Report

on

The Efficacy of

RFID/NLIS

for its Intended Purpose

By
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15 June, 2009

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Australian Beef Association (ABA) Commissioning Letter

Australian Beef Association
A.B.N. 66 079 048 847

1st February 2009

Mr Paul Evans
(Managing Director)
Agribusiness Online Pty Ltd
P O Box 3479
ROBINA TOWN CENTRE QLD 4230

RE: Report on Efficacy of NLIS for its Intended Purpose

Dear Paul,

The Australian Beef Association requests that Agribusiness Online Pty Ltd interrogates, analyses and reports on the efficacy of the National Livestock Identification System in the Australian Beef Industry.

Paul we would be grateful if your company would:

1. Investigate the RFID/NLIS situation in the Australian Beef Industry, by analysing the data in a number of NLIS accounts belonging to some of our members.

2. Report your findings to the Australian Beef Association, following the completion of the analysis.

Background to the RFID NLIS

In 1999 Meat & Livestock Australia (MLA) embarked on a program to transfer Radio Frequency Identification (RFID) Technology to the Australian Beef Industry. The first application was voluntarily offered to the European Union to secure a 7000 tonne annual export quota.

Subsequently, Australia's National Livestock Identification System's (NLIS) was modified to mandate the use of RFID tags across the entire cattle herd, exempting all other farm animals from RFID to date. As a consequence of this cattle industry based policy decision, the NLIS database was constructed and incorporated the existing EU tailored database.

Australia's evolving National Livestock Identification System (NLIS) for domesticated farm animals was first considered by government and industry in 1996. Prior to then, biosecurity and chemical residue issues had been soundly managed by the National Vendor Declaration (NVD) paper trail and the use of low cost tail tags in cattle. A much more complicated and

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costly application of the NLIS, solely for the cattle industry has seen the mandatory use the $3.70 Radio Frequency Identification Device (RFID) tag in Australia's 27 million cattle herd.

The rollout commenced in 2002, in Victoria and was completed across all Australian States by July 1st 2005. To date $400 million has been spent, on tags, reading charges and Government support alone. This expenditure was justified by the purported advantages of individual animal identification, which theoretically allows the NLIS database to record every location change in an individual's life.

By comparison, Australia's NLIS as applied to the 81 million sheep sector is based on the NVD supported by a mandatory low cost group based identification method. This is achieved by inserting a 22 cent plastic tag bearing the Property Identification Code (PIC) of the birth property. No individual identification is required, which obviates the costly system demanded of the cattle industry.

The main proponents of mandatory RFID cattle NLIS have been the Cattle Council of Australia (CCA) and Meat and Livestock Australia (MLA). MLA is an unlisted producer owned company funded through compulsory producer levies and matching Commonwealth Government grants. The CCA and MLA agreed with the State and Commonwealth Governments that "cattle RFID/NLIS is a permanent whole of life system that allows individual animals to be effectively tracked from property of birth to slaughter for food safety, product integrity, and market access purposes. This advice to Governments led to the mandatory introduction of cattle RFID/NLIS by 2005 across all States requiring the application of an RFID tag before cattle could leave their PIC of birth.

Yours faithfully,

R Bellinger

Brad Bellinger
Chairman
Australian Beef Association

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Executive Summary

Background

Radio Frequency Identification (RFID) of cattle became compulsory throughout Australia on the 1st July 2005 and was phased in through the mid 2000's. Consequently, the National Livestock Identification System (NLIS) was modified to facilitate electronic tracking of each animal. The strategic objectives of NLIS were to:

- Identify individual animals at birth and track their movements until slaughter,
- Leverage Australia's safe food image in global beef market by enhancing its world class Quality Assurance systems with accurate traceability functionality,
- Provide an accurate track and trace system, which would assist in the event of an exotic disease outbreak, and
- Develop a sustainable competitive advantage for Australian beef products, by maintaining and improving access to markets, especially in export arenas.

The Australian Beef Association (ABA) believes that cattle NLIS has lowered the industry's profitability by increasing supply chain management costs and that increased export volumes at higher prices have not eventuated. According to the ABA, "over the last 12 months the association has received increasing reports concerning the accuracy of producers' NLIS database accounts which, along with higher than expected tag loss rates, are seriously undermining the credibility of the system."

It is against this backdrop that the ABA Board decided to engage consultants experienced in data analysis and strategic marketing (agribusiness) to investigate and report on the accuracy of the NLIS database in providing lifetime traceability for cattle movements.

Conclusions

Consultants Paul Evans and Scott Paterson, from Agribusiness Online, audited 17 PICs (properties) including a range of small, medium and large properties over most states of Australia. The audit covered around 57,000 tags, a statistical sample size about 20 times larger than the percentage of the population used for a Morgan Gallop poll. The report documents two different methodologies used by Agribusiness Online to cross check its results and conclusions, which can be summarised as follows:

- 34.5% of the study sample's cattle slaughtered to date did not have lifetime traceability. Orange tags represented 18.4% of these, while white tags comprised the other 16.1%.
- Trend analysis conducted on the loss of traceability resulting from transfers on and off the 17 PICs, suggests that white tags will continue to lose traceability at greater than the historical rate of 16.1% which, in addition to the orange tags still in the system, foreshadows a total lost traceability rate of at least 22.3%, increasing with time.
- That figure does not take into account several substantial intangible losses of traceability that are not being captured by the NLIS database system.
- The economic drivers for the NLIS system are away from, not towards, meticulous NLIS administration practices by cattle producers.
- Since at least 20% of cattle do not have lifetime traceability, it is inaccurate and misleading to promote cattle RFID/NLIS as currently providing whole of life traceability, which it is unlikely to ever achieve, because the economic drivers built into the system are fundamentally negative.
- To rely on NLIS for credible information to effectively manage a highly contagious disease outbreak would be illusory and potentially dangerous for the industry.
- For control of contagious diseases with short incubations periods, it can be logically demonstrated that it would be much cheaper, more accurate and more effective to manage disease outbreaks by using an existing supply chain management program or converting NLIS to track consignments electronically.
- It appears that the strategic marketing objective of NLIS to create a sustainable competitive advantage in export marketing arenas using RFID technology to promote Australian beef products has not eventuated. Despite huge investments in the technology and consistent promotion of Australia's beef products and systems Australia has not improved its overall market access. Meanwhile, other major beef supplying countries that do not have lifetime traceability, but have experienced exotic disease outbreaks in recent years, are regaining lost market access at Australia's expense. It is therefore very difficult to make a case from this data that RFID/NLIS is delivering, or ever will deliver, a Preferred Supplier status to Australian beef exporters.

