further registration fee, or allowed to lapse if no longer required. This factor of the service will ensure that marks no longer required will come back into circulation for re-issue, increasing the pool of available marks. Benefits to clients will be a wider range of choice of earmark designs available and therefore enhanced capability for uniqueness from other registered marks.

For further information, please contact:

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AsureQuality Limited
PO Box 3080
Te Rapa
Hamilton

DDI 07 850 2843
Cell 021 596 161
A/H 07 824 9264

AsureQuality

LIVESTOCK BRAND APPLICATION FORM

BRANDS/01.1

Full Name: ..... Farm ID .....

Farm Name/Trading As: .....

Postal Address: ..... Telephone: .....

Location of Farm: ..... District Council Name: .....

Property Owner Initials ..... Property Owner Surname .....

NAMES OF ALL NEIGHBOURS WHOSE STOCK ARE LIKELY TO MIX WITH MINE

Full Name	Office Use Only		Full Name	Office Use Only	

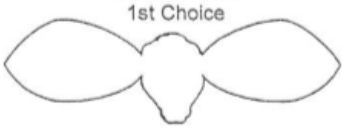
TYPE OF BRAND WANTED

Cross out those not wanted, and, if you prefer a particular brand design or designs, draw it here:

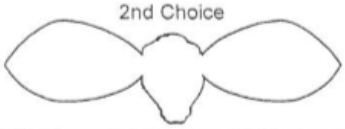
SHEEP: Earmark Firemark
CATTLE: Earmark Firemark
GOATS: Earmark Firemark
DEER: Earmark Hidemark
PIGS: Earmark
OTHER: _____

EARMARK

1st Choice



2nd Choice



HIDEMARK/FIREMARK

1st Choice

2nd Choice

Type of Registration: ☐ New ☐ Renewal ☐ Transfer *

I certify that I own livestock of a type for which the brand(s) is/are required. Signature: ..... Date: ____/____/____

Capacity in which signed: (owner, manager, etc.) .....

* If the registration is a transfer, the current owner of the brand must complete the panel below:

I, (full name) ..... of (postal address) .....

.....

hereby authorise the transfer of the brand(s) described above, currently registered in my name, to the new applicant.

Signature: ..... Date: ____/____/____

This information will be used by AsureQuality New Zealand Ltd. only for the purposes of maintaining and updating the register of Brands and Earmarks, and will be managed according to the principles of the Privacy Act 1993. The purpose of the Register is to facilitate proof of ownership of livestock. Information on the Register will be made available on request to any person seeking to identify livestock based on their brands or earmarks.

Receipt # ..... **Amount $** .....

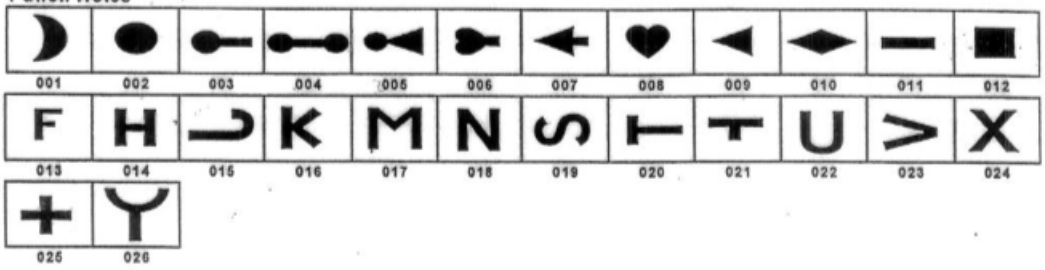
AsureQuality **New Zealand Ltd.**

AsureQuality

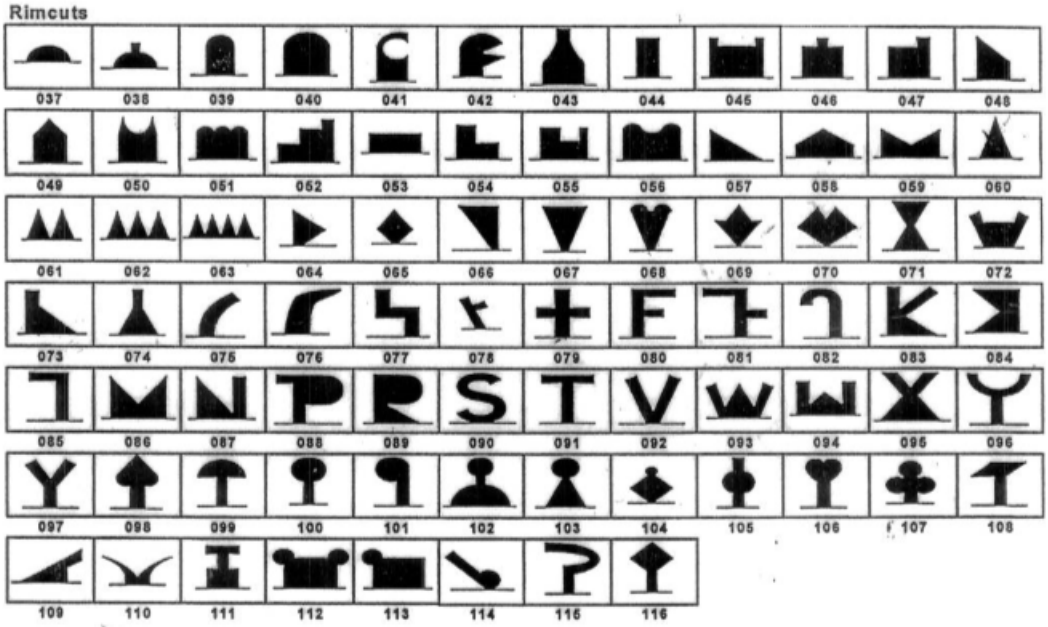
AVAILABLE EARMARK DESIGNS

BRANDS/01.5

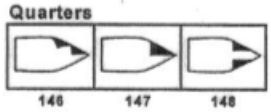
Punch Holes



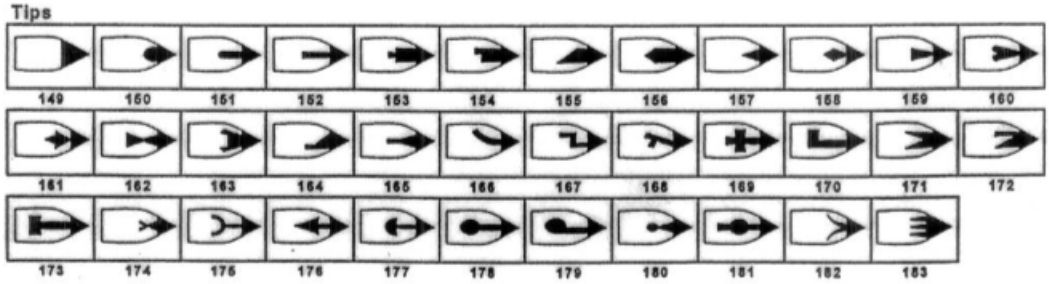
Rimcuts



Quarters



Tips



Retrieved from www.asurequality.com

Ear Tags What are ear tags?

