final report

Project code: I.GNT.1901

Prepared by: Julie Petty
Meat and Livestock Australia

Date published: 24 Feb 2020

PUBLISHED BY
Meat and Livestock Australia Limited
PO Box 1961
NORTH SYDNEY NSW 2059

Scoping study to strengthen Indonesian red meat supply chain traceability systems – full report

Meat & Livestock Australia acknowledges the matching funds provided by the Australian Government to support the research and development detailed in this publication.

Abstract

Meat & Livestock Australia (MLA)-led Rural R&D for Profit Insights2Innovation project identified "Food without Fear" as being an important global concern. A report from Food Innovation Australia Limited (FIAL) estimates ~AUD 272 million pa fraud perpetrated on the industry in export markets, costing the industry 2% of trade value for exports to Indonesia (McLeod, 2017). Management of this threat is both a responsibility for individual supply chains and government. International, inter-governmental and multiparty cooperation is needed to combat the problem.

In 2019, MLA was awarded a grant from The Commonwealth of Australia represented by the Department of Agriculture and Water Resources, issued as part of the Indonesia Australia Partnership on Food Security in the Red Meat and Cattle Sector (the Partnership). Its purpose was to undertake a scoping study to strengthen red meat supply chain traceability systems between Australia and Indonesia.

This study reviewed existing relevant regulatory and commercial arrangements within Indonesia, identified options for strengthening industry self-regulation to improve supply chain traceability, identified drivers for food authenticity issues, how the policy and regulatory context in Indonesia affects Australian red meat supply chains, and identified additional work that can be undertaken to improve consumer confidence and awareness of Australian red meat in Indonesia.

Executive summary

In 2019, Meat & Livestock Australia (MLA) was awarded a grant from The Commonwealth of Australia represented by the Department of Agriculture and Water Resources, issued as part of the Indonesia Australia Partnership on Food Security in the Red Meat and Cattle Sector (the Partnership). Its purpose was to undertake a scoping study to strengthen Indonesian red meat supply chain traceability systems.

This study reviewed existing relevant regulatory and commercial arrangements within Indonesia, identified options for strengthening industry self-regulation to improve supply chain traceability, identified drivers for food authenticity issues, how the policy and regulatory context in Indonesia affects Australian red meat supply chains, and identified additional work that can be undertaken to improve consumer confidence and awareness of Australian red meat in Indonesia.

Dependant on the scoping study outcomes, MLA was to develop a project scope for pilot studies to test the use of authenticity/traceability systems or products and follow the path of beef from Australia to Indonesia end-to-end. The pilot scope has been proposed and preliminary investigations documented. An existing commercial Australia-Indonesia supply chain was mapped and studied as a part of this project. It highlighted the complexity of both the supply chain itself and the many parties involved in delivery of the product to the end consumer as well as the regulatory framework within Indonesia, which is multifaceted and constantly shifting.

The issue of food fraud is not going away, and MLA-led Rural R&D for Profit Insights2Innovation project identified “Food without Fear” as being an important global concern. A report from Food Innovation Australia Limited (FIAL) estimates ~AUD 272 million pa fraud perpetrated on the industry in export markets (McLeod, 2017), which may or may not underestimate the extent of fraud since it is based on economic modelling with no sampling or testing in the marketplace to verify the estimate. Management of this threat is both a responsibility for individual supply chains and government. International, inter-governmental and multiparty cooperation is needed to combat the problem.

It’s clear that the market for authenticity/traceability systems is still maturing with both service providers and supply chain participants facing a steep learning curve. It can be a costly exercise to implement these systems, so a thorough understanding of the end consumer’s key drivers is necessary for the market (or segment) in question, including their willingness to pay for such a service. The initiator (party seeking to increase traceability) then faces the question of how to motivate all parties along the supply chain to participate and contribute to the system. Any supply chain efficiencies which could be gained should be highlighted as should any possible redistribution of profits. Plus of course the indirect benefit of mitigating risk. The benefits of these types of systems can be intangible. For example, a reduction in risk only becomes tangible if it results in reduced insurance premiums. For Australian red meat processors adoption of these systems is being slowed by a lack of clear value gain (or reduction of loss). Regardless, major international retailers are driving the adoption of authenticity/traceability systems and using them for multiple purposes including Walmart, Marks & Spencer and Carrefour.

This document is the full final report and was supplied to the Department of Agriculture, Water and the Environment Australia on 26 Feb 2020. The abridged version of the report was supplied to the department on 26 March 2020.

Table of contents

1 Background

1.1 Purpose

In 2019, Meat & Livestock Australia (MLA) was awarded a grant from The Commonwealth of Australia represented by the Department of Agriculture and Water Resources, issued as part of the Indonesia Australia Partnership on Food Security in the Red Meat and Cattle Sector (the Partnership). Its purpose was to undertake a scoping study to strengthen Indonesian red meat supply chain traceability systems.

This study was intended to include reviewing existing relevant regulatory and commercial arrangements within Indonesia, identifying options for strengthening industry self-regulation to improve supply chain traceability, identifying drivers for food authenticity issues, how the policy and regulatory context in Indonesia affects Australian red meat supply chains, and identifying additional work that can be undertaken to improve consumer confidence and awareness of Australian red meat in Indonesia.

Dependant on the scoping study outcomes, MLA was to develop a project scope for pilot studies to test the use of authenticity/traceability systems or products and follow the path of beef from Australia to Indonesia end-to-end.

1.1.1 The Indonesia-Australia Red Meat and Cattle Partnership

The Indonesia Australia Partnership on Food Security in the Red Meat and Cattle Sector (the Partnership) was developed by the Indonesian and Australian governments to combine their strengths to improve the red meat and cattle sector supply chain in Indonesia and to promote a stable trade and investment environment between Indonesia and Australia.

The 10-year Partnership spans until 2023, with AUD$60 million in funding from the Australian Government and co-contributions from project Partners (The Partnership 2020).

The Partnership Objectives include:

- Increase domestic and foreign investment in the red meat and cattle supply chain
- Improve security, prosperity and productivity of the Indonesian and Australian red meat and cattle industries
- Build a trusted relationship between Australian and Indonesian red meat and cattle industries and governments
- Increase Indonesia's cattle population to help meet local demand and food security targets
- Be able to respond to the increased demand for beef products in Indonesia across differentiated market segments with pricing meting consumer demands.

1.2 Australian-Indonesia relationship

Indonesia is Australia's fourth largest agricultural export market. Australia's trade in boxed beef (and veal), cattle and beef offal with Indonesia was in 2019 valued at AUD1.2 billion (IHS Markit 2020). Trade in beef and veal alone in 2019 was valued at AUD390 million. Seventy-five percent of Australian agricultural production is exported, so market access is critical to the viability of the sector. In 2019, Australia shipped 57,637 tonnes of beef and veal to Indonesia, most as frozen grass-fed beef. Indonesia is Australia's largest exports for live cattle as well, with over 670,000 head exported in 2019 (MLA).

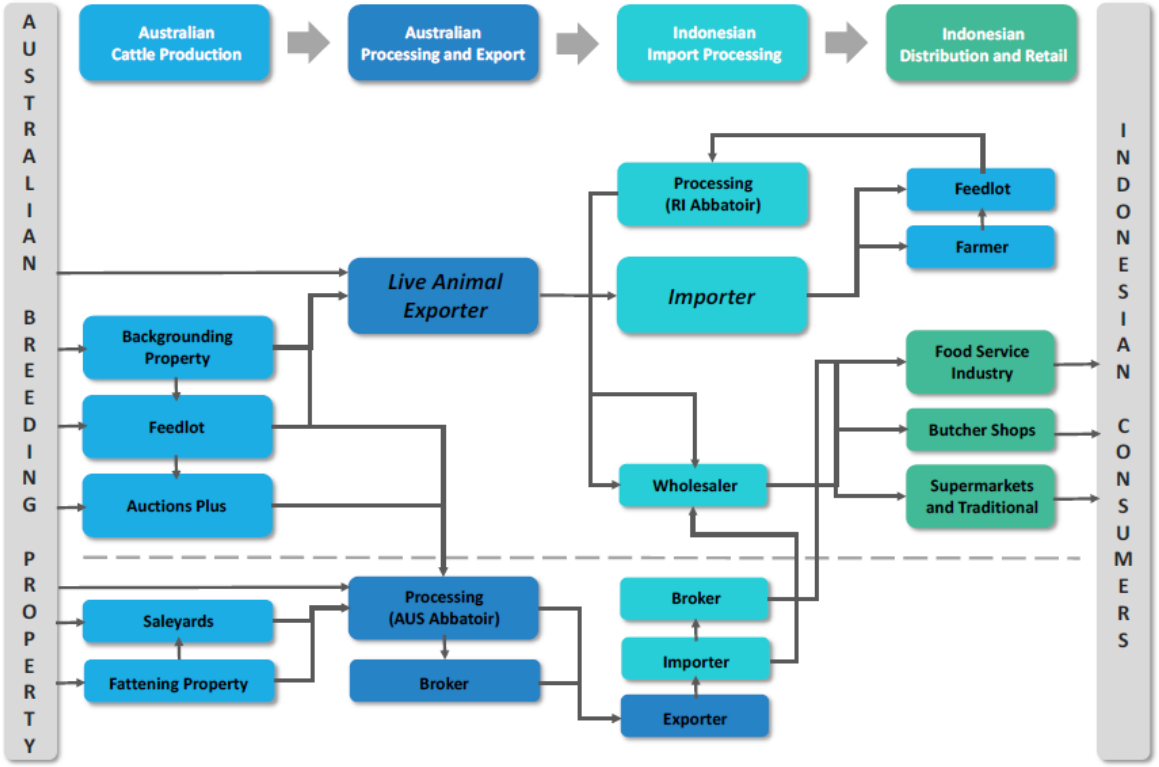
The Indonesian population is estimated at 265 million, with Jakarta the key consumption market with over 10.8 million estimated population in 2019. GDP continues to rise in Indonesia and demand for animal-based protein such as beef, chicken meat, eggs and dairy remains strong.

The ASEAN-Australia New Zealand Free Trade Area (AANZFTA) agreement is in place and the Indonesian-Australian Comprehensive Economic Partnership Agreement (IA-CEPA) is anticipated to enter into force by May 2020. This means remaining tariffs on Australian-Indonesia beef exports will be eliminated by 2023. IA-CEPA also provides the platform for businesses to explore broader market opportunities, including access into third export markets.

1.2.1 Beef and cattle supply chains

Beef and cattle supply chains from Australia to Indonesia are complex, (Figure 1). Given at least 20 entities will have some interaction with the product across the two countries, a high degree of cooperation and accurate data transmission from one entity to the next is required for end-to-end traceability, which is challenging.

Figure 1: Australia-Indonesia cattle and beef supply chain. Source: Maman et al 2018.



1.2.2 Market and consumer preferences

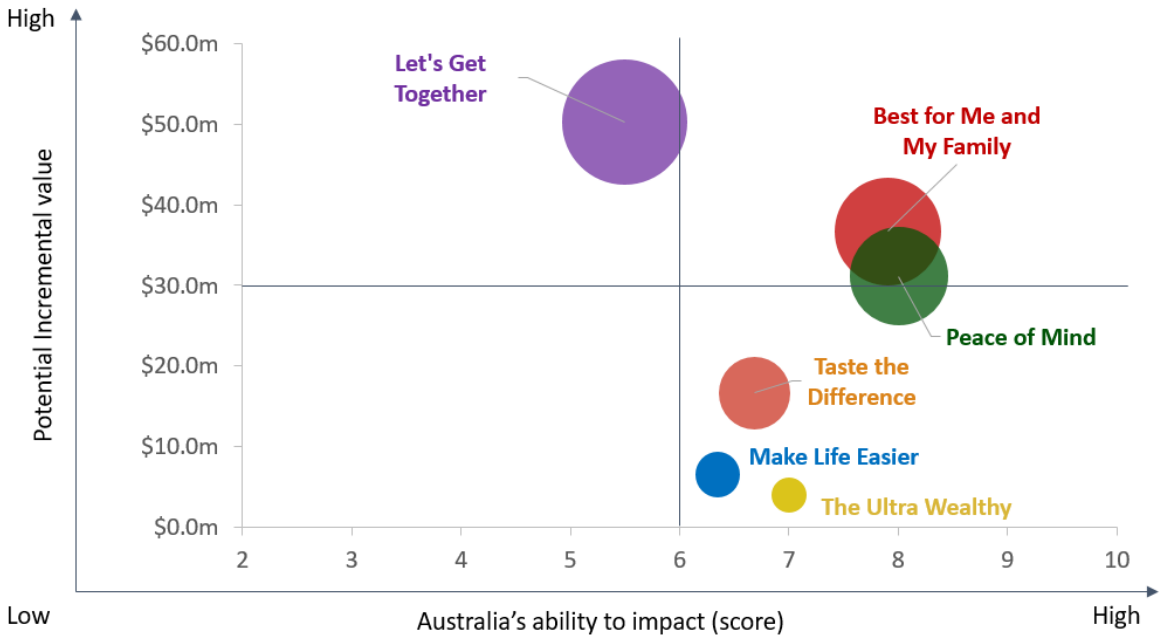
Peace of mind is identified as one of the six major growth drivers for beef in Southern Asia*, including Indonesia in the next five years (Figure 2). It is a fundamental need of consumers when they purchase meat, with safety, trusted quality and naturalness among the most sought-after attributes.