Report Authors

Paul Evans established an agribusiness consultancy company in 1978 and has had a *'Paddock to the Plate'* experience in supply chain management. He has post-graduate qualification in Strategic Marketing (Agribusiness) and has worked with stakeholders across the whole chain of supply, in Australia's Horticulture and Beef Industries. Paul is one of the pioneers of technology transfer and innovation in Australian fresh food supply chains and his business developed the first value-based marketing systems, for beef and fresh produce, which were sponsored by the lead industry bodies, Horticulture Australia and Meat and Livestock Australia.

Scott Paterson is a qualified Electronics Engineer with experience managing multi-billion dollar projects for the Australian Defence Force. At age 34 he was promoted to the rank of Wing Commander and led a team managing the acquisition of upgraded avionics and weapon systems for the Royal Australian Air Force (RAAF) F-18 Fleet. Scott was also responsible for the investigation and implementation of a Business Intelligence system approach at the Gold Coast City Council. His knowledge of tools to extract and analyse data, as well as report on performance led to an Information Access and Delivery Project, which delivered valuable new Information Technologies (IT) capabilities to the council. Scott also has post-graduate qualifications in Management Studies and consults to businesses on strategic planning and systemisation. He therefore understands the need for systems to generate quality real time information that facilitates business decision making processes to produce gain rather than pain.

Objective of the Audit

To evaluate the accuracy and value of the Australian Beef Industry's National Livestock Identification System (NLIS), particularly in the area of individual RFID lifetime traceability and its contribution to the strategic objectives of NLIS.

Methodology

A 4 stage methodology was deployed for the audit process.

Stage 1 established a 17 PIC sample drawn from Far North to Southern Queensland, NSW, WA and Victoria. We then ran some tests to verify the statistical validity of the sample. These tests showed that the sample had a margin of error of less than 3%.

Stage 2 analysed the historical NLIS data relating to the percentage of expired white tags that had lost Lifetime Traceability (LT) and postulated that the same percentage of lost LT (16.14%) could be used to extrapolate how many current white tags have actually lost LT.

Stage 3 adopted a time sensitive approach and analysed trends up or down in loss of LT by analysing the proportion of ***Transfers*** that are ***Systems Transfers***. The findings revealed an upward trend in the percentage of cattle losing LT, which in the year 2009 to date is running as high as 36%.

Stage 4 (yet to be completed) compares NLIS records of transfers and dates with the paperwork of the 17 PICs from 1 Jan 2007 to 31 Dec 2008 to establish the level of accuracy that NLIS achieves in recording cattle movements.

Stage 1

The Statistical Validity of the Sample

A 17 PIC sample was analysed for the purposes of this report, with data originating from four States. The data for this sample is presented at Annex A. In order to establish that the sample was large and homogeneous enough, we looked for a key measure that could be used to establish whether this was the case or not. The measure we elected to use was ***Systems Transfers***.

For every ***systems transfer off*** there is a ***systems transfer on***, so for the complete NLIS database, these figures will be identical. Some individual PICs have variances of infinite percent, i.e., zero in one case and a finite number in the other, while the highest numerical difference is in PIC 5, which has 1,581 on and 528 off, a difference of 1,053. The combined difference of the 17 PIC sample, however, is only 55 out of 4,071 (1.35%).

From this we deduced that the sample size was large and homogeneous enough to provide a fairly accurate statistical representation of the whole NLIS database.

There is a significant disparity between ***transfers on*** (purchases) and ***off*** (sales and transfers to other than meatworks). However, the owners explained that during the period 2005 to 2008 many cattle were transferred to feedlots before being sent to slaughter, so they do not show up on the owners' PICs as ***"Deceased on PIC"*** (sent to slaughter). Therefore this measure cannot be used to gauge the statistical validity of the sample.

Stage 2

Extrapolation of Real Lost Lifetime Traceability as Reported by NLIS

Investigative Methodology

The methodology used for the NLIS audit process is as follows:

Accessing the NLIS Database

1. Access the NLIS database via the web
2. Enter User ID and Password
3. Under "What do you want to do today?" select "View/generate all reports"
4. Click "Go"

Lost Lifetime Traceability on Devices Purchased

5. Under "Which report would you like to view or generate?" select "Purchased devices"
6. Next to "Property Identification Code" select the PIC number you want the data for
7. In the Start Date drop down box for year, select "2002" to go back before most purchases were made.
8. Click "Go"
9. Click on the "LT" column heading which will order the records into "N" LT first and then "Y" LT
10. Note the total number of devices above the NLIS ID column heading and enter this figure into the "Total Tags Purchased" box for the relevant PIC.
11. If there is a "messages pop up" in the bottom left corner, click "hide"
12. Click along the pages until you get to the first page with "Y's" in the LT column and note the record number of the last "N"
13. Enter this figure into the "Total Lost LT" box for the relevant PIC.
14. Scroll to the bottom of the screen and click on "Export"
15. Add all the columns to the report and download the report
16. Save the resultant text file to the desktop
17. Open Excel and click to open a file
18. Browse to the desktop and click on the name of the text file you just saved
19. Tell the dialogue box what delimiter was used and click "finish"
20. Sort the file by LT ascending first and NLIS tag no second
21. Scroll down to the first "Y" in the LT column and delete all the records from that one on
22. Then create two new column headings "Code 1" and "Code 2"
23. If the middle group of 3 letters in the tag no column is an "E", put a "1" in the "Code 1" column
24. In the next cell insert "=" the previous cell and fill down to the last occurrence of a middle E
25. If the middle letter has changed to or is a "B", put a "1" in the "Code 2" column
26. In the next cell insert "=" the previous cell and fill down to the last occurrence of a middle B
27. Keep doing this until you have reached the last record
28. Then sum the two columns to count the number of Code 1's and 2's
29. Add these numbers to the appropriate cells in the top section of the spreadsheet for the relevant PIC
30. Once the PIC owner has advised the number of unused tags, you can enter this into the next box.
31. The spreadsheet calculates the number of tags used and the lost LT as a percentage of the tags used.
32. Note that the actual lost traceability will be higher than NLIS is aware of, because there will be other devices that have been transferred to other properties without NLIS having been notified. Some may even have been to and from agistment and be back on the property of their birth, so have lost LT but NLIS will never know.