Ear tagging is such a routine thing today that it is hard to realize the power of this piece of animal management technology. Consider this, the individually numbered ear tag ushered in a whole new era in recording and monitoring of livestock. And with the onset of the digital era, the story of the individually numbered tag is still unfolding.

There are many varieties of tags available on the market today, all designed for a specific purpose and with a specific class of stock in mind.

Plastic Tagging Options

The examples illustrated below, from www.allflex.co.nz, are just some of the tags available for sheep and cattle. In the right hand column is a picture of the device required to apply the tag. As you can see from the picture, farmers are also given the option to have text printed on the tags. Some choose to have their surname or the name of their property printed alongside the year of birth for example "Telford 2015". Not only does this aid with identifying ownership, the age of the stock can be easily identified too.

Another method which farmers use to identify the year of birth, is a coloured tag. For example, Pink for 2010, Green 2011, Blue 2012, Yellow 2013, Orange 2014 – the helps with drafting, or sorting of stock into their various age groups.

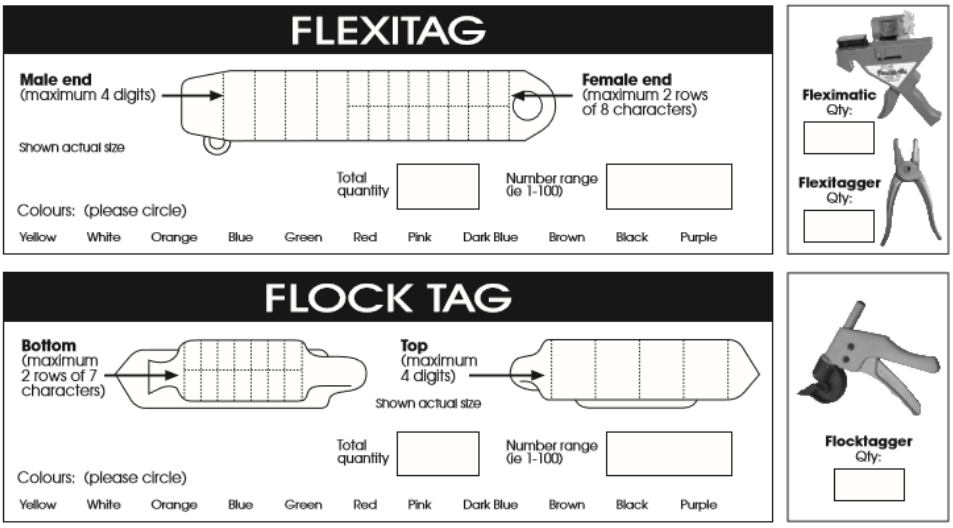


Figure 16 Flexitag and Flock Tag

Retrieved from www.allflex.co.nz

Often the colour black is used for identifying stock which are destined for culling. For example, a farmer discovers a ewe during lambing with only one teat functioning. A black tag is then applied, therefore the ewe can be easily identified during weaning and culled.

Stud Tagging Options

In stud farming situations, a named and numbered brass tag is often used for recording purposes. Lambs or calves are tagged at birth and then records are kept as to who the sire and dam are etc.

Some sheep stud farmers choose to couple the brass tag with a small (panel) numbered cattle tag, for ease of reading (brass tags are often difficult to read – if a farmer is tagging a stud lamb at birth, it's easier to read the dams tag from a distance that to catch her and analyse the brass tag).

Black tags are often used for identifying cull stock and a white tag to indicate a ewe that may have only produced a singleton (rather than a twin). Next time the stud ewe, with one existing white tag, produces another single, she may be black tagged – the farmer is trying to identify the ewes that are the highest producers.

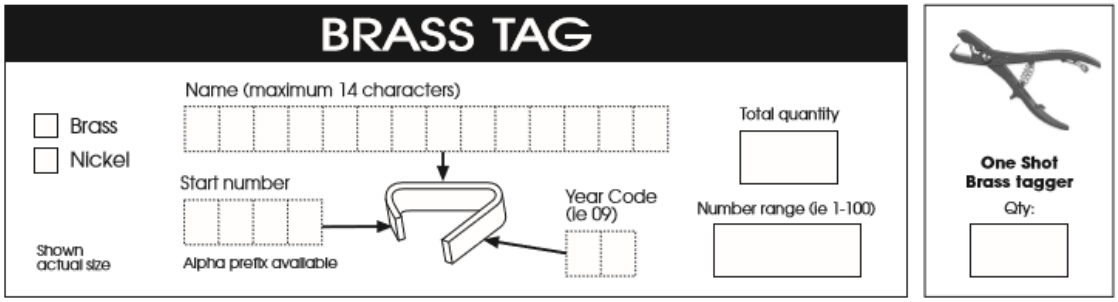


Figure 17 Brass Tag

Retrieved from www.allflex.co.nz

When it comes to tagging cattle, there are many options available. The illustration on the next page from (www.allflex.co.nz) shows the 'panel' tags which are available in many different sizes and a variety of colours. The right hand column indicates the various applicators available to administer the tag to the ear.

As of 1 July 2015, it will become compulsory for all farmers to tag cattle and deer at birth with National Animal Identification and Tracing (NAIT) scheme approved tags. The following section outlines the basics of the NAIT scheme and what it means for farmers in New Zealand.