Figure 2: Southern Asia category growth drivers for beef. Source: MLA

*In this report, Southern Asia refers to the six key markets in the region, including Indonesia, Singapore, Malaysia, Vietnam, Thailand and the Philippines. These other markets are included in this report for comparison.

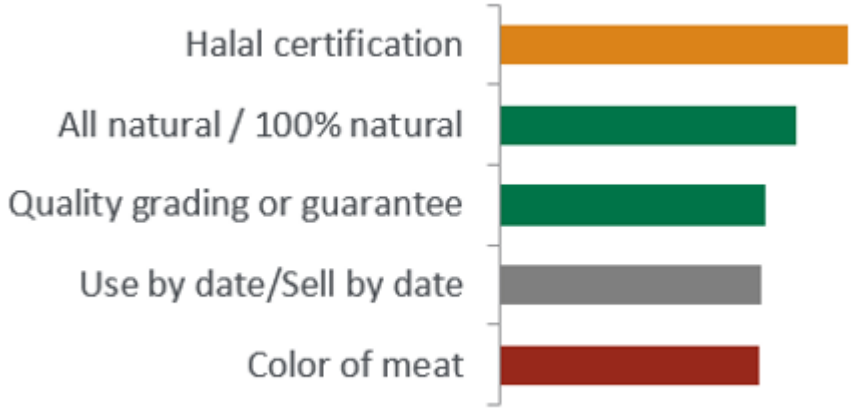
Peace of mind is anticipated to create a relatively big opportunity for the Australian industry and is an area where Australia is well-positioned to impact (Figure 3).

Figure 3: Southern Asia strategic growth drivers' potential incremental value and Australia's ability to impact. Source: MLA



Guaranteed quality, safety certificates and natural products are among the top attributes influencing the purchase decisions of Southern Asian consumers when buying beef (Figure 4). Of the top five most important attributes Indonesian consumers look for when buying beef, four (halal, natural, quality grade, and shelf life) are required to be transmitted from the producer and processor to the consumer through labelling or certificates.

Figure 4: Top five most important attributes Indonesian consumers look for when buying beef Source: MLA Global Consumer Tracker, Thailand 2018, Malaysia 2018, Singapore 2017.



Transparency is important to Southern Asian consumers, and this can draw a premium, especially from the affluent. Consumers want to know where an animal has come from and how it has been raised and are willing to pay a premium (Figures 5 and 6). Product traceability is a pre-requisite for credibility of product claims.

Figure 5: Consumer responses to: *"It's important to know where the animal has been and what it's been treated with in its lifetime"* Source: MLA ASEAN Attractive Cities Study 2018; MLA Global Consumer Tracker 2018, 2016 (Vietnam).

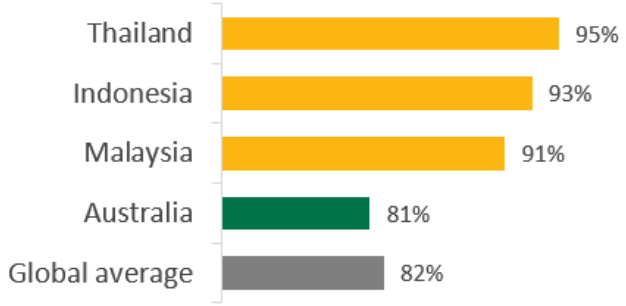
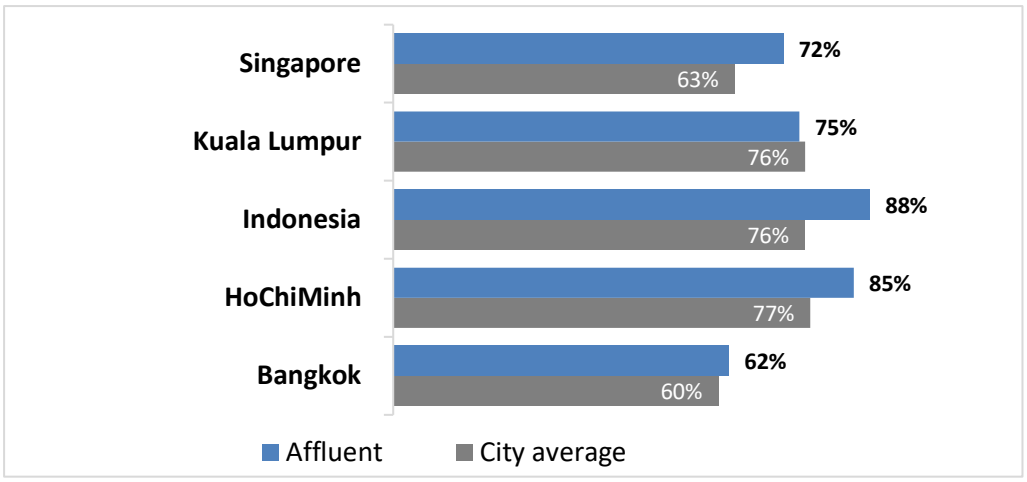


Figure 6: Consumer responses to: *"It's important to know where the meat I buy has been sourced from, and I am prepared to pay a bit more for this".* Source: MLA ASEAN Attractive Cities Study 2018



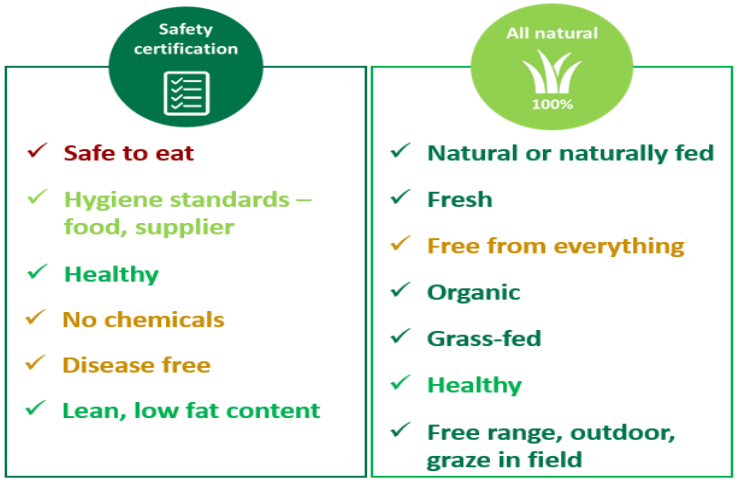
Halal is a vital element to Indonesian consumers. Therefore, it is required to be transmitted from the producer and processor to the consumer through labelling or certificates alongside naturalness, quality grade and shelf life in order to provide Indonesian consumers with ultimate peace of mind. Table 1 segments various sales avenues by consumer expectations (what is considered a given, what's a value add). Systems such as blockchain and MSA grading are disruptive enabling technologies. For wholesale retail ready, this channel is where the potential of loss of control of the brand value of Australia can occur (University of Melbourne 2019).

Table 1: Attributes vs sales channels Source: University of Melbourne (2019)

Opportunity Space	Restaurant/ Primal	Retail Ready	Online Retail Ready	Online Primal	Wholesale Retail Ready	Wholesale Primal
Delighters	Traceability (provenance, authenticity)	Eat Now Indicator (tender/ ripeness) Oxidized flavour, Shelf Life Transparency Meat Firmness Offal: Texture Offal: Flavour/ Odour Offal Fresh/ not Frozen	Eat Now Indicator (tender/ ripeness) Oxidized flavour, Shelf Life Transparency Meat Firmness Offal: Texture Offal: Flavour/ Odour Offal Fresh/ not Frozen	Oxidized flavour, Shelf Life Transparency Meat Firmness	Loose control of Brand Value of Australia	
Normal	Eat Now Indicator (tender/ ripeness) Oxidation/ flavour/ odour Offal: Preferred Texture Indicator Offal: Preferred Flavour Indicator	Education/ Intuitively Obvious information	Education/ Intuitively Obvious information	Education/ Intuitively Obvious information		Fresh not Frozen
Expected	Is it what I paid for? Food Safety Temperature control	Traceability Anticounterfeiting Food Safety	Traceability Anticounterfeiting Food Safety	Traceability Anticounterfeiting Food Safety		Is it what I paid for? Food Safety Temperature control Purge Shelf Life
Enabling Disruptors				Blockchain Green Food Logo MSA Grading		

The general guarantee of product as being safe or natural can be supported by specific claims concerning hygiene standards, use of chemicals, disease status of animals, raising systems etc. (Figure 7).

Figure 7: Southern Asian consumers perceptions of *Safe* and *Natural*. Source: MLA Global Consumer Tracker



Australian beef and lamb are rated more highly than product from competitor countries for being produced in a good environment and being safe and trustworthy by Malaysian and Indonesian higher income groups (MLA Global Consumer Tracker).

Affluent Indonesian consumers look at colour, fresh vs frozen, packaging, leanness and country of origin when deciding if beef is high quality when purchasing (MLA Global Tracker Indonesia, Malaysia, Thailand 2018; Singapore 2017). This is important for all Australian suppliers to the Indonesian market to understand. Implementation of a traceability system would certainly assist in communicating Country of Origin claims. Shelf-life is also important to retailers and can impact on the colour of the meat, so this too needs to be communicated via the traceability system.

1.3 Definition of traceability

Traceability, for the purposes of this project, focuses around the maintenance of product integrity. This includes tracking the chain of custody, verification of authenticity and a system to track and trace product flow. These are all forms of risk mitigation which are used in food supply chains.

Achieving traceability requires cooperation throughout the whole supply chain and effective data/information sharing. Used in this way, it is a vital component to effective decision-making. Food Standards Australia New Zealand (FSANZ) defines traceability as "the ability to track any food through all stages of production, processing and distribution (including importation and at retail).

1.4 Drivers of demand for traceability

MLA's Rural R&D for Profit Insights2Innovation project identified "Food without Fear" as being an important global concern. A report from FIAL estimates ~AUD 272 million pa fraud perpetrated on the industry in export markets and costing the industry 2% of trade value for exports to Indonesia (McLeod, 2017), which may or may not underestimate the extent of fraud since it is based on economic modelling with no sampling or testing in the marketplace to verify the estimate. Types of food fraud are listed below.

Table 2: Types of Food Fraud Source: UK Food Standards Agency, 2016.

Threat	Example
Adulteration – involves lowering the quality of agri-food products by adding inferior substance	Melamine included in infant dairy formula
Substitution – Replacing foods with other similar products without altering their overall characteristics	Wagyu beef is substituted with another, less expensive type of beef.
Diversion – Redirecting foods and other agricultural products from their intended usage.	Spoiled food or animal wastes used for human consumption
Misrepresentation - Marketing an agri-product as something which is not	False declaration about fish and seafood species geographic origin
Identity theft – The identify of a business or brand is used fraudulently for economic gain	Food sold using false company identification

McLeod (2017) noted that products can vary greatly in the possibility of being compromised via food fraud. More expensive items, those with large potential markets, prominent brand recognition with simple logistics and ability to camouflage operations are at higher risk from perpetrators.

1.5 Product integrity

There are strong anti-fraud systems within the Australian meat processing. Government officials supervise the operation of export meat processing establishments. Transfers of product destined for export from one registered establishment to another are controlled. Meat leaving Australia in a carton (majority of product, though some carcases, and large carcase parts are exported) has a

unique GS1-compliant barcode (per carton) and is accompanied by a Government issued certificate. Once product leaves Australia, any number of opportunities for fraud present themselves.

Consumers in many of Australia's export markets presently have few ways to judge the integrity of the products they consume. Even dissatisfaction with product quality may not be reliable if the product is not genuine.