Lost Lifetime Traceability of Devices Currently in use on the Property

33. Under “Which report would you like to view or generate?” select “View devices on my property”
34. Next to “PIC” select the PIC number you want the data for
35. Click “Go”
36. Click on the “LT” column heading which will order the records into “No” LT first and then “Yes” LT
37. Note the total number of devices above the NLIS ID column heading and enter this figure into the “Current Tags on Property” box for the relevant PIC.
38. If there is a “messages pop up” in the bottom left corner, click “hide”
39. Click along the pages until you get to the first page with “Y’s” in the LT column and note the record number of the last “N” and enter this figure into the “Tags on Property that have Lost LT” box for the relevant PIC.
40. The spreadsheet uses the previous figure for “Unused Tags” and calculates the number of tags in use on the property and the lost LT as a percentage of the tags in use on the property.

Comparison of NLIS Activity on PIC

41. Click on “home”
42. Click on “change”
43. make sure the email address is set to the appropriate email address
44. Keep clicking continue or send until you get back to the home page
45. Under “What do you want to do today?” select “View/generate all reports”
46. Under “Which report would you like to view or generate?” select “Audit property”
47. Next to “PIC” select the PIC number you want the data for
48. Set the “Start Date” to 1 Jan 2006
49. Click “Go”
50. This will email the audit report to you
51. Open the report and enter the figures from the report as per the master guide into the spreadsheet row with the same number as the circled number on the master guide

Extrapolation of Real Lost Lifetime Traceability as Reported by NLIS

NLIS Reported Loss of Lifetime Traceability

All Devices – Current and Deceased

Using a statistical sample of 17 PICs with a total NLIS historical record of 56,905 devices purchased, 11,398 or 20.03% of the devices are recorded as having lost lifetime traceability (LT). See Annex A.

This sample includes all cattle slaughtered over the history of NLIS, i.e., White breeder tags and post breeder (orange) tags.

Study Sample

	Current	Deceased	
Orange	1,930	5,579	**7,509**
White	29,402 674 without LT	19,994 3,215 without LT	**49,396** (3,889)
	31,332 (2,604)	**25,573** (8,794)	**56,905**

Of the 20.03% that have lost LT, 7,509 or 13.2% were post breeder (orange) tags and the other 3,889 or 6.86% were breeder (white) tags.

However, if we take the orange tags out of the equation, then 7.87% (3,889 out of 49,396) white tags on the NLIS database (including expired or slaughtered and current) have lost LT.

Deceased Devices

The lost LT for deceased devices within the sample is 34.39% (8,794 out of 25,573). However, 21.82% (5,579) of these devices were orange tags with the other 12.57% (3,215) being white tags. Removing orange tags from the deceased sample gives 16.08% (3,215 of 19,994) that have lost LT.

Current Devices

The lost LT for current devices within the same statistical sample is 8.31% (2,604 out of 31,332). However, 6.16% (1,930) of these devices were orange tags with the other 2.15% (674) being white tags. So what NLIS is trying to tell users, if we take the orange tags out of the system, is that only 2.29% (674 out of 29,402) of current white tags have lost LT.

Extrapolating Real Loss of Lifetime Traceability

We wondered why the lost LT figures were so different for the current versus deceased scenarios and we were able to draw the following conclusions.

We know that the NLIS lost LT tracking for devices in use is too low, because there are many physical transfers that have not yet been uploaded and, when they do, NLIS may find that some devices aren't recorded as being on the PIC they came from, so LT will be annotated as having been lost. These unreported transfers eventually get picked up by the meat works and sale yards, if not before, and NLIS organises "systems transfers" to sort out the errors from past unreported transfers. A systems transfer results in that device being recorded on NLIS as having lost LT.

In other words, the figure for lost LT of 7.91% for the complete history of white tags would be even worse if all the cattle went to slaughter now, as the non-recorded transfers would get picked up by NLIS and listed via systems transfers as having lost LT.

The following page outlines a methodology for mathematically calculating how much worse the lost LT would be and projecting that onto the current white device LT status, assuming that metrics for use of NLIS by owners has remained basically the same over the last 5 years or so.

Methodology for Extrapolating Real Loss of Lifetime Traceability

There is a logical way of mathematically extrapolating what the actual loss of LT would be if we assume that the current behaviour of property owners is the same now as it has been historically. The extrapolation methodology is outlined below.

Step 1 - Numbers for this example – all obtainable from NLIS
Total Breeder (white) purchases is 80 devices
Total Post Breeder (orange) purchases is 20 devices (So Total purchased tags = 100 devices)
Total Current Devices is 45
Total Breeder (white) Devices with NLIS Code 2 (that have lost LT) is 10
Total Current Post Breeder (orange) Devices with NLIS Code 1 (that never had LT) is 5
Total Current Breeder (white) Devices with NLIS Code 2 (that have lost) LT is 2

Step 2 - Calculate Current White Devices:
= Current devices – Current orange devices (45 – 5 = 40)

Step 3 – Calculate Expired White Devices:
= Total white purchases – Current devices + Current orange devices (80 – 45 + 5 = 40)

Step 4 – Calculate Expired White Devices that have Lost LT:
= White devices that have lost LT – Current white devices that have lost LT (10 – 2 = 8)