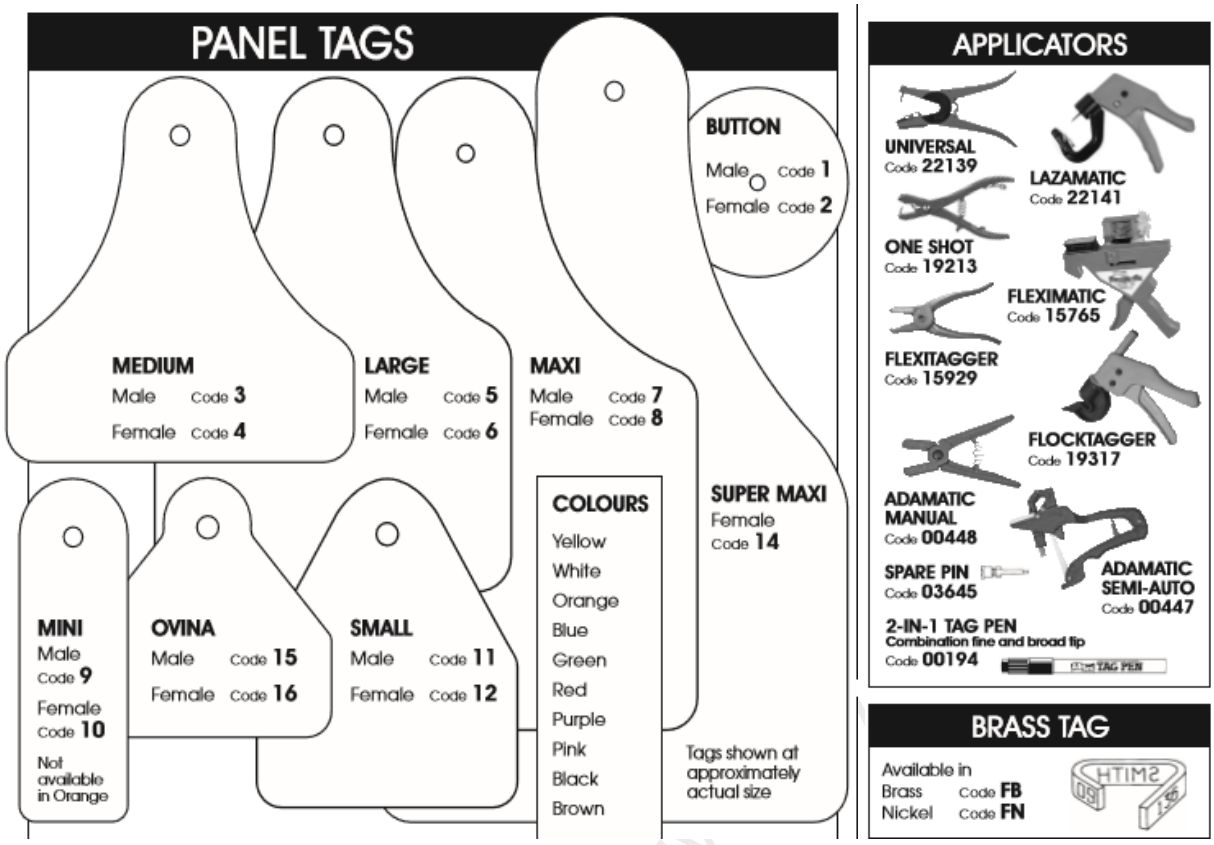


Figure 18 Panel Tags and Applicators

Retrieved from www.allflex.co.nz

The NAIT Scheme

Prior to the introduction of the National Animal Identification and Tracing (NAIT) scheme, farmers were required to use Animal Health Board (AHB) tags, this will be discussed later in this section.

Anyone farming or looking after **cattle and deer** must comply with the regulations set out under the NAIT scheme. The scheme was set up to help connect people, properties, processors and livestock throughout New Zealand.

NAIT regulations state that all cattle and deer must be tagged and identified using an approved Radio Frequency Identification device (RFID) ear tag. The RFID ear tag relays, to the registered national database, information detailing the location of the animal, the movements in the animal's lifetime and the person responsible for the animal.

The NAIT scheme was implemented in New Zealand to assist with managing biosecurity risks, for example an outbreak of disease, by strengthening the country's ability to respond.

Please note that as of 1 July 2015 all older cattle and deer must be tagged with an approved NAIT radio frequency identification tag or prior to that date if they are going to be moved off-farm.

But how do NAIT tags work? The following information is from the NAIT website, www.nait.co.nz:

How NAIT tags work

Tags approved for use in the NAIT scheme are RFID (radio frequency identification) tags. They can store information on a microchip inside the tag.

This microchip also holds a globally unique 16 digit number which identifies that tag and the animal it is on once you register the animal in the NAIT system. This 16 digit number is linked to the visual printing you can see on the outside of the tag in the NAIT system. This visual printing is different for different tag types.

NAIT tags come in two broad types - HDX and FDX. This relates to the way they operate when they are scanned by an RFID reader.

HDX and FDX tags differ in both price and functionality. You can choose either option for your NAIT approved tags.

HDX (half duplex)

HDX tags are higher performing and have a longer read range. They also have protection from outside interference.

- Some on-farm automation systems (e.g. Protrack) will only work with HDX tags
- HDX tags are a popular choice for dairy farmers
- Some older cattle crushes with a lot of metal noise are better suited to HDX
- HDX tags cost about $1.00 more than FDX

FDX (full duplex)

FDX tags have a shorter read range and no protection from outside interference.

- FDX tags are suited to most sheep and beef environments
- They are a lower cost option than HDX tags.
- FDX tags meet the minimum requirements for NAIT compliance.

Both HDX or FDX tags will have better performance if they are read with a scanner that is tuned to that type of tag.

Retrieved from www.NAIT.co.nz

For more information on RFID tagging, please refer to the 'Additional Readings' section of this module. The following link will take you to the full 'NAIT and You' brochure www.NAIT.co.nz

Animal Health Board Tags

You may have noted in the above guide, in the section on 'Exemptions', the AHB is mentioned. AHB or the Animal Health Board was the governing body for livestock movement prior to the introduction of NAIT. Animals were tagged with an Animal Health Board (AHB) bar-coded tag. AHB tags are no longer compulsory in New Zealand but should still not be removed from any animal.

For some examples of AHB tabs, please go to www.zeetags.co.nz:

There are huge advantages of using NAIT tags:

1. To help improve the confidence of consumers
2. To assist with the management of diseases
3. To improve the traceability of food produced in New Zealand.

These will be discussed in more detail in the section on 'Matters of National and International Significance'.

Raddle, Paint and Stock Marker

For information on the history of 'raddle', please refer to the 'Additional Readings' section of this module. The following products and their images are from the Donaghys range of stock markers www.donaghys.com).

Chalk Raddle

The use of chalk raddle is a common practice among sheep farms in New Zealand. It is a scourable product (which means it can be 'scoured' or washed out of wool). In general, chalk raddle is used as a method of identifying stock **temporarily**. A good example of this is, farmers will use chalk raddle when their livestock drafter (buyer) comes to identify ewes or lambs in a mob to be sold or that are ready for slaughter. The lambs can then be easily identified and drafted out (separated) from the rest of the mob. Chalk raddle may also be used to identify calves in a herd.

Stock Marker

Stock marker is a spray paint also used to identify stock in a mob or herd. Stock marker can be found on most farms. A dairy farmer will use stock marker to perhaps identify a cow that is on antibiotics (therefore is required to be milked separately from the main herd). It is also used on sheep farms to mark twin lambs at lambing or a ewe with black wool at shearing (indicating to the farmer that the ewe may have to be culled).

Tail Paint

Tail paint is commonly used to assist dairy farmers and stud cattle breeders identify when their cattle are ready for insemination (or on heat). The farmer will apply a stripe of paint across the highest point of the tail, when the cow is on heat, it will be ridden by other cows in the herd, rubbing the paint off. This

indicates whether the cow is ready for insemination or not. Tail paint can also be used, like spray marker, to identify animals that are on antibiotics for example.