Several elements should work together to provide consumer confidence before purchase, and multiple components are required to satisfy the consumer need to ensure a high level of product integrity (Figure 8). The components may include:

- known composition or addition of a specific tag to meat as a unique identifier
- packaging materials that may have specific/difficult-to-counterfeit features
- a label that has security features
- a label that provides access to information that flows in one or two directions between the product owner/customer/end-consumer
- auditing and information at points in the chain where a process (such as cutting and repacking) further splits products

Figure 8: Product integrity devices at retail

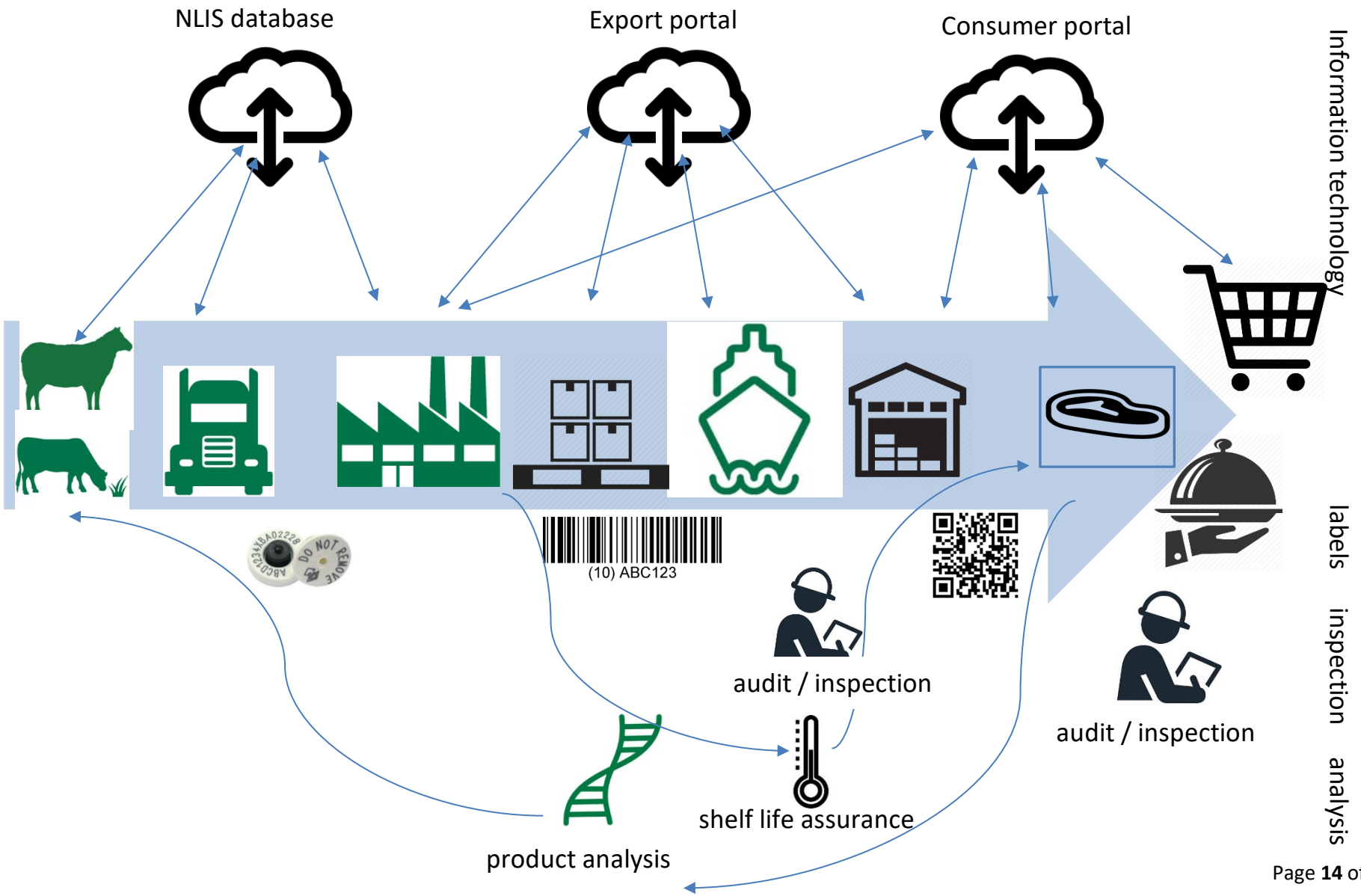
Many of these components may be supported by data storage and transfer in the cloud or backed up by verified ledgers such as Blockchain.

There is opportunity for the beef sector is to develop and improve traceability systems. Consumer assurance concerns related to food safety and religious and cultural practices are creating an

increasing interest in traceability systems in Indonesia for domestic consumption and Indonesian export markets such as China.

In addition to the visual cues, other approaches may be taken to ensuring the integrity of the product. A combination of elements of the integrity and traceability system may or may not interface with the consumer near the end of the value chain but do operate throughout the chain (Figure 9). The integrity elements facing the consumer may be linked in various ways throughout the supply chain, and may link to well-established traceability systems for animals, such as the Australian National Livestock Identification System (NLIS).

Figure 9: Proving supply chain integrity



1.6 Traceability/integrity systems in action

In Indonesia, food traceability initiatives are active, including in products such as mangoes (Vanany et al 2016); cocoa (Syahruddin and Kalchschmidt 2012); wild-caught tuna (Accenture 2018); and fish traceability and stock systems in Bitung (STELINA 2018).

Mangoes
Vanany et al (2016) reports on a case study conducted with mangoes produced in Indonesia. The study discusses the need for an integrated approach to coordinate the various actors in the supply chain. The report findings suggested that building traceability programs in developing economies is not much different than trying to achieve the same in economies considered more developed.

Cocoa
A 2012 report by Syahruddin and Kalchschmidt reviewed traceability in the Indonesian cocoa supply chain. There are approximately 400,000–500,000 smallholders producing cocoa in Indonesia (Panliburton and Lusby, 2006). The supply chain includes growers, collectors, traders, exporters, multinationals, processors and manufactures (Bedford et al, 2002).

Low adoption, limited technology and the need for a legal framework which is more enforceable were hampering traceability at the time of Syahruddin and Kalchschmidt's study. Identification within the supply chains includes labelling systems. The labels often only included the grower names and harvest date. Later in the supply chain the product is labelled for quality. Many steps in this process are manual and this of course leads to the risk of data error (Thakur and Donnelly, 2010).

One option being considered for implementation is the Failure Mode Effect and Critically Analysis (FMECA) proposed by Bertolini, et al (2006) which is used in the industrial food industry. The introduction of regulations targeting supply chains which focused on food quality assurance (Savov and Kouzmanov, 2009) was a recommendation of the report.

Wild caught tuna
Bumble Bee Foods which is one of the biggest seafood brands in the United States uses SAP blockchain. The system allows consumers to track yellowfin tuna from the Indonesian ocean to a specific meal, via a QR code on the packaging. Information can be included about when the fish was caught, who the fisherman was, fair trade fishing certification etc.

A 2018 study by GlobeScan found that 70% of seafood consumers want to know more about the sustainability of the product.

Fish traceability
In August 2018, the Indonesia Ministry of Marine Affairs and Fisheries (MMAF) launched the National Fish Traceability and Stock System (STELINA) to facilitate various international market requirements. These included the United States' Seafood Import Monitoring Program (SIMP) and the European Union (EU) regulations which are designed to tackle Illegal, Unreported and Unregulated (IUU) fishing while supporting food safety.

STELINA is a traceability system hosted by the government with the Director General of Product Competitiveness of the MMAF leading the program. STELINA houses traceability information collected throughout Indonesia's fishery systems (more than ten systems). STELINA facilitates data transfers between the government and the private sector

2 Project objectives

2.1 Objectives

The objectives of the grant included:

1. Review and document the existing regulatory and commercial arrangements within Indonesia that lead to supply chain traceability for import and export of red meat products (section 4.1 of this report).
2. Identify options for strengthening industry self-regulation to improve supply chain traceability (section 4.2 of this report).
3. Identify the drivers for food authenticity issues and how the policy and regulatory context in Indonesia affects Australian red meat supply chains (section 4.3 of this report).
4. Identify and plan additional work that can be undertaken to improve consumer confidence and awareness of Australian red meat in Indonesia (section 4.4 of this report).
5. Dependant on the scoping study outcomes, develop a project scope for pilot studies to test the use of authenticity/traceability systems or products and follow the path of beef from Australia to Indonesia end-to-end (section 4.5 of this report).

3 Methodology

3.1 Phase 1

Following contracting, terms of reference were developed to begin addressing objectives 1-2 within the grant.

The purpose of this phase of the project was to examine ways to protect Indonesian consumers, as well as the reputation of Australian beef suppliers to the Indonesian market, through improvements to red meat supply chain traceability. The study mapped the processes, players and records used to achieve end-to-end traceability in an Australia-to-Indonesia beef supply chain. Value chain mapping was considered a necessary pre-cursor to understanding the capacity of the beef industry supply chain in providing levels of traceability that meet the needs of consumers and regulators alike.

Deakin University was awarded the contract for this phase of the project and their full final report can be found at Appendix 1.

3.2 Phase 2

Following receival of the Deakin University report, it was decided that one-two commercial case studies should be developed to test the findings of the report and current technology offerings. This feeds into project objectives 4 and 5.

MLA sought out supply chain partners with Indonesian connections who would be willing to be a part of this process. The supply chain partner who volunteered has a fully integrated and globally recognised processing facility with capacity for value adding and retail-ready packaging. The facility is capable of processing 350,000 head per year or approximately 90,000,000 carcass kilos per annum.

Following confirmation of this partnership, further terms of reference were developed and circulated via closed tender to over 40 service providers from across the globe. A total of ten applications were received and assessed.

4 Results

4.1 Objective one: Existing arrangement within Indonesia

Objective one: Review and document the existing regulatory and commercial arrangements within Indonesia that lead to supply chain traceability for import and export of red meat products.

What follows is a summary of the relevant regulations within Indonesia. This summary has been taken from the Deakin University report (Appendix 1) which provides additional details (section 5.3 of the Deakin University report).

Additionally, Appendix 2 includes a list of requirements for export to Indonesian from AUS-MEAT. Appendix 3 includes preconditions for market access for Indonesia from the Australian Government, Department of Agriculture.

4.1.1 Indonesian regulatory systems related to beef imports

4.1.1.1 Indonesian livestock policy

The Animal Health Law 18/2009 is the primary legislation governing all aspects of animal health and livestock, including production and import and export conditions. Beef self-sustainability is one of the driving forces within the Indonesian policy environment. It's a long-term goal supported over the years by subsidies and trade constraints which were aimed at reducing import reliance. The current timeframe is to achieve beef and buffalo meat self-sufficiency by 2026. More information here. The Ministry of Agriculture's Livestock and Animal Health Statistics 2018 publication states that between 2014 and 2018 the Indonesian beef cattle population increased from 14.7 million to 17 million representing an average annual growth rate of 3.7%. Relevant laws and decrees are listed below.

Beef import trends are influenced by factors such as Australia's domestic livestock prices, competition from other suppliers including Indian buffalo meat and complex regulations. Given the focus on self-sustainability, imported feeder cattle are usually perceived more favourably than imported boxed beef.

Law (*Undang-Undang* or UU) Number 41 of 2014
Article 36B states that live animals and animal products can be imported if the production and supply of domestic animals and animal products are not sufficient to meet consumer demand. Law Number 41 of 2014 also stipulates animal disease prevention (Article 41), and various aspects related to food safety including on monitoring, inspection and test of animal products and requirements for veterinary and halal certification (Articles 58 and 59), among others.

Decree of Minister of Agriculture (MoA) No. 48//Permentan/PK.210/10/2016
This Degree discusses a priority program to accelerate an increase in pregnant beef cattle and buffalo populations. This is to be achieved via increasing populations through enhancing artificial insemination as well as intensification of natural mating.

Government Regulation (PP) No 6/2013
The regulation deals with small-holder farmer empowerment. Support is provided via promotion and marketing of animals and animal products and provision of an information system of animal markets requiring modern markets to prioritise sales of domestic animal products.

Article 45 stipulates that pricing protection for animal products is completed based on quantity and types of products imported. The exporter's business type is also a factor along with domestic demand and supply.

Law (UU) No. 41 of 2014, Decree of MoA No.13/Permentan/PK.240/5/2017, President Decree Number 44 of 2016, Government Regulation (PP) Number 9 of 2016
The above laws, degrees and regulations are all focused on developing improved relationships and resources which prioritise the use of domestic materials. This includes processing capability, facilitating investment, developing livestock business partnerships to improve the scale, efficiency, capacity, market access, competitiveness of farm business.

In summary, the regulations include a focus on the development of domestic livestock industry and they also influence the importation of animals and animal products.

4.1.1.2 Policy related to traceability

There are several definitions of traceability and for this report policies have been highlighted which point to "the ability to trace" the history of a meat product. Hobbs (2016) classed the roles of livestock traceability systems into three sections:

- ex-post cost reduction;
- allocation of liability; and
- ex-ante quality verification function.

Regarding Indonesia, a regulatory framework specifically for food traceability does not exist. Traceability is, on the whole, regarded as either an integral part of or with a focus on compliance with the halal certification requirement, as legislated under the Halal Assurance Law No. 34/2014 (see section 4.1.1.4 for more information).

4.1.1.3 Beef importation and distribution

Beef import is undertaken to complement local production and fill demand gap. Beef import trends are influenced by factors such as Australia's domestic livestock prices, competition from the entry of other alternative meat products into Indonesia including Indian buffalo meat, Brazilian beef, and complex regulations. Given the focus on self-sustainability, imported feeder cattle are usually perceived more favourably than imported boxed beef.

ASEAN-Australia New Zealand Free Trade Area (AANZFTA) and Indonesia-Australia Comprehensive Economic Partnership Agreement (IA-CEPA)
The elimination of tariffs on Australian-Indonesia beef exports will reduce from 5% and be eliminated by 2023. Interestingly though import licenses are considered a major roadblock by Australian exporters into Indonesia. A key outcome of the **Indonesia-Australia Comprehensive Economic Partnership Agreement (IA-CEPA),** will be Indonesia's guarantee for the automatic issue of import permits for key products such as live cattle. The frozen beef tariff will also be reduced from 5% to 2.5% or 0%.