Step 5 – Calculate Expired White Devices that have Lost LT as a % of Expired White Devices
= Step 4 / Step 3 (8 / 40 = 20%)

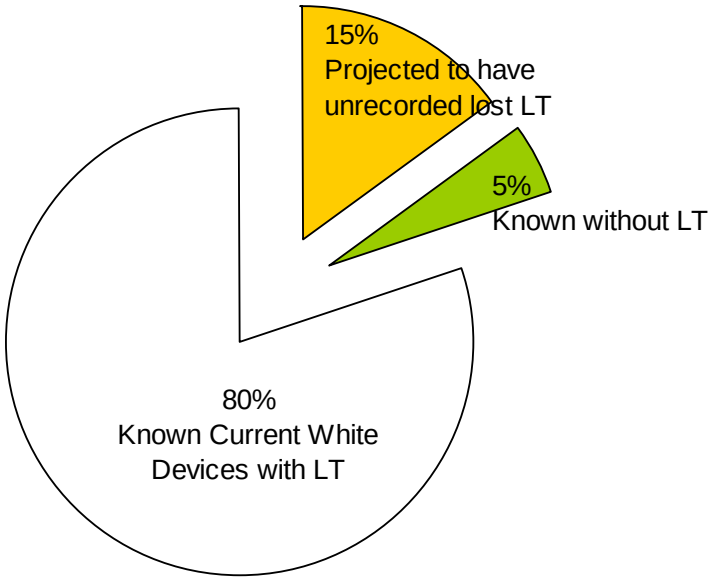
Step 6 – Assume Lost LT % for Current White Devices is the Same
So Projected Lost LT for Current White Devices = Lost LT for Expired White Devices (20%)

Step 7 – Calculate Projected Unreported Lost LT for Current White Devices
= Projected Lost LT for Current White Devices - % of Current White Devices with Code 2
= 20% - (2/40) x 100% = 15%

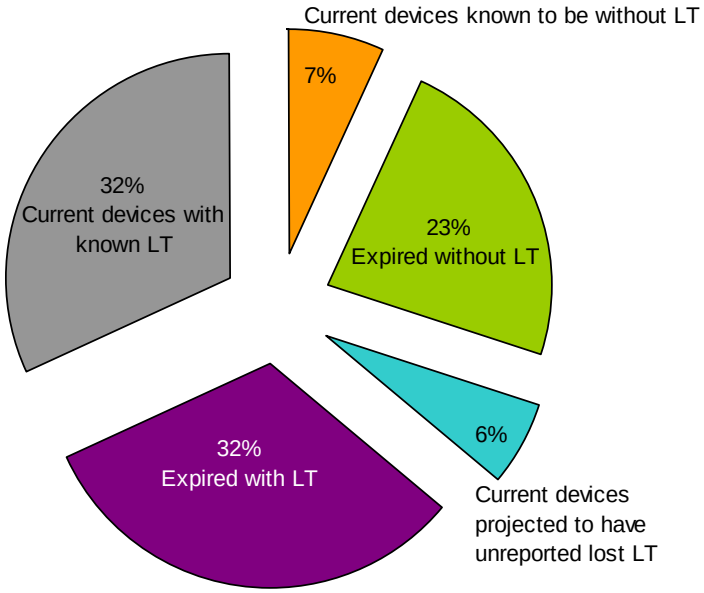
The pie charts on the following page demonstrate the methodology in a more pictorial way.

Pie Charts of Methodologies

Methodology Example
Pie Chart of all Purchased Devices



Methodology Example
Pie Chart of Current White Devices



Total Current Devices = 45
Total Current White Devices = 45 – 5 orange = 40 white
White devices projected to have unreported lost LT = 15% of 40 = 6
Current Devices without LT = 5 orange + 2 White
% of Current White Devices without LT = 2 / 40 = 5%

Projected Real Loss of LT Using the 17 PIC Sample

Agribusiness Online developed an Excel spreadsheet that uses the methodology previously outlined to project the real loss of LT based on the actual figures from the NLIS sample. The results can be seen in the Pie Chart at Annex B. The data for the attachment comes from the NLIS Accuracy Analysis summary spreadsheet of the 17 PICs in the study sample at Annex A.

Summary

The results of the projected real lost LT from an in depth examination of the NLIS data are summarized in the table below.

Table Summarising Methodology and Real Lost Lifetime Traceability

	Methodology Process (Step)	Formula	No	%
A	Total Breeder (White) Devices Purchased – Step 1	NLIS data	49,396	
B	Total Post Breeder (Orange) Devices Purchased	NLIS data	7,509	
C	Total Current Devices	NLIS data	31,332	
D	Total Code 2 (White) Devices – that have lost LT	NLIS data	3,889	
E	Current Code 1 (Orange) Devices – that never had LT	NLIS data	1,930	
F	Current Code 2 (White) Devices – that have lost LT	NLIS data	674	
G	Current White Devices – Step 2	C – E (/ A)	29,402	
H	**Current Code 2 Devices that have lost LT as % of Current White Devices**	**(F / G) x 100%**		**2.29%**
I	Expired White (Deceased) Devices – Step 3	A – G (/ A)	19,994	
J	Expired Code 2 (White) Devices – that lost LT - Step 4	D – F	3,215	
K	Expired White Devices that have Lost LT as a % of Expired White Devices -Step 5	(J / I) x 100%		16.08%
L	**Assume Lost LT for Current White Devices is the same – Step 6**	**K**		**16.08%**
M	**Projected NLIS Unreported Lost LT for Current White Devices – Step 7**	**K - H**		**13.79%%**

The above table shows that, if the proportion of future systems transfers remains similar to those of the past, for some of the life cycle reasons previously documented in this report, then a significantly greater proportion of current devices in use, than those recorded by NLIS, have also lost lifetime traceability.

The methodology developed calculates that, on the basis of the study's statistical sample, 16.08% of white devices do not have lifetime traceability regardless of what NLIS records. Since NLIS advises that only 2.29% of current devices in the sample have lost lifetime traceability, then an additional 13.79% of current devices (over 6 times the number reported by NLIS) have most likely also lost traceability even though NLIS has no current record of that. These additional lost traceability records will show up later via NLIS systems transfers when the cattle are slaughtered or sold through a sale yard.