Self-Test Questions #2

1. What is the main advantage of an ear mark?

2. What does NAIT stand for?

3. What type of ear tag is approved for use under the NAIT scheme?

4. You have a cow in your milking herd that has been diagnosed with mastitis and is now on a course of antibiotics. Choose the best option below, for identifying this cow from the remainder of your herd:

    a) Chalk raddle and record the NAIT tag
    b) Spray marker on the leg
    c) Tail paint or spray marker on the leg and udder, record the NAIT/tag number

Matters of National and International Significance

You may be wondering why it is becoming increasingly important to correctly and accurately tag animals, particularly cattle and deer. The following section gives a brief overview of the issues locally and worldwide that have triggered this movement.

Tuberculosis (TB) and TBfree New Zealand

What is Tuberculosis? The following description, from The Beef Site (www.thebeefsite.com), describes best how TB impacts cattle:

> *"Tuberculosis (TB) in cattle is caused by the bacterium Mycobacterium bovis. The disease incidence is increasing and is highest in the southwest of England (Clifton-Hadley, 1993). M. bovis is killed by sunlight, but is resistant to desiccation and can survive in a wide range of acids and alkalis. It is also able to remain viable for long periods in moist and warm soil. In cattle faeces it will survive 1 – 8 weeks (Andrews, 1992).*
>
> *Bovine tuberculosis is a zoonotic disease and causes tuberculosis in human. The disease can be transmitted in raw milk but pasteurisation effectively prevents the spread via milk. M. bovis has been found in several wild mammal species….M. bovis also infects people (Chalmers et al., 1996; Hardie and Watson, 1992) and was in the past a major cause of death in humans in the United Kingdom. Animals are probably more likely to be infected by M. bovis when they are poorly nourished or under stress. Growing heifers and younger cows are most at risk (Griffin et al., 1996).*
>
> *There is evidence that more intensive dairy farms also have a higher risk of infection (Griffin et al., 1993). M. bovis is spread in a number of ways by infectious animals - in their breath, milk, discharging lesions, saliva, urine or droppings. In cattle, excretion of M. bovis begins around 87 days after infection occurs (Neill et al., 1991). Entry is usually by inhalation (especially if housed) or ingestion. Once in a herd, infection probably spreads from cow to cow by inhalation (Costello et al., 1998). Spread from cows to calves may occur via the milk or colostrum (Evangelista and Anda, 1996). Various body systems can be affected, but signs are usually confined to the respiratory tract. A soft, chronic cough occurs once or twice at a time.*
>
> *In more advanced cases, there is a marked increase in the depth and rate of respiration as well as dyspnoea. Areas of dullness can be heard in the chest on auscultation or percussion. Some cases may squeak, whistle or have a snoring respiration (Andrews, 1992; Cassidy et al., 1999)."*

TB is managed in New Zealand by TBfree. TBfree New Zealand is a government and industry led initiative. "TBfree New Zealand's primary role is to manage the implementation of the National Pest Management Plan for Bovine TB, with the aim of eradicating the disease from New Zealand" (www.tbfree.org.nz).

Bascially, anyone that owns or manages cattle and deer in New Zealand, must register with the TBfree programme. Farmers (dairy, beef and deer) pay a levy towards funding this initiative. Funding is also received from central and local government.

A short outline of how TBfree currently manage the National Pest Management Plan for Bovine TB:

- TB testing regimes have been introduced; the frequency of testing depends on the level of risk (of your stock contracting TB) and the 'Disease Control Area' your stock are in
- Restrictions on the movement of stock that have been classified as 'infected'
- The implementation of MCA or Movement Control Areas; stock in these areas are at a greater risk of being exposed to or contracting TB, therefore farmers are restricted as to where they can move stock
- Stock going to slaughter (there are a few exceptions for example bobby calves) must be accompanied by a signed and completed Animal Status Declaration – TB declaration.

Herd Numbers

TBFree New Zealand allocate each farm with a **Herd Number**. Herd numbers assist TBFree New Zealand with monitoring and controlling the movement of stock. This number is printed on **birth identification tags**. Sometimes farmers will also choose to print this number onto a secondary brass tag as a second form of identification.

> *"Anyone owning cattle or deer must register those animals as a herd with TBfree New Zealand. Even if you only have one animal, it is considered a herd and must be registered as such."*

If a single cow was sold to another farm, it would then be included under the new farms Herd Number – keeping its original tag however. Keep in mind, NAIT tags can never be removed without permission from NAIT itself. Most cows in New Zealand are sold in herds, therefore the Herd Number becomes an easier form of management.

How do NAIT and TBfree work together?

For more information on the TBfree New Zealand programme, please go to www.tbfree.co.nz

For further information on TB and movement control in New Zealand, visit www.tbfree.org.nz.

Frequently Asked Questions

TBFree NZ have produced a list of FAQ's for farmers, http://www.tbfree.org.nz/common-questions.aspx

Mad Cow Disease (MCD)

The ongoing concern of an outbreak of MCD has triggered an international response. A significant increase in the use of ear tags appeared in response to the epidemic of BSE (Bovine Spongiform Encephalopathy, or "mad cow disease", first officially recognised in 1986 and peaked in 1992. In the UK, some 4 million head of cattle were slaughtered as part of the eradication drive (http://www.cdc.gov/ncidod/eid/vol4no3/pattison.htm).

In order to identify the infected cattle before they showed signs, it was absolutely crucial to know the exact movements and feeding policies for all cattle from the moment of their birth. This was hampered by the lack of a nationally coordinated cattle identification and recording system. So it was BSE that sparked the drive toward an internationally recognised standard, with national involvement, in cattle identification and recording systems.

Part of that international standard is to be able to provide all information about a single animal (birth place, farms of residence, drug treatments, also movements from farm gate to consumer plate) within 48 hours of data base search.

There is a useful quote on the NAIT website (www.nait.co.nz), on how NAIT assists with improving disease management in New Zealand:

> ***"Improving disease management:*** *New Zealand's primary industries are a key element to our economic success. Cattle (including dairy), deer and sheep account for more than $12 billion in exports every year. Existing disease in New Zealand, such as bovine tuberculosis (TB) can benefit from a traceability scheme. We can use the information collected to trace back to the originating source and implement testing regimes. Risk of new exotic disease incursions is increasing as the volume of trade and tourists increase. Overseas countries are demanding better proof of freedom from disease, using evidence based programmes."* *www.nait.co.nz*

Traceability

The consumer has also driven the demand of NAIT tagging. Consumers want to know more about where their food has come from. Because of this demand, traceability systems must be effective and efficient to allow New Zealand continued access to international markets.