Minister of Trade (MoT) No 59/2016, MoT Decree No 13/2017, MoT Decree No 20/2018
These decrees relate to provisions for Animal and Animal Products Exportation and Importation. The weight limit of imported feeder cattle has been increased from a maximum average of 350kg to 450kg. Import permits can now be obtained from the Director General, previously the Minister.

MoT Decree No 59/2016 includes topics ranging from import approval requirements to labelling requirements. Importation of animal and animal products is restricted to companies that own API (*angka pengenal impor* – import identification number), state-owned enterprises (BUMN) and regionally-owned enterprises (BUMD).

Import approval requirements must be submitted electronically (http://inatrade.kemendag.go.id/), include the import identification number (API), evidence of ownership of cold storage, and a recommendation from the Minister of Agriculture and BPOM. Offal importation presents opportunities for Australian exporters. Beef offal cut restrictions have been relaxed since 2016 and demand for the product is increasing. In 2017–18 Indonesia imported roughly 27,800 tonnes and became Australia's largest destination for beef offal exports (MLA 2019).

MoA Decree No 34/2016

The degree relates to the importation of meat, carcasses, offal and/or its processed products (effective since 19 July 2016) and expands on the cuts/type of meat that can be imported. It now includes prime cuts, secondary cuts, manufacturing cuts, fancy meats and offal including liver, heart, lung, tongue and lips.

MoA Decree No 2/2017, MoA Decree No 49/2016, MoA Decree 41/2019

This decree relates to the 5% feeder to breeder import policy. In effect, importers are now required to import one breeder for every twenty feeder cattle. The average maximum weight of 450kg for feeder cattle is specified with a maximum feeder cattle age of 48 months. This needs to be supported by a letter from the country of origin. These regulations were effective from August 2019 with annual compliance audits.

Regarding the distribution of imported beef following entrance to the Indonesian market, four aspects have been identified and should be considered key.

- registration of staple food distributors;
- the price aspect;
- the requirement for cold chain facilities; and
- entry of alternative meat products.

MoT Decree No 20/2017

This decree requires distributors, sub-distributions and agents to acquire a registered licence to distribute staple foods (including beef). The application process and registered licence is free and renewed after five years.

The MoT Decree No 96/2018, MoT Decree No 58/2018, MoT 27/2017, Minister of Finance Decree No 116/2017

Food price stabilisation (which includes beef) is a long-held policy interest by the Indonesian government. These degrees relate to floor (farmer level) and ceiling (consumer level) prices for eight commodities including corn, soybeans, sugar, cooking oil, shallots, meat, chicken broiler and chicken broiler eggs. Additionally, Minister of Finance Decree No 116/2017 stipulates that 'meat' is not subject to value added tax. 'Meat' is defined as fresh meat originated from livestock and poultry without being processed, including chilled, frozen, chalked, salted, pickled, or preserved by other means.

Table 3: Ceiling prices MoT Decree No 96/2018

Commodity	Ceiling prices (IDR)
Frozen buffalo meat and beef	Rp 80,000/kg
Fresh/chilled beef	
1. Forequarter (elaborated as forequarter, blade, shank)	Rp 80,000/kg
2. Hindquarter (elaborated as rump, topside, knuckle, outside)	Rp 105,000/kg
3. Brisket	Rp 80,000/kg
4. Trimmings/CL	Rp 50,000/kg

MoA Decree No 34/2016
Article 19 of MoT Decree No 59/2016 relates to the requirement for cold chain facilities and states that animal products (listed in Appendix II of that document) can only be imported for the purposes of use and distribution by industries, hotels, restaurants, catering, wet markets that *have cold chain facilities* and/or other certain purposes. The Decree states that frozen meat, carcass and offal can be stored only for a maximum of six months (from arrival) and must be in a frozen condition at -18°C. Chilled products can be stored for a maximum of three months in a frozen condition at 4°C.

MoA Decree No 17/2016
The entry of alternative meat products, particularly buffalo meat from India, has certainly disrupted imported beef distribution. Reportedly, buffalo meat is being sold as high as Rp 80,000/kg and is in peak demand leading up to religious celebrations such as Eid-al Fitr. Clear information regarding the distribution of buffalo meat into wet markets is scarce. Buffalo meat entered Indonesia following a relaxation of regulations around importing meat from countries not free from Foot and Mouth Disease (FMD). Article 22 of the MoA Decree No 17/2016 states that the reasoning for this relaxation is to help stabilise food prices and fulfil demand.

Regulation No. 27 of 2013
The Supervision of Drugs and Food Imports into Indonesia is regulated under the Head of the National Drug and Food Control Agency (Badan Pengawas Obat dan Makanan or BPOM). This regulation is relevant to distribution of processed foods (including beef). The importer in addition to having a current distribution permit (*izin edar*) and applicable import requirements, must have an Import Certificate (SKI). Imported processed food products must also have at least 2/3 of the storage life remaining.

4.1.1.4 Halal and Food Safety

The Halal Assurance Law required goods and services traded and distributed in Indonesia to be certified as halal and introduced the concept of a halal assurance system. Certification under the halal assurance system certification could require the establishment of processes and procedures relating to traceability, but the main purpose at this stage is for compliance, i.e. to address public interest in consuming food that comply with religious dietary requirements. More than 87% of Indonesians identify as Muslim and the Indonesian government has also combined the halal concept with a wider food safety campaign, known as the ASUH program or *aman-sehat-utuh-halal* (or safe-healthy- wholesome-halal). The Animal Health Law and Food Act No 18/2012 stipulate these food safety requirements – e.g. the monitoring, inspection and testing of animal products, registration of production and distribution facilities – and potentially, these provide the foundation for any future traceability-specific regulatory framework.

While the Food Act No 18/2012 does not specifically refer to the aspect of traceability it is attempting to improve the management of information in the food system. Article 75 of the Food Act necessitates government build, arrange, and develop an integrated food and nutrition information system. Article 76 states that this system will include collection, processing, analysis, storage, presentation and dissemination of data and information about food and nutrition (Elphick-Darling et al 2019). Should the system be successfully developed and launched, it could form the basis for or be an important part of a new traceability system/s in Indonesia. Industry associations should be consulted throughout this process, such as meat processors, distributors, abattoirs and feedlots. Regulation scope could then be expanded to ensure consistent information is included at point of sale. There is also opportunity to link to the product's halal accreditation which is a key requirement for Indonesian consumers.

Law of the Republic of Indonesia Number 33 of Year 2014 on Halal Product Assurance, Government Regulation (PP) No 31/2019, Law No 41/2014, Law No 41/2015
This law provides a legal and regulatory framework for the enforcement of halal laws. Introduced in 2014, it was to be implemented within five years. Food and beverage products were to be compliant within five years. The Ministry of Religious Affairs, Indonesian Ulama Council (MUI), the Halal Product Assurance Organising Agency (BPJPH), the Halal Examination Agency (LPH) and other Indonesian Ministries with control of drugs, food, industry, agriculture and standardisation and accreditation are all involved in halal assurance.

Article 2 of Government Regulation (PP) No 31/2019 states that products and services entering, distributed and traded in Indonesia must have a halal certificate. Services includes those relating to slaughtering of animals, processing, storage, packaging, distribution, sales and service. Article 58 of Law No 41/2014 states that animal products produced in or brought into Indonesia must also have a halal certificate and a veterinary certificate. Halal assurance is implemented by the Minister of Religious Affairs. The below table summarises the relationships and cooperation between entities involved in halal accreditation. Additionally, PP No 31/2019 also regulates the registration process of halal certificates from overseas. Article 64 states that products certified by overseas halal certification bodies have a recognition partnership meaning they are not then required to apply for a halal certificate in Indonesia. Naturally, the foreign halal certificate must be registered with the BPJPH before the products can be distributed.

Article 59 of Law No 41/2015 stipulates that individuals bringing in animal products to the territory of Indonesia must obtain permit from Ministry of Trade after receiving recommendations from the Minister of Agriculture for fresh animal products or the Head of BPOM for processed animal products.

Table 4: Description of cooperation between BPJPH and other institutions according to PP No 31/2019 Source: Elphick-Darling et al. (2019)

Halal Product Assurance Organising Agency (BPJPH)			
Relevant ministries •Industry, trade, health, agriculture, cooperatives and small and medium enterprises, foreign affairs, and other e.g. food and drug control agency, accreditation, etc. (Article 5-19) •E.g. the development of halal industry zone (Industry); •Monitoring of halal products traded (Trade); •Determining standards for slaughterhouses and slaughtering guidelines (Agriculture), •Support for cooperatives and SMEs (Cooperatives and SMEs); •Facilitate international cooperation, promotion of halal products in overseas, and provision of information on foreign halal certification institutions (Foreign Affairs)	LPH Verification and testing of a product's halal status, as determined by BPJH	MUI Certification of halal auditors, including education, training and competency test for auditors (Article 22) •Determination of a product's halal status. LPH to provide halal test results, and BPJPH to verify the results and present to MUI halal fatwa assembly, whose decision will be conveyed to BPJPH and serve as a basis to issue a halal certificate (Article 23) •Accreditation of LPH through sharia compliance assessment by MUI, facilitated by BPJPH (Article 24)	International cooperation Development of halal assurance (through technological development, human resources, and facilities and infrastructure of halal assurance, Article 26); compliance assessment and/or recognition of halal certificate (Article 25) •This international cooperation is implemented by BPJPH in coordination and consultation with MoRA and Ministry of Foreign Affairs, and in line with foreign politics, national laws and regulations, and international norms.

In addition to the above, there are numerous other regulations relating to red meat in Indonesia and halal. These include:

- Ministry of Agriculture Number 58/Permentan/PK210/11/2015 on Importation of Carcass, Meat, and/or its Derivatives into the Territory Of The Republic Of Indonesia
- Ministry of Agriculture Number 17/Permentan/PK.450/5/2016 on Importation of Boneless Meat in Certain Circumstances From A Country or a Zone Within a Country
- Ministry of Agriculture Number 34/Permentan/PK 210/7/2016 on Importation of Carcass, Meat, Offal and/or Their Processed Products into the Territory Of The Republic Of Indonesia
- Ministry of Trade of The Republic Of Indonesia Number 59/M-Dag/Per/8/2016 on Provisions of Animal and Animal Products Exportation and Importation
- Ministry of Religious Affairs of The Republic Of Indonesia Number 42, Year 2016 on the Organisation and Functioning of the Ministry of Religion

Law (UU) Number 41 of 2014

The Indonesian government has also combined the halal concept with a wider food safety campaign, known as the ASUH program or *aman-sehat-utuh-halal* (or safe-healthy- wholesome-halal). ASUH is supported by a number of initiatives and the key messages are to introduce conditions when the ASUH target is met:

- A (*aman* or safe) - the products do not contain biological, chemical and physical ingredients and other substances that can adversely impact human's health;
- S (*sehat* or healthy) - the products contain good nutrition for human's health;
- U (*utuh* or wholesome) - the products are not mixed or contaminated with other substances;
- H (halal)-- the products are slaughtered according to the Islamic laws.

ASUH also provides practical recommendations such as:

- The meat products must come from animals slaughtered at slaughterhouses with NKV (or nomor control veteriner or veterinary control number);
- Meat products that couldn't be sold on the day must be stored in 4°C;
- Frozen meat must be stored and sold in a frozen condition at -18°C;
- Halal meat must be separated from non-halal products (e.g. pork); and
- Local meat must not be mixed with imported meat.

Article 58 of the Law No 41/2014 stipulates that monitoring, inspection and testing of animal products are to be conducted sequentially at the production facility, slaughterhouse, storage and collection points. The products must be fresh (not preserved). It is clear from field observations that many meat sellers at wet markets do not have cold chain equipment such as freezer and fridges to sell imported frozen beef accordingly. Additionally, while NKV-registered slaughterhouses must be used, there is no traceability system in place to track the distribution products to consumers for either local or imported meat.

MoA Decree No 44/2014, MoA Decree No 94/2011, MoA Decree No 34/2016, Law No 16/1992, MoA Decree No 17/2016

Animal disease prevention factors in consideration of food safety measures for the Indonesian government. The MoA Decree No 44/2014 concerns quarantine for animals and plants. Article 41 of the Law (UU) Number 41 of 2014 also addresses animal disease prevention.

Article 9 of MoA Decree No 34/2016 states that large ruminant meat must only come from countries that are free from FMD, Rift Valley Fever (RVF), Sheep and Goat Pox, Peste des Petits Ruminants (PPR), and Scrapie. Law No 16/1992 relates to animal, fish and plant quarantine.

MoA Decree No 17/2016 regulates importation of boneless meat under certain conditions from a country or zone and includes some exceptions to Article 9 of MoA Decree No 34/2016 (above) specifically regarding cattle and buffalo. The exceptions relate to the implemented an official FMD control program (as set by the World Organisation for Animal Health (WOAH/OIE)). The importation would then be carried out by BUMN as assigned by the Minister of BUMN.

Exemptions are also in place where there is a need to maintain food security, availability and price stabilisation. This is based on a decision by the Minister of BUMN upon reviewing the economic situation.