Systemic Problems Associated with NLIS Lifetime Traceability Process

Life Cycle	Issues for Cattle Breeders	Implications for Lifetime Traceability
NLIS is not designed to define beast ownership.	It is designed with the intention of recording where a calf was born, tracking every property it gets moved to over its life span (with a transfer date accuracy of less than 48 hours) and the property it dies on or the meatworks it is slaughtered at.	NLIS is not part of the beef supply chain and lacks motivating factors for its proper use.
Calf Born on owner's PIC	Australian regulations only require tagging of a beast born on the owner's PIC before the animal departs the birth PIC. Initially owners generally tagged calves at branding for convenience reasons. However in some environments tag loss rates have become a serious problem. Many owners now only tag animals when they leave the property So, there is no driving motivation for owners to tag calves, other than the fact that tagging a calf is easier than tagging a fully grown beast.	NLIS cannot be used to determine the age of beasts, which may not be an issue. NLIS cannot be used as an indicator as to stock levels on any given PIC or for Australia as a whole.
Calf Born on agistment PIC	If born on an agistment PIC, the calf should be tagged with devices purchased by the agistment property. Tagging calves on agistment complicates the ownership position placing a heavy reliance on branding. Consequently owners are tempted to tag calves later with their own devices if they plan to ultimately move the beasts back to their own PICs. This also solves the tag loss problem	Genuine LT can be lost without NLIS ever knowing, because the first appearance of the device on NLIS may not be the accompanying beast's actual birthplace.
Beast transferred to another PIC for agistment	In the busyness of on farm life, there is no driving motivation to scan cattle as they arrive at an agistment destination, other than unenforceable government regulations. If subsequently sold from the agistment property, the database will record a loss of traceability. If returned to the home PIC, the database will never know that the beast has in reality lost LT.	LT will be lost without NLIS knowledge, if there is one or more movements to agistment and back to the home PIC where no NLIS notification occurs.
Beast sold / transferred to another PIC via saleyard	Presumably, the NLIS transfer process is more strictly controlled by the saleyard and processing cattle through sale yards will result in uncovering some lost LT by forcing NLIS systems transfers of devices on the manifest that are not listed on the seller's PIC.	This process will not pick up the lost LT from agistment transfers or tag swapping.
Lost Traceability from tag loss	When a previously tagged beast is found without a tag, there is no way of knowing the device number of the lost tag without a full muster and herd "read", which is completely impractical. Even if a full muster was done, and more than one tag was found missing, there is no way of knowing which lost device belonged to which beast. Estimates for lost tags vary between 2% and 5% of tagged cattle per year.	LT does not exist for most replaced devices, because it cannot be linked to the old device's history.
Orange swapped for a white tag	Given that tags fall off and get replaced, the same can happen to orange tags. In fact, it can be to the owners' economic benefit for orange tags to be cut off and replaced with white ones (despite being illegal).	The economic motivator here is to replace orange tags with tags that pretend to have LT
Beast dies or is slaughtered on owner's PIC	There is no driving motivation to approach a decaying corpse to recover the tag and record the death on the database. Some owners may even be sensitive about recording that sort of information (number of deaths on their properties).	There may be many devices recorded on NLIS as being active even though they are not. Not an LT issue though.
Beast transferred to meat works	Presumably, the NLIS transfer process is more strictly controlled by the meatworks and processing cattle through abattoirs is more likely to result in uncovering some lost LT by forcing NLIS systems transfers of devices on the manifest that are not listed on the seller's PIC.	This process will not pick up lost LT from unrecorded agistment transfers or tag swaps.

Unquantifiable Lost Lifetime Traceability

It must be noted that there are several systemic problems associated with the NLIS process that will result in lost LT that will never be picked up during any stage of the NLIS life cycle. These relate to births on agistment and transfers between PICs for agistment without any transfer of ownership as well as swapping out of orange tags and replacing lost tags without reporting it as an untraceable lost tag replacement. These factors could add another 5% to 15% to the calculated real lost LT, with the most quantifiable being tag loss with estimates varying from 2% to 5% of tagged cattle per year.

Stage 2 Conclusions

The section titled **"Systemic Problems Associated with the NLIS Process for Lifetime Traceability"** shows that there are many problematic reasons why device transfers may not get uploaded to NLIS. An additional category of non-NLIS recorded transfer not listed in that section is a transfer that occurs via a direct sale from one owner to another that does not go through a sale yard. Once again, in the busyness of life or due to the lack of an RFID tag reader, the receiving owner may not complete the NLIS transaction for any number of reasons. At least this category of non-NLIS recorded transfer will eventually get picked up by a saleyard or meatworks. However, this is a classic case of shutting the gate after the cattle have bolted.

The methodology developed by Stage 2 of this report from data inherent in the NLIS database itself and the table above deduce that the real lost lifetime traceability of the 17 PIC statistical sample used by this report is closer to 16% of current devices than the 2.29% reported by NLIS.

In other words over 85% of NLIS records that have most likely lost lifetime traceability are misleadingly presented by NLIS as having traceability.

This is largely due to a completely unenforceable methodology for recording device transfers. The use of NLIS is largely voluntary for owners with, only legislative drivers to motivate owners to faithfully use the system. Most economic drivers are actually negative motivators for using the system properly.

Some less scrupulous owners could target the purchase of orange tagged cattle at a cheaper price and retag them with white devices as "breeder" cattle for resale at a premium.

The NLIS system has no solid checks and balances to monitor owner behaviour or incentives to drive owner behaviour in the desired direction. What checks there are can be circumvented.

There are several categories of systemic problems that will never be recorded by NLIS, even after slaughter. These include most physical transfers without any change of ownership, such as all the births on agistment followed by unrecorded transfers back to the owners' PICs, and transfers between PICs for agistment without any recorded transfers. This all adds additional lost lifetime traceability to quantifiable outcomes that are already unacceptable.