Case Study: Dairy Farm – Ear Tagging in Practice

Due to all the recent changes within New Zealand related to tagging; the introduction of NAIT, phasing out AHB tags, TBFree New Zealand monitoring, the need for traceability and the advances in technology (electronic recording and data collection), it would be beneficial to study how some dairy farms manage their ear tagging system on farm:

These days all calves are required to be recorded at birth. The following is a list of steps this farm takes to ensure each animal born on farm is correctly identified:

1. Calf is born – an elastic necklace with a numbered tag is placed around the calf's neck and another (with the same number) around the cow's neck.
2. A calf that is to be kept as a replacement is transported to the rearing shed where it will be tagged with:
    a) A birth identification tag and (details the Herd Number, year code and the individual animal number)
    b) A brass tag detailing the 'Herd Code' and its year of birth – farm management tag i.e. not compulsory
    c) Within the first 6 months, the calf must be tagged with a NAIT approved RFID tag or before the animals first move off farm
3. A calf that is destined for the bobby truck (slaughter) can be tagged with a "direct to slaughter tag" providing it is less than 30 days old. Calves less than 30 days old are not required to have a NAIT tag. The purchaser of the calves (e.g. the meat company) provides the farmer with the "direct to slaughter tags" directly.
4. The cow which has then calved enters the milking parlour (with the Colostrum herd for milking), she still has her numbered elastic necklace around her neck. Her EID, or Electronic Identification tag (a NAIT approved RFID tag) is read/scanned as the cow enters the rotary for milking therefore the farmer is able to link the cow with the calf she has just produced.
5. The reading off the EID comes up on the computer screen in the cow shed and the farmer is able to see the history and production details of this particular cow and then record the details of her progeny.
6. Having EID in the cow shed enables the farmer to:
    a) Manage feeding electronically – some cows may be given a 'personalised' ration of feed while she is being milked
    b) Automatically control drafting – the cow may need treatment, so she is drafted off from the herd during milking
    c) Control foreign milk from entering the vat – a cow on antibiotics
    d) Assist with management of stock during Herd Testing

Animal Recording on Farm and Information Usage

Up until now, most of the discussion of animal identification has centred around the need to comply with issues of food quality and safety and consumer satisfaction, and also with national (and international) disease surveillance and control (we have already mentioned Tuberculosis and BSE). These are all issues that require to be monitored and managed off-farm.

Animal identification is necessary for on-farm management as well. There are times where a farmer needs to know important history about a cow in order to make a meaningful decision. Examples of such times include:

Autumn culling of dairy cows, your decision on removing low performers and keeping the high performers, depends upon:

- Did the cow produce a lot of milk or a little?
- Is she constantly riddled with mastitis or totally free of mastitis?
- Is she in calf or is she empty?
- Did she have any health problems such as bad feet?
- Is she nice natured, or does she kick with intent to kill?

Discussing a case history with the vet:

- Is the cow pregnant, or how recently did the cow calve (the vet is always interested to know this)?
- Has the cow had the problem before, and what were the findings previously?
- Is the cow worth a high cost and not every time successful treatment?

Presenting details of a cow for sale:

- The more confidence the purchaser has in your record taking and reporting systems, and the more animal information you can share with the purchaser, the better the price you will receive.

Working out if a cow needs help getting back in calf:

- Has she exceeded the normal time limit between calving and beginning to cycle again? – Dairy heifers (2 year old should be back cycling by 60 days at the very latest, and cows by 45 days.
- Did the cow have a white or smelly discharge sometime after calving?

Complying with Meat and milk withholding on any animal remedies:

- Is it safe to put this cow's milk in the vat, or will the milk factory test your milk for antibiotic residues and send you a fine ($)?

These are just some examples. There are plenty more. If you were managing a farm, what sort of identification and recording systems would you use in order to make all these economically important decisions? And how much time, effort, and money would you put into collecting all the information in the first place? Let's take a look at some of the recording and information systems that are available

Top Pocket Notebook

Farmers have traditionally kept a diary and pencil in their shirt pocket. They got these, often as a free giveaway, from their stock and station agent. In this diary would go cow's ear tag numbers and stock groups against calving dates, mating dates, and drug treatment dates.

Image by Sembazuru, 2005. Licenced under CC BY-SA 2.0

Office Based Paper Work

Day Diary, Herd Record Sheets, Auditable Drug Record Books, Cashbook

These office based systems have served the farmer well, and will continue to do so. There are two major drawbacks:

- You have to transfer all records out of your top pocket diary into the office based system.
- You have to do the number crunching more or less by hand.
- Any reports (for the bank manager or other business partners) must be either hand entered into a computer or put on forms and sent in the post. That makes for a third or fourth round of entering the numbers.

Computerised Data Management Systems

Following the introduction of the NAIT tagging system, it is far easier for farmers to manage their herd records. The most commonly used software, which integrates with the NAIT system, is MINDA:

> *"The MINDA herd records service enables farmers to establish, maintain and benefit from complete herd records, regardless of which (if any) LIC services they use. When used in conjunction with Herd Testing and Artificial Breeding, MINDA provides a variety of management reports which enable farmers to maximise the benefits of herd improvement.*
>
> *Farmers who have a computer and use the MINDA service, can receive and send herd details electronically e.g. using MINDA Software." (www.lic.co.nz)*

We will discuss MINDA in further detail later in this section. There are also other options available to farmers, such as:

Palm Pilot (Digital Version of the Top Pocket Notebook)

The Palm Pilot is a hand held computer. When it has the appropriate software is installed, a Palm Pilot can be used in a similar way to the top pocket notebook. It even has a plastic stick that works a little like a pencil! The rain doesn't have to be a worry, because special rainproof plastic wallet can protect them.

Figure 19 Palm Pilot

Advantages

One time only entry of data, which is then automatically transferred to the home computer, and from there via the world wide web to the server of the database provider. In New Zealand, the most popular database provider is the Livestock Improvement Corporation (LIC), with it's MINDA animal and farm data management system.

Immediate retrieval of individual cow data while still out on the farm.

Other advantages are discussed in the LIC's information sheet on its M-NOTE software for Palm Pilots (see next section).

Disadvantage

Farming is a wet and muddy business. It is therefore difficult to keep your Palm Pilot clean and free of water that might damage it's electronics. (There are special plastic pouches to help you with this).

You need special software to drive your Palm Pilot, and to keep it able to talk to your home computer. M_NOTE from the LIC is one such software package (see next section).

M-NOTE: Palm Pilot Software from the LIC

[From: http://www.lic.co.nz/lic_MNOTE.cfm2]

Profitable NZ dairy farmers make objective herd management decisions based on reliable information.

They need a tool that provides them with accurate information on the spot. LIC have the ultimate solution.

[1] While LIC (Livestock Improvement Corporation) is a major farm data software provider, there are other such providers in New Zealand. Two other providers include:
http://www.farmmap.co.nz/index.html for farm mapping
http://www.fairport.com.au/ for comprehensive farm management software

[2] While LIC (Livestock Improvement Corporation) is a major farm data software provider, there are other such providers in New Zealand. Two other providers include:
http://www.farmmap.co.nz/index.html for farm mapping
http://www.fairport.com.au/ for comprehensive farm management software

It's called M-NOTE. Good things come in small packages M-NOTE is made for a Palm Handheld computer, so you aren't constrained to viewing details of your herd in your dairy or home office.