Act (*Undang-Undang*) No 7/1996 on Food, Food Act No 18/2012. Government Regulation No 17/2015

The Food Act states that "the facilities and or infrastructure which is used directly or indirectly in the food production activities or process, storage, transportation, and or distribution must fulfil the sanitation requirements". Article 6 states that "any person responsible in the executive of food production activities or process, storage, transportation and or circulation shall:

- meet the requirements on sanitation, security and or safety of humans;
- execute a periodic sanitation monitoring program; and
- execute the supervision on the fulfilment of the sanitation requirements".

4.1.1.5 Labelling

Food Act No 7/1996, Food Act No 18/2012, MoT Decree No 59/2016, MoA Decree No 34/2016

Article 30 of the 1996 Food Act states that "any person producing or importing into the territory of Indonesia food which is packed for sale is obligated to place a label on, within, and/or at the packing of the food". The label will at a minimum include information concerning: product name, list of materials used, net weight or net contents; name and address of the party which produces or imports the food into the territory of Indonesia; information on halal; and the expiry date, month and year. In addition, Article 96 of the Food Act No 18/2012 requires inclusion of date and production codes, distribution permit number for processed foods and origin of specific ingredients.

For animal products the label must be written and printed in Indonesian language in a clear and easy-to-understand way and contain at a minimum: net weight, name and address of the manufacturer, halal status, production date, expiry date, distribution permit for processed food, and origin of specific ingredients. The packaging requirements include use of approved materials for packaging and a recycle logo.

Article 18 of the MoA Decree No 34/2016 relates to the importation of carcass, beef, offal and/or its processed products. It states that the label must use Indonesian language and English and include:

- country of destination – Indonesia;
- veterinary control number (NKV);
- slaughter date, cutting date and/or production date;
- quantity, types and specification of carcass, meat, offal and/or its processed products; and
- a halal sign.

4.2 Objective two: Options for strengthening industry self-regulation

Objective two: Identify options for strengthening industry self-regulation to improve supply chain traceability.

4.2.1 Retail motivation

Improvements in traceability systems and therefore quicker location of the source of a contamination has a three-fold effect: reduced product loss, mitigating a further loss of consumer trust and in some cases saving lives. This is the motivator for a number of large international retailers who have implemented traceability programs. Several examples are listed below, and these approaches could potentially be adopted by the larger Indonesian retail chains.

Within Indonesia, the retail environment is fragmented, with modern retail accounting for only about 12.5% of the channel in 2019, but is expanding at 9% per year (compound annual growth rate 2019-2024) (IGD, 2019). While only currently representing a small segment of the market, the channel attracts higher income, more discerning consumers that look for premium attributes such as quality (natural, shelf life) and safety (halal, welfare) as mentioned earlier in the report. As such, drivers exist for modern retailers to test and invest in traceability systems, compared to traditional channels where price is almost always the only consideration. Products moving through these channels are likely to be higher quality and more value-added, thus more susceptible to fraud (more profitable to substitute). High end food service outlets also receive these types of products, so their supply chains are another possible target.

In the traditional retail or wet market environment, there is no self-regulation around traceability and consumers usually buy meat from stall vendors based on visual cues and touch. Consumers interact with meat vendors and rely on the meat sellers to provide them with the information relating to product origin, freshness, halal and other attributes. Based on MLA-conducted survey in 2017, wet market traders stated that their customers do look for safety and quality attributes beyond price. However, limited information exists on whether meat sellers would be interested in instituting any self-regulatory measures. Given the fragmented nature of wet markets, any research on self-regulation would best be initiated in the modern retail such as supermarkets and hypermarkets.

A number of the modern retail chains in Indonesia is certified for standards such as HACCP and ISO (9001, 22000) but no traceability systems right through to consumers have been implemented to date (see Deakin report). Willingness and capacity of modern retail, including online platforms, to take up a traceability program can be tested through the end-to-end commercial supply chain pilot in phase 2.

4.2.1.1 Retail systems

Walmart

In 2016 Walmart started with two proof of concept trials using Blockchain technology with the technology provider IBM (Hyperledger 2019). Walmart now uses a technology solution called Hyperledger Fabric. The program is open source to allow ready access for the many technologies and systems already in place along the many Walmart supply chains.

As a part of the 2016 trials, one trial traced the origin of mangos sold in Walmart's US stores and the second was targeted at tracing pork sold in Walmart's China stores. Using Walmart's existing traceability systems, it took nearly a week to locate the origin farm of a packet of sliced mango.

Walmart reviewed their own processes and those of their suppliers before designing an application with IBM taking into account the enterprise systems and GS1. Suppliers then used new labels and upload data through the application. The pilot program worked and for mangoes the provenance trace time reduced from a week to 2.2 seconds (Hyperledger 2019). For pork sold into China, the system allowed for uploading authenticity certificates which is helping to build trust in the product.

Marks & Spencer
In 2018 Marks & Spencer ran a "We trace it, so you can trust it" beef campaign promoting its new traceability system backed by DNA sampling through a company called Identigen (Marks & Spencer 2018). All beef is British and regular testing is carried out to ensure Marks & Spencers' standards are met. It's claimed that through the system the retailer can trace every slice of beef back to its origin farm and animal.

"Provenance is such a powerful story for M&S. We're excited to be launching this fresh campaign, it's a bold message delivered in an integrated way that will leave customers in no doubt over where M&S beef comes from" said Luke Williamson, Executive Creative Director at M&S ad agency Grey London (Marks & Spencer 2018).

DNA samples are taken from every animal destined to supply Marks & Spencer and these are cross matched with random samples from stores and distribution warehouses.

Carrefour
In early 2019 Carrefour implemented a blockchain traceability system for its Quality Line of chicken as well as tomatoes. The retailers plans were to roll this system out gradually to eggs, milk, oranges and salmon initially followed by the rest of the Quality Line products, of which there are hundreds (Morris 2019).

Carrefour is using the system both for traceability but to also highlight individual suppliers. The buyer has complete visibility and can see where the product was produced, processed and distributed. For chicken, the farmer's name is visible, and there is information on how the chickens were reared (feed, treatments). All the consumer has to do is scan the product's QR code with their smartphone.

In terms of technology solutions, Carrefour has used both Ethereum and Hyperledger Fabric (as has Walmart).

4.2.1.2 Consumer willingness to pay

Before implementing an expensive traceability program tackling food fraud, supply chain participants need to have thorough understanding of consumer demand for this as well as willingness to pay. Several case studies on willingness to pay have been completed, though most focus on more developed countries. Cicia and Colantuoni (2010) summarise the case studies undertaken in parts of Europe, the US, Canada, and the UK. The most requested attributes from consumers in these countries are "food_safety," "multi_attribute_traceability," "on_farm_traceability" and "animal welfare" (Cicia and Colantuoni 2010).

Ward et al. (2008) reviewed labelling and quality characteristics of ground beef and steak in the US and found that quality grade signals didn't have a significant influence on ground beef prices, but they did for steak. Conversely, steaks labelled as having "no hormones added" were priced lower than steaks with no special labels. The opposite is true in France, Germany and the UK where consumers are willing to pay significant premiums for steaks produced without growth hormones. This is a prime example of the huge differences in market preferences and their willingness to pay for certain attributes.

Mennecke et al. (2007) found that the most important characteristic for U.S. consumers is the region of origin, breed, on-farm traceability and type of feed.

China is a focus for studies targeting emerging economies (Ortega et al. 2016; Zhang et al. 2012) and their demand for traceability systems.

Ortega et al. (2016) explored emerging markets for imported beef in China and assessed Beijing consumer demand for quality attributes. The food quality attributes considered in the study included food safety, animal welfare, Green Food and Organic certification while taking into account country-of-origin. The high-level findings from the study were:

- There is strong demand for food safety assurance in beef products.
- Consumers are willing to pay more for Australian beef products than for US or domestic beef.
- Consumers prefer Green Food to Organic certification.
- Consumers are currently not willing to pay a high premium for animal welfare information.

Green Food is a Chinese eco-certification scheme for food (Paull 2008). Products eligible to be labelled as Green Food are produced with reduced use of pesticides and submit to a testing regime for pesticide residues. Green Food differs from organic certification as it includes certification of both production and the outcome. Organic certification is a certification of production process alone (Paull 2008).

There are presently no published case studies reviewing the consumer willingness to pay for beef traceability in Indonesia. However, MLA's market research identifies attributes which will help a product attract a premium price (MLA Global Consumer Tracker Indonesia, Malaysia, Thailand 2018, Singapore 2017). A well-integrated traceability system (information transfer) supported by verification, such as DNA sampling will assist in reducing product fraud and substitution. If, for example, buffalo meat was being repacked into Australian beef packaging and sold with under this claim, there is a direct and clear impact on the level of product consistency. A traceability system can/should be supported by a communication program which can then feature claims of relevance to that market, such as '*the animal is well cared for*'.

4.2.2 Technology interventions

McLeod (2017) concludes there are a variety of range of technologies and tools which could be used to combat food fraud. These include biological identification, DNA markers, track and trace and anti-counterfeiting packaging and labelling.

This is a fast-evolving space. A catalogue of potential technology service providers has been compiled (Appendix 4). MLA has engaged with a number of technology providers. Our experience is that technology providers have limited understanding of the complexity of red meat supply chains, over promise the technology's capability, and a tendency to try to overcomplicate existing processes. Australian red meat supply chains present several challenges including the geographical spread of production, in some areas limited uptake of electronic services such as eNVDs (electronic National Vendor Declarations for cattle) which could more easily feed into a blockchain system and the use of contract processing plants. For those exporters essentially buying 'kill space' at a contract processing plant, complexity is added both for them and the processor. The processor may be requested to participate in a variety of different information systems by different clients. Packing and labelling may be more time consuming beyond the usual international standards. This all adds time to the process and therefore costs the processor. The exporter is reliant on the processor's cooperation to contribute to, for example, a blockchain system and to potentially undertake additional labelling such as application of QR codes.

Biological identification, DNA markers, track and trace and anti-counterfeiting packaging and labelling were reviewed by Rural Industries Research and Development Corporation (RIRDC) in 2016 (Table 5).

Table 5: Technology Validation capability by objective Source: RIRDC (2016)

Validation Objective	Biological identification techniques			Track and trace			Anticounterfeiting packaging and labelling		
	Trace mineral markers	Spectroscopic analysis	DNA testing	GS1 Universal Product Code Applications	GS1 Unique Product Code Applications	RFID	Low Tech labelling	Tamper proof packaging and labelling	Embedded labelling
Prevent re-use of packaging									
Prevent counterfeiting of labels/packaging									
Prevent substitution/dilution									
Prevent contamination									
Prevent spoilage									
Respond to product recalls and supply chain integrity issues									
Ensuring authenticity of origin									
Ensuring contents and ingredients									
Ensuring production practices									
Ensuring supply chain practices									
Enabling supply chain and consumer feedback									
Enabling supply chain and consumer marketing									

Biological identification techniques

Biological identification techniques revolve around the analysis of a raw product to authenticate certain attributes such as origin (RIRDC 2016). The key benefit of this technology is the inability to copy it because of the uniqueness of the biological material (trace minerals or DNA).

Trace mineral markers have been used to validate Argyle diamonds produced from the Kimberly region of Western Australia. Since that initial use, the technology has expanded greatly, and multiple commercial examples of its use exist in the food sector including fisheries, Australian pork and wine. Validation requires sampling at the point of production as well as later in the supply chain so these

can be cross referenced. This technology is more suitable for some products than others and it is one possible solution which the consumers themselves cannot validate. The consumer must rely on the testing process in place along the supply chain (RIRDC 2016). The technology can be costly because of the intensive sampling and testing and the time required.

McLeod (2017) notes that there are other identification approaches under development. These include application of near infrared spectrometry and chemometrics for authenticity and spectroscopic analysis.

It's likely that trace mineral markers, spectroscopic analysis and DNA testing are the most beneficial for confirming authenticity of origin, ensuring contents and ingredients, and preventing substitution and contamination (RIRDC 2016). There are many examples of DNA applications in the red meat industry including EasiTrace™, DNA TraceBack and SureTRAK. These technologies would be more attractive for higher value goods.

Track and trace

A product's progress along the supply chain can be followed via product serialisation and track and trace technologies. Track and trace is typically used for three reasons: associating products or materials with unique identifiers (UIDs), capturing information at various points along the supply chain and performing analytics and reporting on the captured information (RIRDC 2016).

While GS1 barcoding is the standard typically used, there are various other platforms in use which use universal EAN/UPC barcodes to record product information. McLeod (2017) noted that YPB systems (Brand Reporter) used GS1 EAN/UPC barcode scanning and linked it with smartphones to find products.

Barcodes must be able to discern between individual products and batches otherwise they can be copied. GS1 barcodes used by the Australian red meat industry have unique codes for each carton. RIRDC (2016) noted the increase in adoption of RFID chips embedded in product as the cost of these devices is decreasing.

GS1 is working with Deakin University to develop a framework of data standards and protocols to enable end-to-end food product traceability (Elphick-Darling et al 2019). This is based on open technology and solution-agnostic approaches which will enable enterprise systems to be interoperable. This initiative is industry-led through Deakin's Food Traceability Lab with MLA support.