If the function of RFID/ NLIS is to provide lifetime traceability for Australian cattle and other trade and disease control objectives listed previously, **then RFID/ NLIS by any measure is failing.** With at least 16% of supposedly traceable white "breeder" devices having lost traceability historically and continuing to do so, this conclusion is inescapable. In addition, orange "non breeder" tags, which by definition have lost traceability, increase total quantifiable loss of traceability to well over 20%.

This failure stems from NLIS being an ill conceived system that relies on unenforceable regulations in the absence of sufficient positive economic drivers. The macro designers of the system had completely unrealistic expectations of the ability and willingness of property owners to operate the system faithfully in the presence of several negative economic motivators that militate against NLIS being used in a fashion that would provide accurate lifetime traceability.

Stage 3

Analysis of Lost Lifetime Traceability Exposed by Transfers

Methodology

It could be argued that the analysis presented in Stage 2 of this report has not considered the possibility that:

1. the 17 PIC sample may be skewed to support a particular argument, or
2. that the analysis is cumulative and does not take trends into account, since the rate of LT being lost may be increasing or decreasing with the maturity of the NLIS system.

To that end, Agribusiness Online conducted an analysis of ***transfers on*** and ***off*** by year for the same 17 PIC sample. ***Systems transfers*** were calculated as a percentage of ***transfers*** and presented in Annex C. The above two points and an analysis of the data in Annex C are addressed below.

Validity of Statistical Sample

The sample for Stage 3 was taken from the same 17 PICs, but about 2 weeks after the data for Stage 2. Consequently, some additional transfers had taken place since the Stage 2 sample was taken. As previously discussed, there must be an NLIS ***systems transfer off*** for every ***systems transfer on*** to balance the ledger. Therefore, for an NLIS sample size to be statistically useful, ***transfers on*** would need to be within a few percent of ***transfers off***. In this case the difference is 119 ***transfers*** out of an average of 4,120 ***transfers*** or 2.9%. So the sample is still closely representative of the whole NLIS database and there is no statistically significant skew in the data sample.

Trend Analysis

By definition, 100% of NLIS ***systems transfers on*** to a PIC (B) result from that PIC (B) owner not ***transferring on*** a purchase from PIC (A). However, the actual ***systems transfers on*** do not occur until a later sale ***(transfer off)*** by PIC (B) and an NLIS upload of ***transfers on*** by the next purchaser at PIC (C). Any devices transferred from PIC (B) to PIC (C) that were not recorded by NLIS as being on PIC (B) will be ***systems transferred off*** PIC (A) and ***systems transferred on*** to PIC (B).

So *systems transfers on* to a PIC are an immediate and direct result (subset) of *transfers off* and represent a true ratio of overall devices with and without LT if the sample is statistically valid.

Annex C presents the NLIS data for ***systems transfers on*** and ***off*** as various ratios of ***transfers on*** and ***off***. The first graph depicts the ratio described in the previous paragraph and the fourth graph represents all ***systems transfers*** as a ratio of all ***transfers***, so it should also be representative of the total population of ***systems transfers***.

What the data at Annex C shows (using the less dramatic of the two graphs for the sake of conservatism) is that, prior to 2005, there were not enough transfers recorded to be statistically valid and there was minimal loss of LT in 2005. In 2006, after the use of NLIS became mandated, there was a 10.4% spike of lost LT recorded, as a percentage of ***transfers off***, while NLIS was catching up with the data from ***transfers*** that graziers started to record. This settled down back to 9.6% in 2007, but started creeping back up in 2008 to 14.5% and is a huge 23.7% of ***transfers off*** at this point in 2009.

The sample for the 2009 YTD has a larger statistical error than the samples for 2006 to 2008, because it is much smaller (being just one third through the year as at the end of April 2009). However, even if the error was as high as 25%, the lost LT figure for 2009 would still be 17.8% and the lost LT trend would be from 9.6% to 14.5% to 17.8% over the period from 2007 through 2008 to 2009.

This is the reverse of the trend we expected to see if graziers were getting better acquainted with NLIS and using it more strictly as time goes on.

What the data is actually showing is that there is a growing trend away from a strict NLIS protocol and, therefore, the future percentage of lost LT that can be derived from NLIS data will be higher than the 16.08% projected by the first methodology in this report. The trend could be as high as 24% if the 2009 sample for the year thus far continues in the same vein to the end of the year.

Stage 3 Conclusions

Data from NLIS for ***transfers on*** by year clearly show a trend towards greater loss of lifetime traceability with time. Therefore, the 16.08% projection for lost LT arrived at in Stage 2 of this report must now be considered to be too low, rather than being too high or about right. That figure still does not take into account any of the other factors that are intangible for NLIS, such as:

1. the replacement of orange tags with white tags
2. the replacement of lost tags with white tags on beasts with another owner's brand
3. the unrecorded transfer of cattle to and from agistment

By combining these intangible factors with a quantifiable factor that is somewhere between 16% and 24%, the actual loss of lifetime traceability will increase substantially.

This alternative, cross checking methodology for establishing the loss of lifetime traceability as a function of time supports the analysis and conclusions made in Stage 2 of this report. The only additional conclusion is that the industry's confidence in NLIS appears to be diminishing as evidenced by the growing rate of loss of lifetime traceability.