When M-NOTE is used with MINDApro, you have access to huge amounts of vital information for each animal (such as a history of production data, health records and indexes).

Record events ONCE as they happen. You can record animal and health events while in the field. When you return to your home computer or office, simply press a button to send events from M-NOTE to your PC (this is called a hotsync operation).

There's no need to manually re-enter events, saving you time and hassle.

M-NOTE also copies your latest herd information from your PC whenever you hotsync. Provided that you hotsync your Palm regularly, you will always have the latest information about your herd at your fingertips.

Immediate validation at point of entry M-NOTE checks events as you record them for errors. If M-NOTE detects a problem in an event you have recorded, it will tell you! Users of M-NOTE often comment that this "at-source" checking is a huge timesaver.

Less Recording Errors = Less Queries = Better records + Less Hassle

Tight Integration with MINDA Software M-NOTE works with both MINDAlink and MINDApro. Regardless of which flavour of our PC software you prefer (MINDAlink or MINDApro), you'll notice many similarities between the software on your PC and your Palm Handheld.

For example, the Groups of animals you create and use on your PC are automatically copied to M-NOTE each time that you hotsync. M-NOTE even allows you to create new Groups directly on your Palm handheld. Of course, these will be transferred to your PC as well after your next hotsync operation.

M-NOTE is Palm based software that works with both MINDAlink and MINDApro. Record events in the field as they happen. Sort and report on the spot. One button synchronising with MINDAlink and MINDApro. Super easy and convenient.

"MINDA" Data Management Software and Servicing from the LIC

[information reprinted from http://www.lic.co.nz/lic_MINDA.cfm - visit this webpage for further information].

The MINDA herd records service enables farmers to establish, maintain and benefit from complete herd records, regardless of which (if any) LIC services they use. When used in conjunction with Herd Testing and

Artificial Breeding, MINDA provides a variety of management reports which enable farmers to maximise the benefits of herd improvement.

Farmers who have a computer and use the MINDA service, can receive and send herd details electronically e.g. using MINDA Software. For more information refer to the MINDA Software pages of this Internet site.

MINDAlink is the electronic alternative to sending in paper forms to update herd records. Errors are highlighted before they are sent, which avoids queries. One click updating of the MINDA database with real-time updating so your herd information is always current. Create groups of animals to simplify data entry. Transfer animals without transfer cards. Fast and simple.

MINDApro provides powerful reporting features, as well as incorporating all of the functions of MINDAlink for easy herd recording. Have your herd information how you want it, when you want it, without complexity. Degrees in rocket science are not required.

Other software and 'apps' are also available and are compatible with MINDAlink and MINDApro are able to be access via http://www.lic.co.nz/lic_MINDA.cfm

Case Study: Automatic Milking Systems - The Greenfield Project

With the aid of RFID ear tags, robots can recognise cows, milk them and direct them around the farm. By the use of in line milk sensors, they can record a massive amount of information about each cow's milk. The possibilities are limitless. The following, reprinted from "the Biotechnology Learning Hub"[3], tells you more about automated milking in New Zealand.

The Greenfield Project has DairyNZ scientists and farmers working with engineers from Sensortec Ltd. The University of Waikato and the Waikato Automatic Milking Farmer Group also help out. People with a range of different skills are needed to make this project successful.

What is automatic milking?

Figure 20 A cow enters a robotic milking stall

Retrieved from
:http://www.biotechlearn.org.nz/focus_stories/robotic_milking/images/cow_enters_a_robotic_milking_stall)

Robotic milking is when a type of robot called an Automatic Milking System (AMS) replaces a person to do all the jobs involved in milking a herd of cows. The system is set up to:

- Guide the cows to the milking shed
- Identify each of the cows individually
- Milk the cows

[3] http://www.biotechlearn.org.nz/focus_stories/robotic_milking

- Check the milk
- Record data about individual cows

The first Automatic Milking Systems were set up on commercial farms in The Netherlands in 1992. By the middle of 2005, over 2,500 farms worldwide used one or more AMS to milk their cows. They are mostly in north-western Europe, although there has recently been large growth in Japan and North America.

How do robots milk cows? -Video

To access a video from the Biotechnology Learning Hub, type the following web address into your browser: http://tinyurl.com/8j6fvy [4]

How do robots milk cows? - Transcript from the Video

> *"Dr Jenny Jago (DairyNZ): When a cow arrives at the waiting yard, the gate to the automatic milker or the robotic milker is opened. At that point she can walk into the bale, sometimes we call it a crate, and the aerial [RFID antenna] picks up the ID of that cow, and then at that point the robot knows for example that its cow number 15. It has a memory of where that particular cow's udder and teats should be. So the arm swings in to underneath the cow near her udder, and then first of all it washes her teats. So there are little rollers it goes through, which wash each teat to make sure it's clean, and then there is a laser which starts to look for the teats. So it has a broad idea of where to go through its memory of where that cow's udder and teats were last time she came in to be milked, but then it uses a little laser to identify where the teats are at this particular milking, and then it puts the cups on one teat at a time….*
>
> *Once the milk flow starts to decline, once it gets to a certain level, it will take the cup off. And when all the quarters are finished…, it applies a teat spray to the teats. And then the gate opens and the cow walks out, and then the entry gate opens for the next cow to come in."*

How do Robots Control Cow Movements?

On the Greenfield farm the cows have to take themselves from the paddock to the automatic milking machine and then back out to the paddock again. The cows' movement is directed using temporary fences and a system of cow-controlled and computer-controlled gates.

The cows have to be taught how to use the AMS and how to take themselves to be milked. Incentives, or rewards (such as water, or the promise of fresh grass), are used to encourage the cows to move into the selection units.

[4] This tinyurl web address will redirect you to the following:
http://www.biotechlearn.org.nz/focus_stories/robotic_milking/video_clips/how_do_robots_milk_cows_v0132

Individual attention

A lot of individual information about each cow can be recorded and stored [alongside her RFID ear tag number]. The farmer can track the cow's movement through the paddocks. The amount of milk being produced by each cow (and even each teat!) can also be recorded.

'Sensors', in the milk line (electronic measuring devices), can be used to measure (for example) antibiotics (so that the milk can be kept separate), somatic cell count (which might indicate the presence of infections like mastitis), milk solids (an indication of milk quality), or specific high-value substances like lactoferrin. The AMS also allows farmers to easily separate the milk of certain cows from the milk of other cows. [This is useful if the cow's records indicate that she is still producing colostrum, or if she is being treated with antibiotics].

Self Test Questions #3

1. In what ways can RFID (or EID) tagging assist with management on farm?

2. What are the components of an RFID ear tag?

3. List some types of information that are required to be recorded and stored to enable you to make important stock management decisions.