Anticounterfeiting packaging and labelling

There are obvious benefits to packaging and labelling innovations which help prevent substitution and reuse. RIRDC (2016) indicates that labels can be embedded using laser technology (holograms), nanotechnology, microfluidics and 'lab-on-a chip' to reduce fabrication. Some Australian wine brands are using anticounterfeiting packaging and labelling technologies.

Present packaging systems include

- Overwrap
- *High O_2 Modified Atmosphere Pack (80%O_2: 20% CO_2)*
- Vacuum Pack
- *Vacuum skin pack – DARFRESH*
- *MAP/VSP combination – DARFRESH bloom*

Figure 10: Examples of present packaging systems (overwrap, Vacuum Pack, MAP, Vacuum skin pack, MAP/Vacuum Skin Pack combination, Vacuum Pack). Source: University of Melbourne (2019).

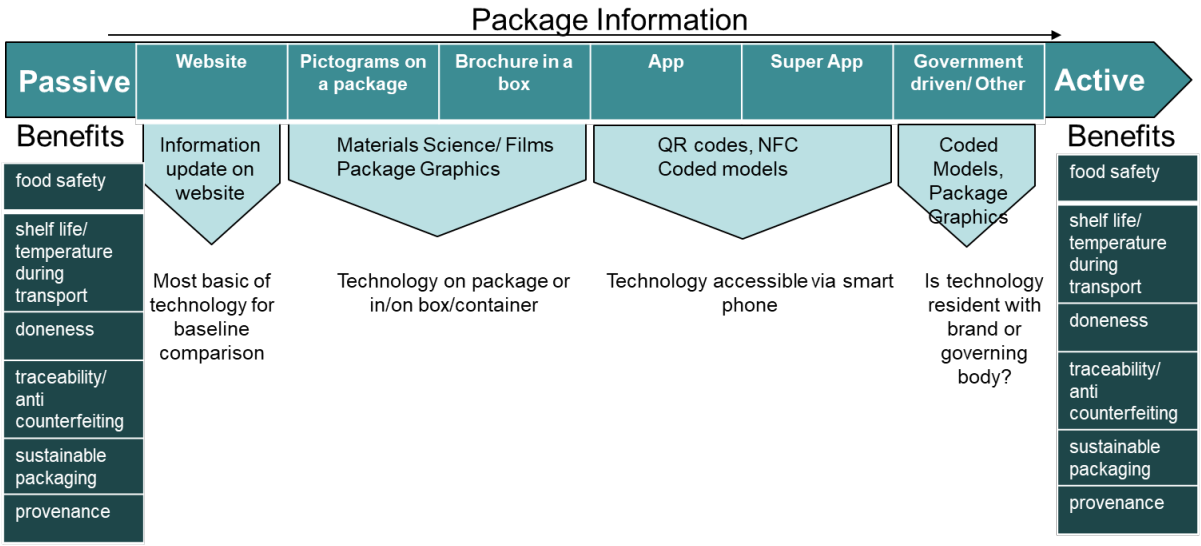
More than 80 packaging / anticounterfeiting/ packaging technologies were reviewed (MLA 2019). These included: Time temperature Indicators, Temperature Sensitive Labels, Time-Temperature Data Loggers, Pressure Sensitive Labels, Bioactive Sensors, DNA Tracing of Beef, Confinement odours, Ethanol Sensing with RFID, Freshness Indicators, Electronic Nose, Antimicrobial, Antioxidant, Vacuum Packaging, Self-Cooling Food Packaging, Oxygen Indicators Moisture Absorbers, Extended shelf-life, Antimicrobial, Antioxidants, Oxygen Scavengers, Moisture Absorbers, CO2 releasers, Anticounterfeiting Options (30+), Blockchain, MSA Grading, and Green Food Logo (China). A short summary of each of these can be found at Appendices 5 and 6 focusing on the technology, the benefit and applications (University of Melbourne 2019).

Information push vs pull to consumers

A combination of passive and active information channels needs to be considered (Figure 11) when private and public sectors are trying to get their messages to their target audience (University of Melbourne 2019).

- **A website** that consumer search for is one of the most basic forms of information technology. Parties with limited interest in smart packaging may find this to be a less onerous option to consider when trying to manage food fraud risk.
- **Pictograms on a package** is a simple way to provide information to the end consumer and must be balanced with the risk that many consumers may be overwhelmed with too much information on the package. Design of the graphics is key to ensure the information is intuitive and not overwhelming to consumers.
- **Brochure in a box** is an option for on-line retail where the product is shipped in a secondary outer container allowing for inserts to be included or prints included on the secondary packaging. Again, design of these packaging graphics is critical.
- **Apps** allow for far more complex information to be accessible to the consumer. QR codes or Near Field Communication devices (NFC) are extremely common and can direct consumers to a website and provide other company or product information (i.e. authentication, animal welfare claims).
- **Government Driven/ Other** includes the value of government certifications and how the above technologies may integrate or assist with product claims made (i.e. organic).

Figure 11: Packaging Information and Benefits



End to end solution

A fully comprehensive end to end traceability system will most likely need to include a combination of technologies and communication tools, particularly if, in addition to traceability, some protection against fraud is desired. In order to provide the maximum assurance, attention to both packaging (and its associated information) and product (and its associated qualities) is required. As the market for these technologies matures, more and more solutions are looking to integrate tools such as biological fingerprinting, cloud computing and smartphone capability.

4.2.3 System design

Food fraud is a global concern that drives the development of systems that can also be used for product traceability and providing assurance and information for consumers. A number of approaches are being taken to food fraud including the development of analytical methods that are often very sophisticated, but those relating to information sharing and vulnerability assessment are probably of greatest value in contributing to the development of traceability systems.

There is much opportunity to learn from each other and share knowledge. Collaborations on this issue, for example, Global Food Safety Partnership (GFSP) and Global Food Safety Initiative (GFSI), encourage information sharing, capacity building and development in both government and business. Information channels need to be well integrated to ensure relevant information is clearly and quickly shared. Several commercially available databases collect and collate food safety and food fraud incidents so that supply chains can be rapidly informed, for example, Descernis (includes the United States Pharmacopoeia (USP) database), Riskplaza and HorizonScan.

Vulnerability assessment, sometimes through a process analogous to food safety analysis (Hazard or Vulnerability assessment and critical control points; HACCP/VACCP), focuses on food fraud including systematic prevention of any potential adulteration of food, whether intentional or not, by identifying the vulnerable points in a supply chain. It is especially concerned with product substitutions, unapproved product enhancements, counterfeiting, stolen goods and others. GFSI-benchmarked certification programs (such as British Retail Consortium and FSSC 22000 programs) have a requirement for VACCP implementation.

Businesses in food supply chains can benefit from taking a systematic approach to protecting their product and providing assurances to consumers, responding to retail drivers, and utilising available technologies to overcome known potential problems in their supply chain.

4.3 Objective three: Drivers for food authenticity

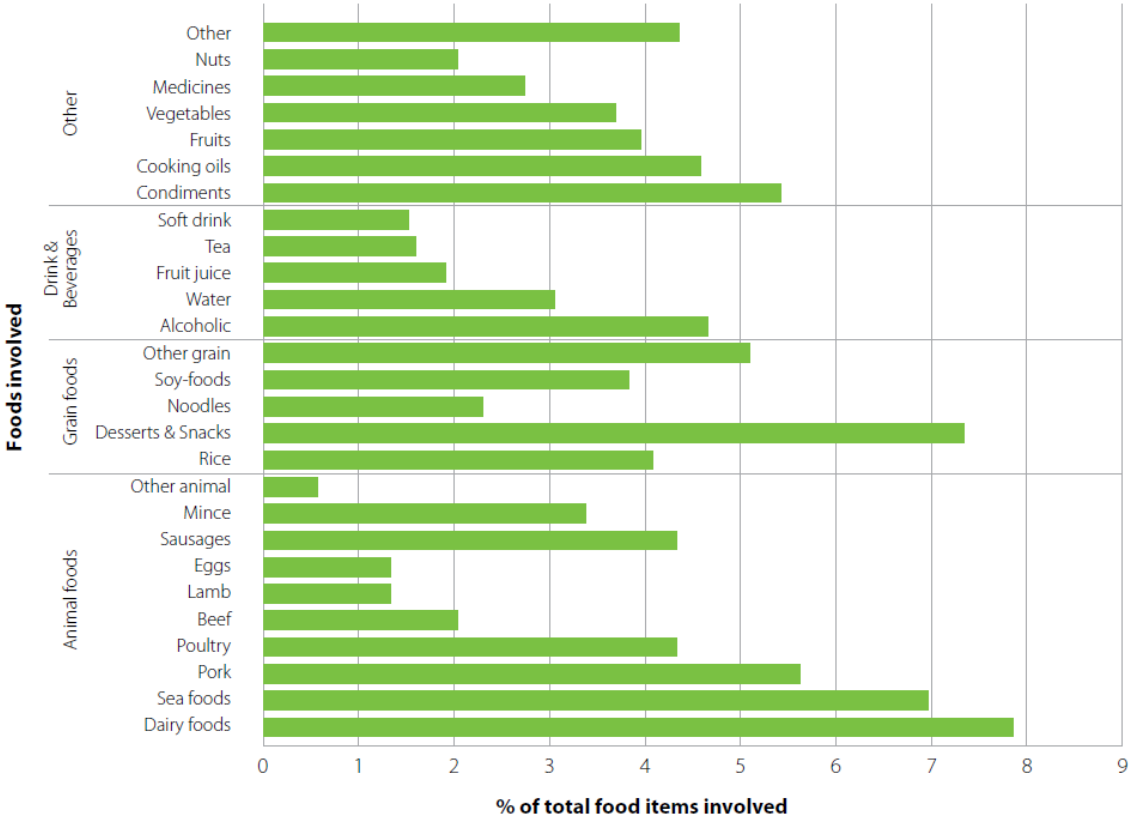
Objective three: Identify the drivers for food authenticity issues and how the policy and regulatory context in Indonesia affects Australian red meat supply chains.

4.3.1 What's driving food fear

Food fraud isn't new and over time scandals have emerged within the global food industry causing both (real and perceived) public health hazards as well as economic losses. This trend continues and is evolving to become a multimillion-dollar threat to the food industry. Because of the potential impact to public health and possible erosion of access to sufficient, safe and nutritious foods, governments, academia and industry representatives from around the world now see food fraud as an increasingly important priority.

A high-profile example of food fraud was in China in 2008 where approximately 54,000 children became ill from melamine adulteration of milk powder. Companies impacted lost up to US$10 billion. It is estimated that up to 50% of Australian wine is substituted in some markets with more expensive brands/bottles targeted (McLeod 2017). Figure 12 shows the economic impact for foods involved in fraud incidents.

Figure 12: Food Fraud Incidents in China from 2004 to 2014. Source: Zhang and Xue (2016)



4.3.2 Drivers for practice change

Productivity gains, risk mitigation and competitive advantage/s are just some of the possible benefits to be realised by taking effective steps to manage food fraud. Given the push from both retailers and consumers for more transparency in this space, it is almost inevitable that supply chains will need to adjust their practices. McLeod (2017) outlines the drivers and benefits of mitigating food fraud, see below table.

Table 6: Drivers and benefits of food fraud mitigation

Driver	Benefit
Management of Risks	Protect brand name – Minimise reputation and revenue losses arising from counterfeiting and fraudulent use of brand name. Biosecurity – Quick and accurate tests lead to avoidance or limitation of sales ban and mandatory destruction of assets. Market Access – Unhampered access to markets where traceability is mandatory (USA, Europe, Japan). Product recall and withdrawal – Reduce costs, increase precision and efficiency while demonstrating control. Addresses consumer confidence, perception and negative publicity. Liability – Increased ability to prove that you are not the source of a biosecurity or public health problem. Public health & safety – Minimise costs to the economy (e.g. health costs and lost productivity) arising from public health and safety incidents.
Competitive Advantage	Build product differentiation through verification of credence attributes. Enhance brand protection through product authentication. Deliver superior customer service through product information portals. Increase sales of high value or premium products to niche markets through provenance certification. Regionalisation.
Productivity gains through supply chain management	Improve inventory management through product quality monitoring – Sourcing raw materials that optimise the performance of the manufacturing process or finished product. Enhance customer / supplier relationships through information sharing. Consistency for global logistics.

For those companies involved in the exportation of Australian beef to Indonesia, a traceability system can be seen as 'insurance'. Not only does it help ensure a safe product can be delivered, but breakdowns in the chain can be more easily identified and economic liability assigned.

4.3.3 Policy and regulation impact on Australian red meat supply chains

It is clear through the policy summary provided for Objective One, that Indonesia is placing increasing weight and importance on the issue of food fraud and even more so, food security. For example, the Indonesian Cold Chain Association (ARPI), has initiated *National Dialogue on Cold Chain Infrastructure and Strategy* to help drive adoption of technology and improvement of practices. An Indonesian Animal Logistics Forum (FLPI) was formed in 2015 to help improve livestock management in logistics.

Another strong policy theme is Indonesia's drive toward beef self-sustainability. These policies encompass various subsidies, tax concessions, and trade constraints aimed at reducing reliance on imports. The current timeframe is to achieve beef and buffalo meat self-sufficiency by 2026. More

information here. The Livestock and Animal Health Statistics (2018) book commissioned by the Ministry of Agriculture states that between 2014 and 2018 the Indonesian beef cattle population increased from 14.7 million to 17 million representing an average annual growth rate of 3.7%.