NLIS Accuracy Analysis Table

Annex A

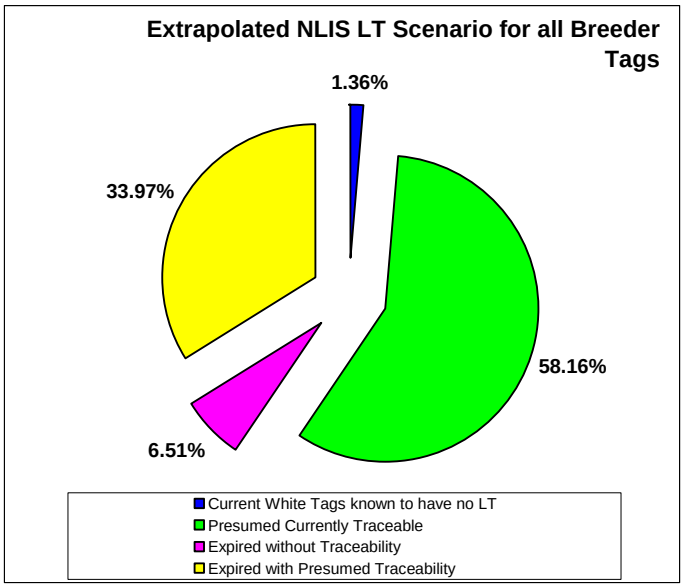
STAGE 2 DATA	PIC 1	PIC 2	PIC 3	PIC 4	PIC 5	PIC 6	PIC 7	PIC 8	PIC 9	PIC 10	PIC 11	PIC 12	PIC 13	PIC 14	PIC 15	PIC 16	PIC 17	PIC Total
Lost Lifetime Traceability																		
Total Tags Purchased	822	1150	13900	1910	5170	9300	4150	2412	900	430	50	1876	7300	4485	1600	1200	250	**56905**
Total Tags with no LT	85	1014	2672	213	1695	1352	2002	577	69	60	15	147	663	385	300	118	31	**11398**
Orange Tags - that never had LT	72	950	1900	60	1020	800	1950	12	0	30	0	0	0	385	300	0	30	**7509**
White Tags - that have lost LT	13	64	772	153	675	552	52	565	69	30	15	147	663	0	0	118	1	**3889**
Total Tags Used	822	1150	13900	1910	5170	9300	4150	2412	900	430	50	1876	7300	4485	1600	1200	250	**56905**
Used Tag Lost LT %	**10.3%**	**88.2%**	**19.2%**	**11.2%**	**32.8%**	**14.5%**	**48.2%**	**23.9%**	**7.7%**	**14.0%**	**30.0%**	**7.8%**	**9.1%**	**8.6%**	**18.8%**	**9.8%**	**12.4%**	**20.03%**
Current Tags on Property	404	0	7445	896	4359	5905	3392	1191	150	155	25	296	2169	2525	1824	507	89	**31332**
Orange Tags that never had LT (1)	70	0	559	65	482	268	357	42	0	3	0	0	0	47	16	0	21	**1930**
White Tags that have Lost LT (2)	0	0	72	58	113	106	189	65	0	0	0	1	0	4	2	64	0	**674**
Unused Tags	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White Tags in use on Property	334	0	6886	831	3877	5637	3035	1149	150	152	25	296	2169	2478	1808	507	68	**29402**
White Tags in use that have Lost LT %	**0.0%**	**0.0%**	**1.0%**	**7.0%**	**2.9%**	**1.9%**	**6.2%**	**5.7%**	**0.0%**	**0.0%**	**0.0%**	**0.3%**	**0.0%**	**0.2%**	**0.1%**	**12.6%**	**0.0%**	**2.29%**
Current Tags in use that have Lost LT %	**17.3%**	**0.0%**	**8.5%**	**13.7%**	**13.6%**	**6.3%**	**16.1%**	**9.0%**	**0.0%**	**1.9%**	**0.0%**	**0.3%**	**0.0%**	**2.0%**	**1.0%**	**12.6%**	**23.6%**	**8.31%**
Total Activity from 1999 Onwards																		
Baseline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Breeder Purchased Devices	750	200	12000	1850	4150	8500	2200	2400	900	400	50	1820	7300	4100	1300	1200	200	**49320**
Post Breeder Purchased Devices	72	950	1900	60	1020	800	1950	12	0	30	0	0	0	385	300	0	30	**7509**
Devices Transferred on (TAGTRANS)	0	0	0	0	0	0	0	0	0	0	0	56	0	0	0	0	20	**76**
Cattle Transferred on	3	0	3076	702	3205	4309	5795	744	9	0	0	6	5	824	1941	180	62	**20861**
Cattle Transferred on by the System	0	0	65	518	1581	744	419	88	194	15	3	0	435	1	1	5	2	**4071**
Cattle Transferred Off	419	501	7828	1961	3118	5668	3140	1121	869	258	12	1160	5156	1890	32	783	224	**34140**
Cattle Transferred off by the System	0	477	598	140	528	645	247	641	51	28	15	142	396	4	0	104	0	**4016**
Total Direct to Slaughter	17	172	1169	134	1952	2135	3589	291	33	4	1	284	19	949	1686	40	1	**12476**
Devices Transferred off (TAGTRANS)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Deceased on PIC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inactive Devices	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Active Devices	**389**	**0**	**7446**	**895**	**4358**	**5905**	**3388**	**1191**	**150**	**155**	**25**	**296**	**2169**	**2467**	**1824**	**458**	**89**	**31205**
NLIS Reported Total Active Tags	389	0	7446	895	4358	5905	3388	1191	150	155	25	296	2169	2467	1824	458	89	**31205**
Error %	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.00%
Total Unused Tags	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Active Devices in Use	**389**	**0**	**7446**	**895**	**4358**	**5905**	**3388**	**1191**	**150**	**155**	**25**	**296**	**2169**	**2467**	**1824**	**458**	**89**	**31205**
STAGE 4 DATA																		
Total Transfers On by Paperwork																		**0**
NLIS Transfer On Error	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
NLIS Transfer On Error %	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Total Transfers Off by Paperwork																		**0**
Total Transfers Off Error	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total Transfers Off Error %	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Total Sent to Slaughter by Paperwork																		**0**
Total Sent to Slaughter Error	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total Sent to Slaughter Error %	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Average Days to Upload Transfers																		**0**

Real Lost LT Projection Calculator

Breeder Purchases	49396
Post Breeder Purchases	7509
Current Devices	31332
Current Code 1 (Orange) Devices - Never had LT	1930
Current Code 2 (White) Devices - Have Lost LT	674
Current White Devices	29402
Total System Transfers Off	4016
Total System Transfers On	4071
Total Code 2 Entries - Lost LT	3889
Expired Code 2 Entries - Lost LT (10 - 7)	3215
Expired White Devices	19994
Current Lost LT % (White tags only)	2.29%
Expired Lost LT % (White Tags Only)	16.08%