4. Name a total stock data management service that is offered by the LIC.

Self-Test Answers

Self-Test Answers #1

1. *Black and white markings and large dairy cow udder.*
2. *Polled, or hornless*
3. *As beef breeds go, the Angus is **smaller** than most and **matures** earlier. It is especially common in the North Island of New Zealand.*
4. *Bit like a large beefy Friesian; has straw to red colour markings instead of black though*
5. *Excellent rates of growth; excellent rate of feed to meant conversion.*
6. *Red animal with white heads, necks, dewlaps, and underlines*
7. *Hardy, can handle rough terrain and climate, good feed conversion.*
8. *Angus; Hereford; Simmental*
9. *Calving difficulties*

Self-Test Answers #2

1. *It is permanent and can be used to identify ownership of stock.*
2. National Animal Identification and Tracing
3. *RFID (Radio Frequency Identification tag)*
4. *Option C*

Self-Test Answers #3

1. *Automatic reading of cow's ID (for example, the cow now being milked has the ID 79)*
   Immediate transfer of information to a computerized data storage and processing system (for example, "this cow's milk is infected with mastitis")
   Immediate pre-programmable response to the information (for example, "open gate to mastitis holding pen for farmer to examine later")
2. *A computer chip*
   An antenna (or aerial)
   a substrate
3. *Your answer should include items the same as, or similar to those listed under the section on 'Animal Recording on Farm & Information Usage'.*
4. *MINDA! (note: while MINDA has been extensively tuned to the needs of dairy farmers, it has also been adapted to the needs of sheep or beef farmers, who can also benefit from it).*

Additional Readings

History of Earmarking

Earmark is a term that dates to the 16th century, originally referring to cuts or marks in the ears of cattle, pigs and sheep made to show ownership, age and/or gender. Nowadays in New Zealand, farmers may still use earmarks to identify age or sex, especially in sheep, but eartagging has become the preferred method of identification.

Image by CGoodwin, 2009. Licenced under CC BY-SA 3.0

Quote: Earmarking in Pioneer New Zealand

Even up until recent times, New Zealand farmers were required to register earmarks (and brands) to aid in identification of ownership of livestock. There would have been a Registrar of Brands within the [then] Department of Agriculture. Earmarks tended to be a bit more limited in variety as earmarking pliers were a precision instrument. Earmarks and brands had to be distinct from others in the immediate area and of a pattern that could not be changed by a fraudulent neighbour or near neighbour. Earmarks were usually applied at an early age - at docking (tailing) at about two to three weeks in the case of lambs, and reasonably early in life in the case of cattle. Earmarks for both cattle and sheep were arranged differently for male and female animals, usually as a mirror image. Animals, particularly sheep, could be sorted by sex as they ran through a drafting race, just by looking at the ears of the advancing animal.

History of Branding

The act of marking livestock with fire-heated marks to identify ownership has origins in Ancient times, with use dating back to the Ancient Egyptians. In English Lexicon, the word brand originally meant anything hot or burning, such as a firebrand, a burning stick. By the European Middle Ages it commonly identified the process of burning a mark into stock animals with thick hides, such as cattle, so as to identify. The practice became particularly widespread in nations with large cattle grazing regions, such as Spain. In fact, branding was the preferred identification method prior to the adoption of eartagging. In American cattle ranching, branding was (and still is) part and parcel of the cattleman and cowboy culture, with many ranches named after the brand on their cattle (see http://en.wikipedia.org/wiki/Livestock_branding).

Quote: Branding and Earmarking in Pioneer New Zealand

Brand: The letter or other mark which each owner has to identify his own stock. (1) It is stamped on to sheep with paint applied with a branding iron or brand, and (2) on to cattle and horses with a red-hot iron which leaves a mark on the skin [usually on the rump in cattle]. Hence branding race, a narrow race for branding sheep, and brander, the man whose work it is to brand (reference: The Early Canterbury Runs by Acland). Years ago the Department of Agriculture was responsible for registering brands and earmarks for sheep and cattle. There would have been a Registrar of Brands within that department. A farmer commencing farming in a particular area had to ascertain the brands of his neighbours (before choosing his own). He may have continued with the mark of a previous owner or could suggest his own. There were a number of approved patterns, but a farmer could suggest a pattern, particularly for brands.

(Source: South Canterbury Sheep Farming Glossary -http://www.rootsweb.ancestry.com/~nzlscant/terms.htm)

A brand can also be made with extreme cold by the prior immersion of the branding iron in dry ice or liquid nitrogen. This sort of branding leaves a white patch on dark skin, and may not be appropriate for white skinned cattle.

History of Raddle

Raddle means "little red". The term raddle was first seen in English literature in 1572, and refers to red ochre, a red earthy hematite used as a pigment.

Today, raddle has come to mean any form of temporary mark to identify and organize livestock. Examples in cattle include:

Spray (aerosol) raddle.

The vet is pregnancy testing a mob of heifers, and you want to identify the empties, so you spray the letters "MT" on their backs.

You are vaccinating a mob of calves while the mob is drinking at the Calfeteria, so each calf gets a jab and a spray mark at the same time.

Tail Paint

Tail paint is applied to the base of the cows' tails to help identify the cows that have been on heat. When the cow is on heat, she stands to be ridden by the cows and her tail paint is worn off.

Leg Bands

The original leg band was probably a piece or wrap around insulating tape. Commercially available versions include Velcro strips and self locking plastic strips.

Cow Bells!

Still used in Switzerland, and they carry a surprising amount of information! - The sound of the bell identifies the cow, where it is and what it is doing…

Image from Irmgard, 2006. Licenced under CC BY-SA 3.0

History of Ear Tagging

Brass and zinc coated tags

Ear tags were developed as early as 1913 as a means to identify cattle when testing for tuberculosis.

Today, ear tags in a variety of designs are used throughout the world on many species of animal to ensure traceability, to help prevent theft and to control disease outbreaks.

The first ear tags were primarily steel with nickel plating. After World War II, larger, flag-like, plastic tags were developed in the United States. Designed to be visible from a distance, these were applied by cutting a slit in the ear and slipping the arrow-shaped head of the tag through it so that the flag would hang from the ear.

Start of the animal identification and recording revolution

In 1953, the first two-piece, self-piercing plastic ear tag was developed and patented. This tag, which combined the easy application already developed in metal ear tags with the visibility and colour options of plastic tags, also limited the transfer of blood-borne diseases between animals during the application process. (for example, Enzootic Bovine Leukosis or EBL - if you use a fresh self-piercing tag each time, and thoroughly rinse the taggers in disinfectant, there is not transfer of blood, and therefore no transfer of infection – A blood testing program against EBL in New Zealand in the late 1990's - combined with hygiene in practises such as tagging and injecting - has more or less eradicated this illness from the national cattle herd). Cattle herd owners who wanted easy identification at a distance could now use the large plastic ear tags. This, when combined with the farmer's shirt pocket notebook, revolutionised the practise of on farm identification and recording, and was one of the necessary requirements for the full and reliable use of artificial insemination in the dairy herds of the western world.