4.3.3.1 Standards and regulations

As summarised in section 3, extensive regulations already exist for the import, distribution and export of meat and products. These government regulations have enabled officials to have oversight and control of the health, halal and safety status of livestock and products upon entry, and trade flows into and out of the country, but there is no specific regulatory framework yet on traceability. Elphick-Darling et al (2019) noted the absence of government-imposed regulations requiring the recording trace and track information in Indonesia. Furthermore, no private standards were identified either such as animal welfare, or organic for beef in Indonesia. There is however opportunity to expand current regulations.

Food Act

While the **Food Act No 18/2012** does not specifically refer to the aspect of traceability it is attempting to improve the management of information in the food system. Furthermore, **Article 75 of the Food Act** necessitates government build, arrange, and develop an integrated food and nutrition information system. **Article 76** states that this system will include collection, processing, analysis, storage, presentation and dissemination of data and information about food and nutrition. As a minimum it must include the types of food products, food balance, location, area and food production zones, market demand, market opportunities and challenges, production, price, consumption, nutrition status, supply estimates, production estimates, climate forecasts, food technologies, regional food demand, and forecast on fish catches (Elphick-Darling et al 2019).

Elphick-Darling et al (2019) concluded that should the above food and nutrition system be successfully developed and launched, it could form the basis for or be an important part of a new traceability system/s in Indonesia. Industry associations should be consulted throughout this process, such as meat processors, distributors, abattoirs and feedlots.

Regulation scope could then be expanded to ensure consistent information is included at point of sale. This must include expiry dates for products as this is an ongoing frustration for end users. There is also opportunity to link to the product's halal accreditation which is a key requirement for Indonesian consumers.

Any introduction of new regulations in this space must be accompanied by clear communication to both consumers and retailers to make sure they know their own rights and obligations.

Access

Regarding market access, there are several opportunities including:

- Tariff reductions - under the ASEAN-Australia New Zealand Free Trade Area (AANZFTA) the base tariff of up to 5% will be eliminated for most lines by 1 January 2020.
- The Indonesia-Australia Comprehensive Economic Partnership Agreement (IA-CEPA) guarantees automatic issue of import permits for key products.
- MoT Decree No 13/2017 means an increase to the weight limit of imported feeder cattle providing exporters with more flexibility with shipments.
- MoA Decree No 34/2016 has broadened the type of carcass and meat that can be imported to include prime cuts, secondary cuts, manufacturing cuts, fancy meats and offal including liver, heart, lung, tongue and lips.

The regulations highlight that beef importation is contingent on both domestic supply and demand for animal products indicating the continued linkages between domestic industry performance, and government's attitude towards beef importation.

4.3.3.2 Traceability and labelling

Meaningful and useful traceability is dependent on all transformations in the chain being recorded. Indonesia does not yet have any regulations which would require the recording of such transformations. There are also no identified commercial/private standards (i.e. organic) relating to beef in Indonesia. It would appear that 'traceability' within the Indonesian context is interpreted as matters related to halal assurance and that food safety concerns are addressed by assessments on the physical appearance of the beef products. As discussed earlier this does not mean there is not demand from some consumer segments for traceability.

The halal assurance program discussed in the policy section of this report does involve the establishment of processes and systems which would contain useful traceable information. However, it is not really set up with traceability in mind. This means the ability to integrate other systems may be more difficult. A regulatory framework specific to food traceability unfortunately does not exist.

The lack of cold chain facilities is a key concern for beef imports. **Article 19 of MoT Decree No 59/2016 states** that animal products can only be imported for the purposes of use and distribution by industries, hotels, restaurants, catering, wet markets that have cold chain facilities and/or other certain purposes. Wet markets are a traditional meat outlet for Indonesian consumers. In these wet markets most meat is sold as fresh slaughtered hot carcasses. The meat is prepared on the premises and sold directly to consumers or chefs. Because of how this system works, there is no traceability beyond the butcher's own record of purchase. Many wet markets have no cold chain facilities and thus cannot comply with the regulations. Infrastructure upgrades to wet markets have commenced and the flow on market impacts are unclear as yet. These improvements should expand the regulation compliant outlets imported beef could be distributed through.

Unfortunately, cartons of frozen Australia beef are not labelled with any expiry date which makes determining shelf life difficult. Retailers have to manually add an expiry date themselves and once removed from storage all products are given three day's shelf life. This is a food safety concern for retailers who have no insight into how the cold chain has operated and if there were any breaches. To help improve this situation, retailers have set specifications and standards for suppliers consistent with ISO 22000-22005. It is very difficult for any domestic suppliers to comply readily with these standards.

Presently there is no requirement for labels to list all product ingredients, only the 'main ingredients' (highest quantity) for processed foods. Consumers therefore do not have access to all the ingredient information which includes details of any other meats added (i.e. a mix of Australian beef and other types of meat).

Another complication to effective traceability is that any new labels added by the in-market distributor and or buyer systems to identify the product are not corelated with the original identifier – the carton barcode. Effectively the in-market systems treat the product as a new product for distribution purposes and "oversticker" the original identifier. Often these new barcodes are not consistent/compliant with global data standards; they are generated from an enterprise system. This means the product can only be followed back to the original barcode through the Warehouse Management System or retailer system of the buyer. Original information now becomes inaccessible to future customers.

There are many opportunities for change for both government and supply chain participants which will improve visibility along the chain.

4.3.3.3 Competition and price

Buffalo meat is particularly popular in the lead up to religious celebrations such as Eid-al Fitr. Importation from India began in 2016 as regulations relating to Foot and Mouth Free (FMD) status of the exporting country were relaxed. Article 22 of the MoA Decree No 17/2016 denotes that the reasoning for this is to food prices and to ensure supply.

Floor and ceiling prices were discussed earlier in this report (section 4.1.1.3). Price protection is actively practiced and supported by Indonesian policy. The price for imported beef is decided based on the product quantity and type, as well as the type of business exporting from the originating country. Domestic demand and supply of animal products is also obviously a consideration.

4.3.3.4 Cooperation and resources

Enforcement of food fraud regulations will require a multi-pronged approach across authorities, law enforcement departments and the general public (Elphick-Darling et al 2019). A driver for food fraud is economically motivated criminality making it hard to spot and predict and there is a heavy additional demand for existing services and resources.

To combat this issue, governments of the United Kingdom and the Netherlands have created technical food crime investigation departments, where the police help trace and investigate breaches (Elphick-Darling et al 2019). Their resources, scope and skills are well beyond that of a conventional food regulatory department.

Again, provision of resources and authority to combat food fraud is an opportunity for government and a way to link in with the various other international bodies in this space.

4.4 Objective four: Additional work in Indonesia

Objective four: Identify and plan additional work that can be undertaken to improve consumer confidence and awareness of Australian red meat in Indonesia.

The Deakin University report (Appendix 1) and the MLA global tracker surveys (referenced throughout section one of this report), have summarised the key drivers that Indonesian consumers considered when purchasing Australian red meat: consistent quality, halal and food safety and price. MLA, as the service provider to the Australian red meat sector, is already working with trade, retail and foodservice partners in Indonesia to promote the integrity and quality attributes of Australian red meat. This includes trade workshops and product knowledge sessions as well as consumer-facing True Aussie international marketing campaigns in reputable retail chains and foodservice establishments, as well as through media platforms. There is scope to broaden the awareness work to include partners with other like-minded organisations to raise awareness about food fraud and what Australia is doing in this space. The possible pilot study (outlined further in section 4.5) would potentially provide the platform for these conversations to take place.

Given the impact of food fraud globally, there is much opportunity to learn from each other and share knowledge. The Global Food Safety Partnership (GFSP) and Global Food Safety Initiative (GFSI), as discussed earlier both encourage information sharing, capacity building and development in government and business.

GFSI is a private organization, established and managed by the international trade association, the Consumer Goods Forum under Belgian law in 2000. GFSI maintains a system which benchmarks food safety standards for manufacturers as well as farm assurance standards. GFSI has three strategic objectives:

- Benchmarking and harmonisation – fostering mutual acceptance of GFSI-recognised certification programmes across the industry while enabling a simplified "once certified, recognised everywhere".
- Capacity building – development of information and tools to guide companies towards GFSI-recognised certification.
- Public-private collaboration - GFSI is leading discussions with regulators and governments to share the achievements of the private sector. GFSI has also initiated several large-scale collaboration projects focusing on food safety.

GFSP is a public-private initiative dedicated to supporting and promoting global cooperation for food safety capacity building. GFSP can review food safety systems and suggest interventions to address food sector concerns and prioritize hazards and threats. GFSP's collaborators include the Food Safety and Standards Authority of India (FSSAI), GFSI, New Zealand Ministry for Primary Industries (MPI), Singapore Food Agency, the Netherlands Ministry of Economic Affairs and Climate Policy, The World Bank Group and the United States Agency for International Development (USAID).

Both GFSI and GFSP are supported by major international food manufacturers and retailers. Both organisations have strong themes around capability building and knowledge sharing. Many of MLA's activities in this area closely align with GFSI's and GFSP's themes (Table 7).

Table 7: GFSI strategic objectives and relevant MLA activities

Themes	MLA activities
Benchmarking and standards	MLA provides the Australian red meat industry with opportunities to produce products to the highest standards and meet and exceed consumer expectations. Benchmarking performance of the Australian industry is an essential planning tool. Consumer attitudes towards Australian product, activities of other meat-producing countries, and available technologies in other industries are a first step in planning for future work. Harmonisation of activities and the standards employed between companies, commodities and countries is an important pre-requisite for efficient supply chains. MLA collaborates with Codex Alimentarius activities, GFSI food safety systems, GS1 product identification systems to ensure that the work we do aligns with global directions.
Capacity building	Possible technology solutions MLA has developed a service provider 'catalogue' for use by industry. Marker technology A project has been initiated to pilot a 'marker' technology in an effort to show beef and lamb produced in Australia can be scientifically distinguished from meat produced in other countries. The technology offering places no reliance on packaging, bar codes, tag and trace, or additives and delivers an innate chemical "fingerprint" for products (focusing on trace elements and isotopes). This fingerprint ties them to their production or manufacturer origin which supports provenance claims and identifies substitution and counterfeit goods. If the technology is successful industry will be in a position to audit (test) products from anywhere in global supply chains to determine that products labelled as Australian beef and lamb are true to their claimed country of origin. MLA is actively engaging with companies with 'marker' technology to participate in the below-mentioned case studies. Commercial case studies Through commercially-based case studies, MLA is seeking to test several options to provide customers and consumers with confirmation of the authenticity of product.

	• Trial 1 seeks to build on this project and features an Australian exporter with supply chains into Indonesian and Japan. The technology solutions likely to be trialled include a combination of source verification (DNA and isotopes) and data integration linking producers with the end consumers. • Trial 2 will trial a data integration system for an Australian exporter with supply chains into Singapore, Japan, and the United Arab Emirates. The technology solution is designed to provide solutions that offer end-to-end traceability and provide a "single version of the truth" for the consumer, producer and supply chain participants. • Trial 3 involves a fully-integrated beef supply chain into China. It will connect Australian farmers and exporters to retailers and consumers in China proving the authenticity of beef products and link those goods with evidence of the journey, brand story, and compliance collected and shared as the product moves along the supply chain. The trails will not only test the technology offerings but draw out the learnings via case studies which can then be used through MLA's communication channels to help build capability in other supply chains. Capability building is a high priority for MLA as the market seems to be particularly confused presently regarding how, when and where technologies can most effectively be used as well as which technologies (including Blockchain) can deliver as promised in a commercial environment. <u>Market research</u> MLA is contracting a project to undertake market research to better understand; a) who generates value from implementing a traceability system and therefore if implementation is 'worthwhile'; b) how supply chain participants can be incentivised to participate and c) identify which are the most promising products and markets (or market segments) where value can be derived from implementing an integrity system for various attributes. Findings from this work will be shared across the industry and with potential service providers. <u>Education and awareness-raising</u> MLA is working with commercial partners to promote Australia's red meat integrity systems and programs right through to end-consumers. In high end modern retail, there is further opportunity to partner and undertake in-store campaigns to investigate consumer's interest in product claims, country of origin labelling and other additional labelling.
Public-private collaboration	MLA is actively encouraging public/private collaboration. All case studies have been initiated once a commercial supply chain has agreed to participate and volunteer their knowledge and connections. The market research mentioned above is being funded by public funds and the case studies are wherever possible being funded via a mix of private investment and public.

Regarding the above-mentioned trials, the Partnership may wish to engage more directly to better understand their achievements and encourage other supply chains to consider a similar application. Further, the Partnership may desire to encourage Australia Indonesia supply chains to meet certain standards and follow certain approaches to supply chain traceability and providing proof of authenticity. The Australian and Indonesian governments may also choose to become more closely involved in how existing systems such as eCert and EXDOC on the Australian side and complementary systems on the Indonesian side can be integrated into the commercial information systems to learn what efficiency gains can be made.