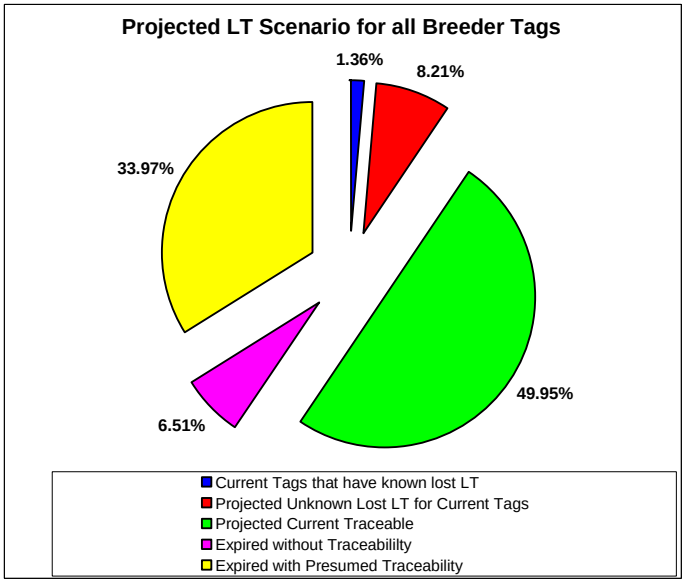
Extrapolated NLIS LT Scenario for all Breeder Purchases

Current White Tags known to have no LT	1.36%
Presumed Currently Traceable	58.16%
Expired without Traceability	6.51%
Expired with Presumed Traceability	33.97%
	100.00%



Projected LT Scenario for all Breeder Purchases

Current Tags that have known lost LT	1.36%
Projected Unknown Lost LT for Current Tags	8.21%
Projected Current Traceable	49.95%
Expired without Traceabililty	6.51%
Expired with Presumed Traceability	33.97%
	100.00%

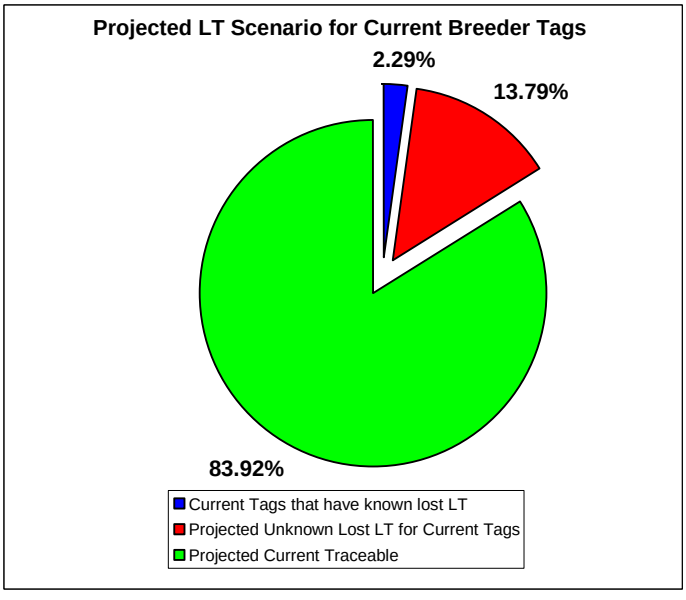


Note:
Total Lost LT = Blue + Red + Purple

Extrapolation of Real Total Lost LT	**16.08%**

Project LT Scenario for Current Breeder Tags

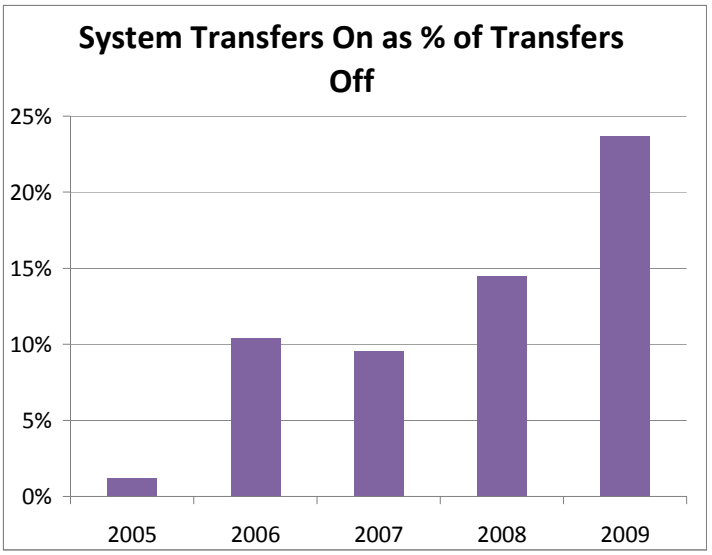
Current Tags that have known lost LT	2.29%
Projected Unknown Lost LT for Current Tags	13.79%
Projected Current Traceable	83.92%
	100.00%



Lost Lifetime Traceability Exposed by Transfers

Annex C

Year	Transfers Off	Systems Transfers On	System Transfers On as % of Transfers Off
2004	63	35	35.71%
2005	4437	55	1.22%
2006	12103	1409	10.43%
2007	9580	1015	9.58%
2008	6856	1162	14.49%
2009	1637	508	23.68%



Year	Transfers On	Systems Transfers On	Lost LT as % of Transfers On
2004	0	35	100.00%
2005	2021	55	2.65%
2006	5025	1409	21.90%
2007	6780	1015	13.02%
2008	6393	1162	15.38%
2009	915	508	35.70%

Year	Transfers Off	Systems Transfers Off	Lost LT as % of Transfers Off
2004	63	0	0.00%
2005	4437	56	1.25%
2006	12103	1081	8.20%
2007	9580	1290	11.87%
2008	6856	1209	14.99%
2009	1637	429	20.76%

Year	Total Transfers	Total Systems Transfers	Average Lost LT %
2004	63	35	35.71%
2005	6458	111	1.69%
2006	17128	2490	12.69%
2007	16360	2305	12.35%
2008	13249	2371	15.18%
2009	2552	937	26.86%