RFID: Digital Revolution applied to the Monitoring of Livestock Movement

Radio-frequency identification (RFID) is an automatic identification method that relies upon storing information in an RFID tag (a special type of computer chip with a transmitting and receiving antenna attached to it), and a remote data sending/retrieving device (generally called a scanner, or a reader). RFID tags are also called transponders. RFID transponders already play a huge role in monitoring the movement of (for example) manufactured goods, cartons of food, passengers on transport networks, and people carrying passports. For example, New Zealand passports have been using RFID's since November 2005 (we were amongst the first in the world after Malaysia). If you are carrying your passport, then all you have to do is walk past a wall mounted scanner, and the owner of that scanner has access to your photograph and any other details that are stored in your passport chip5 6 7. The transponders in a standard cattle RFID ear tag are more limited than this, holding as little information as a herd ID number and an individual animal ID number (the same number that is on the tag's bar scanner code). With the aid of computers however, you can store as much information as you like alongside that animal's unique number.

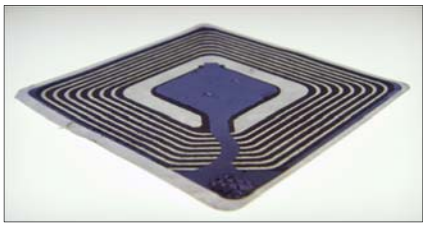


Figure 21 Above Left: Photograph of an RFID chip.

Embed this in an ear tag (above right), and you have a unique animal identifier that can be read ("scanned") from a distance of meters away.

[5] http://en.wikipedia.org/wiki/RFID

[6] How to block/kill RFID chips: http://www.instructables.com/id/How-to-blockkill-RFID-chips/

[7] Three Challenges of Secure Embedded System Design: www.dss.uwaterloo.ca/presentations_files/2007_Nachiketh_Potlapally.ppt

The RFID big picture. The transponder chip transmits its information to a receiver, which then sends the information via a network (such as the world wide web) to a computer server. There are many transponder chip applications.

For a better understanding about the practical aspects of RFID ear tags in cattle, please go to the following site for information http://www.y-tex.com/pdfs/RoundRFIDTag.pdf. This contains specific information on:

- Application of tags
- Examples of tags
- Bluetooth and wireless tag trackers
- Tag tracker base stations
- Station reader

RFID's in Stomach Boluses

Stomach boluses that contain RFID transponders. For example please go to:
http://www.datamars.com/products/livestock-id/boluses/

You need a special bolus applicator to place the bolus at the back of the cow's throat so she will swallow it for you.

RFID's in Injectable Chips

These are what are injected into "the scruff of the neck" of your pet dog or cat. In cattle, they would be injected under the skin of the ear (and that is easily done by the way – the hardest part is making sure the correctly numbered chip goes into the correct animal!).

ICAR

The International Committee for Animal Recording (ICAR) controls the issue of electronic tag numbers on a world wide basis[8].

[8] ICAR web site http://www.icar.org/index.htm

1) Introduction

1.1 On 1 July 1999, the Animal Health Board (AHB) introduced the National Identification System for cattle and deer.

1.2 The system has been introduced to facilitate the tracing of suspect and confirmed TB cases.

1.3 The legal authority to operate the system is contained within the Biosecurity (Animal Identification Systems) Regulations 1999.

1.4 The regulations require identification systems approved by the Director General to be used.

1.5 The system specifications have been amended for consistency with the National Animal Identification and Tracing (NAIT) system for cattle from 1 July 2012 and for deer from 1 March 2013 .

2) Obligations for Persons In Charge of Cattle and Deer

2.1 All cattle and deer 30 days of age and older when first moved are to be identified with an approved Identification device.

2.2 The following exemptions may apply where they are not inconsistent with NAIT system requirements:

2.2.1 Animals that move to grazing but remain under the owner's management and while grazing are not mixed with animals from other sources;

2.2.2 Deer that move directly to a Game Estate.

2.3 All Identification devices are to be inserted as recommended by the supplier.

2.4 Identification devices must be inserted prior to movement. .

2.5 The purchaser/user is responsible for the cost of purchasing and inserting Identification devices.

3) Replacing Identification Devices that are Lost

3.1 When an animal loses an original identification device, the person in charge must ensure the animal is correctly identified prior to its next movement. The following options for replacing lost devices apply:

3.1.1 Apply to the approved identification system for a duplicate identification device which will carry the identical numbers as were printed on the lost device; or

3.1.2 Insert a new identification device.

4) Offences

4.1 It is an offence to:

4.1.1 Move cattle or deer 30 days of age or older when the animals are not identified in accordance with the requirements of the Biosecurity (Animal Identification Systems) Regulations 1999, unless the written permission of an inspector or authorised person under the Biosecurity Act 1993 has been given.

4.1.2 Remove, without reasonable excuse, official identification devices without the written permission of an inspector or authorised person under the Biosecurity Act 1993;

4.1.3 Alter or deface any device inserted as part of the official identification program;

4.2 The maximum penalty for these offences is a fine of $5,000 for an individual and $15,000 for a corporation.

5) Identification Devices

5.1 From 1 July 2012 (for cattle) and from 1 Match 2013 (for deer) all approved Identification devices will conform to the Approved Permanent Radio Frequency Identification Device Standard (Cattle and Deer) as issued and updated by National Identification and Tracing (NAIT) Ltd for the purposes of the National Animal Identification and Tracing Act 2012.

5,2 Identification devices are to be inserted as required in the NAIT standard, with the female component of the device in the front of the ear as per manufacturer's instructions.

5.3 From 1 October 2012 to 1 March 2013, devices previously approved by the Animal Health Board, or devices as in 5.1 above may be used for deer.

6) Approved Manufacturers

6.1 Manufacturers must be approved by the AHB to supply devices for use in the National Identification System. The National Identification System allows for multiple approved manufacturers.

6.2 To be approved, manufacturers will need to meet all AHB approval requirements, sign a Memorandum of Agreement which, among other requirements, includes the following:

6.2.1 maintain a quality assurance system certified by a credible national or international agency, which demonstrates that the production, marking and despatch of devices meet the standards and requirements of the National Identification System.

6.2.2 develop and maintain a defective product recall system for devices and accessories used in the system

6.2.3 nominate identification devices by species that the manufacturer believes will conform to the required standards

6.2.4 maintain a quality assurance system to monitor the performance (retention and readability) of devices used within the system.

6.2.5 develop and maintain education programmes on the use of the manufacturer's devices within the system.

6.2.6 ensure all orders for AHB approved devices are made using the AHB Tag Ordering System .

6.2.7 meet all AHB annual reporting requirements.

AHB Specification released on 1st October 2012 (visit http://www.tbfree.org.nz/guidelines-and-manuals.aspx)