MLA has not engaged with Indonesian retail chains extensively in the work conducted to date. The engagement of retailers is key, not just because they are near to the end of the supply chain, but because the benefits to consumers need to be communicated, and the benefits to retailers need to be shared with the supply chain. Commitment from retailers to the concept and the business model is crucial to wider success. The Indonesia Australia Red Meat & Cattle Partnership may wish to initiate an engagement process with Indonesian retailers to increase their capabilities and involvement initiating future trials. Additional recommendations are listed in section five of this report.

4.5 Objective five: Possible pilot studies

Objective five: Dependant on the scoping study outcomes, develop a project scope for pilot studies to test the use of authenticity/traceability systems or products and follow the path of beef from Australia to Indonesia end-to-end.

The Deakin University report provided a summary of an Australia-Indonesian supply chain. It was a good basis from which to plan a program of pilot trials of authenticity/traceability systems within Australia-Indonesian beef supply chains.

Detailed below is the proposed project scope for pilot studies to test the use of authenticity/ traceability systems and follow the path of beef from Australia to Indonesia end-to-end. Scope development was all that was required for this objective, not execution.

4.5.1 Pilot goals

The below goals have been identified for the proposed pilot study:

- Learn how to integrate technologies to design a supply chain that can provide adequate assurance to consumers
- Determine if the authenticity/traceability system chosen for trial works effectively and provides adequate assurance to customers in a commercial setting
- Generate case study materials for communication to supply chains, technology providers and other interested parties to encourage further development and adoption of appropriate technologies
- Assess the commercial benefits of applying such a technology
- Test the uptake of the traceability system at the end-customer/consumer level and validate the value proposition that customers and consumers are willing to pay a premium for traceable product.
- Increase usage of country of origin labelling for red meat.
- Increase the capability of technology providers and supply chain participants
- Increase the number of technologies explored so that supply chains are better able to make informed decisions
- Help supply chain partners to understand how to ensure that these systems deliver value for consumers and supply chain participants

The pilot must be implemented in conjunction with:

- An Australian-Indonesian supply chain with access to their systems, contacts, distribution networks etc
- Suitable technology service provider/s who can address the needs of the specific supply chain

Following this, learnings and communication collateral can start to be developed from the pilot. The ideal would be for commercial businesses to then take the lead on traceability. Apart from technological applicability, the trial should also provide insights on customers/end-consumers views towards food fraud, labelling and traceability, and validate whether they are willing to pay more for traceable products.

It should be noted that MLA has taken some steps initiate a pilot as described above, above and beyond the remit of this project objective. Activity so far:

- A supply chain partner with Indonesian connections was sought out to participate. The company which volunteered has a globally recognised processing facility with capacity for value adding and retail-ready packaging.
- Tenders were sought from service providers across the globe to participate in the pilot. Ten applications were received and assessed, and applicants detailed their proposed solutions. The technology solutions likely to be trialled include a combination of source verification (DNA and isotopes) and data integration linking producers with the end consumers.

Learnings from this trial will include technological limitations as well as non-technological (e.g. regulatory, environmental, social, economic, logistical, etc.) that may hamper sustainable application. Case studies will be produced for the industry's use showcasing the learnings from the process and applicability or not of the technologies used.

5 Conclusions/recommendations

5.1 Learnings

Learnings from this project can be summarised as follows:

- The Indonesian policy and regulation landscape is complex and ever changing so those actors wishing to interact in this market place must be vigilant to change in this space
- A strong policy theme within Indonesian policy is the drive toward beef self-sustainability
- Indonesia is placing increasing weight and importance on the issue of food fraud and even more so, food security
- Major retailers are driving the adoption of authenticity/traceability systems and using them for multiple purposes
- It is likely that multiple service providers and technologies will be required to work together for a full end-to-end solution to the meat supply chain.
- Service providers in this space still have much to learn about the agriculture sector and how they can truly add value to the process
- For many supply chain participants, the benefits of these types of systems can be intangible for example a reduction in risk only becomes tangible if it results in reduced insurance premiums. Adoption of these systems by Australian red meat exporters is being slowed by a lack of clear value gain (or reduction of loss).
- Before implementing an authenticity/traceability system, businesses must have a thorough understanding of their consumer's willingness to pay for this additional service.

5.2 Recommendations

Recommendations from this project can be summarised as follows

- Adoption of traceability systems by Australian red meat exporters is being slowed by a lack of clear value gain as the benefits are largely intangible. MLA needs to build this argument and communicate clear savings to supply chains.

- Additional work is required to better understand how best to incentivise cooperation across supply chains and sectors for seamless data transfer
- Within Indonesia, pilot projects or case studies could be conducted to validate the traceability system as well as to be better understand the social and commercial benefits of its application. Depending on pilot project learnings, there is scope to expand this to other products, including the live cattle trade between Indonesia and Australia.
- Both individual supply chains and government must take responsibility to combat food fraud. The issue of food fraud is a global one and international, inter-governmental and multiparty cooperation is needed to combat it. All parties must stay abreast of this issue. Areas for improvement include:
    - technical food crime investigation or at least cooperation with international government departments
    - development of partnerships with organisations such as GFSP and GFSI to facilitate information sharing, capacity building and development in government and business
    - The Australian and Indonesian governments may choose to become more closely involved in how existing systems such as eCert and (N)EXDOC on the Australian side and complementary systems on the Indonesian side can be integrated into the commercial information systems to learn what efficiency gains can be made.
    - Closer engagement between Indonesian retailers, MLA, importers/distributors and the Australian supply chain participants to ensure the retailers' and consumers' needs are well understood and met. This may also assist in the provision of improved communication of the benefits of traceability to retailers/consumers.
    - Closer engagement with private and government committees and organisations to share observations and learnings from studies and trials, including MLA's upcoming traceability systems trial to better understand their achievements, publicising their operation, encouraging other supply chains to consider a similar application etc.
    - Additional funding be set aside to conduct other additional trials to encourage Australia Indonesia supply chains to take up best practices, systems and standards that allow for greater supply chain traceability and authenticity.
- Improvements in logistics and cold chain management throughout the supply chains will improve consumer experiences and likely reduce product losses/rejections. Improvements could include cold chain monitoring throughout transport from the Australian processing plant to continued upgrades to Indonesian facilities (starting with modern retail and with the option to look improving facilities in the more modern wet markets). Improvements in cold chain management will assist in meeting consumer expectations regarding quality, shelf life and traceability.
- Improvements in product labelling should be encouraged and facilitated. Labels need to include expiry dates, full ingredient lists and country of origin. Again, this will assist in meeting consumer expectations regarding quality, shelf-life and traceability.

5.3 Conclusion

The issue of food fraud is not going away, and the MLA-led Rural R&D for Profit Insights2Innovation project identified "Food without Fear" as being an important global concern with FIAL estimating ~AUD 272 million pa fraud perpetrated on the industry in export markets (McLeod, 2017).

This project has provided valuable insights into the nuances of the Australia-Indonesia red meat supply chains and has identified additional work that can be undertaken to improve consumer confidence and awareness of Australian red meat in Indonesia. The market for authenticity/traceability systems is still maturing with both service providers and supply chain

participants facing a steep learning curve, though regardless, major international retailers are driving adoption of these systems.

Management of the threat of food fraud is both a responsibility for individual supply chains and government. International, inter-governmental and multiparty cooperation is needed to combat the problem and there is much opportunity to learn from others who are further ahead in this space.

MLA would like to thank the Indonesia Australia Partnership on Food Security in the Red Meat and Cattle Sector (the Partnership) for its foresight in investing in this investigation.

6 Bibliography

Bertolini, Massimo *et al* (2006) FMECA Approach to Product Traceability in the Food Industry. *Food Control. Vol. 17. pp. 137 – 145*

Centers for Disease Control and Prevention (2017) Surveillance for Foodborne Disease Outbreaks — United States, 2017

Charlebois S, Sterling B, Haratifar S, Sandi Kyaw Naing SW (2014) Comparison of Global Food Traceability Regulations and Requirements. Comprehensive Reviews in Food Science and Food Safety 13 (5):1104-1123. doi: 10.1111/1541-4337.12101.

Cicia G, Colantuoni F (2010) Willingness to pay for traceable meat attributes: a meta-analysis. International Journal on Food System Dynamics, 1(3), pp.252-263.

Elphick-Darling R, Permani R, Michaels H, Rendon Benavides R (2019) Australia Indonesia Value Chain Mapping. Deakin University

Hobbs JE (2016) Effective use of Food Traceability in Meat Supply Chains. Chapter 17 in Food Traceability Techniques and Technologies, Elsevier, pp 321-335.

Hyperledger (2019) Case study: How Walmart brought unprecedented transparency to the food supply chain with Hyperledger Fabric

IHS Markit (2020) https://ihsmarkit.com/index.html

Kalchschmidt M, Normansyah S, Traceability in the Cocoa Supply Chain: An Indonesian Context

Lane J (2016) Agricultural Product Validation: Needs analysis and technology evaluation. Rural Industries Research and Development Corporation https://www.agrifutures.com.au/wp-content/uploads/publications/16-020.pdf

Maman U, Mahbubi A, Jie F, (2018) "Halal risk mitigation in the Australian–Indonesian red meat supply chain", *Journal of Islamic Marketing*, Vol. 9 Issue: 1, pp.60-79.

Marks & Spencer (2018) M&S raises the stakes with unrivalled new British beef traceability campaign

McLeod R (2017) Counting the Cost: Lost Australian food and wine export sales due to fraud. Food Innovation Australia Ltd.

Mennecke B.E, Towwnsend A.M, Hayes D.J, Lonergan S.M. (2007) A study of the factor that influence consumer attitudes toward beef products using the conjoint market analysis tool. Journal of Animal Science 85: 2639-2659.

Ministry of Agriculture (2018) Livestock and Animal Health Statistics 2018. Ministry of Agriculture

Morris N (2019) Carrefour extends food traceability blockchain. Ledger Insights

Ortega DL, Hong SJ, Wang HH, Wu L (2016) Emerging markets for imported beef in China: Results from a consumer choice experiment in Beijing. Meat science, 121, pp.317-323.

Paull J (2008) Green Food in China. Journal of Bio-Dynamics Tasmania Issue 91.

Pebrianto F (2019) Kementan: Swasembada Daging Sapi Tercapai di 2026 Tempo.Co

Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (2019) 2019 Revision of World Population Prospects, United Nations

Rural Industries Research and Development Corporation, 2016. *Agricultural Product Validation: Needs analysis and technology evaluation*. Publication No. 16/020

Savov AV, Kouzmanov GB (2009) Food Quality and Safety Standards at a Glance*. Bioeconomics and Biotechnol. EQ. 23 / 2009 / 4*

Tenrisanna V (2015) Offal and beef demand in Indonesia and Australia's trade prospects (a case study of Makassar City) (Doctoral dissertation, University of Southern Queensland).Adam et al (2016) "Enhancing food safety, product quality and value-added in food supply chains using whole-chain traceability", International Food and Agribusiness Review, Special Edition Vol 19, Issue A, pp 191-214.

Thakur, Maitri, Sørensen, Carl–Fredrik, Bjørnson, Finn Olaf, Forås, Eskil, Hurburgh, Charles R. (2011). Managing Food Traceability Information using EPCIS Framework. *Journal of Food Engineering. Vol. 103. pp. 417 – 433*

The Partnership (2020), Indonesia Australia Partnership on Food Security in the Red Meat and Cattle Sector (the Partnership)

Toiba H, Umberger WJ, Minot N (2012) Exploring Indonesian consumer's willingness to pay for high-value agricultural products. IV International Symposium on Improving the Performance of Supply Chains in the Transitional Economies 1006 (pp. 397-404).

University of Melbourne (2019) Design led Development of Novel Pack solutions for origin assured High valued export meat products – Smart Packaging Final Report. Meat & Livestock Australia

Vanany I, Mardiyanto R, Ijtihadie R, Boga Andri K, Engelseth P (2016) Developing electronic mango traceability in Indonesia, Supply Chain Forum: An International Journal

Ward C.E, Lusk J.L, Dutton, J.M (2008) Implicit Value of Retail Beef Product Attributes. Journal of Agricultural and Resource Economics 33: 364–81.

Zhang W, Xue J (2016) Economically motivated food fraud and adulteration in China: An analysis based on 1553 media reports. Volume 67 in Food Control pp 192-198

7 Appendix 1: Deakin University report

final report

Project code: V.GNT.1901

Prepared by: Rose Elphick-Darling, Dr Risti Permani, Helena Michaels, Ruben Rendon Benavides
Deakin University

Date published: 16 August 2019

PUBLISHED BY
Meat and Livestock Australia Limited
Locked Bag 1961
NORTH SYDNEY NSW 2059

Australia Indonesia Value Chain Mapping

Meat & Livestock Australia acknowledges the matching funds provided by the Australian Government to support the research and development detailed in this publication.

Executive summary

This report maps the processes, players and records used to achieve end-to-end traceability in an Australia-to-Indonesia beef supply chain. It identifies critical traceability events and the key data elements in a case study of frozen beef supply into the Indonesian market, distributed across varied sales channels. It also identifies traceability gaps or vulnerabilities that were evidenced in the case study fieldwork.

To achieve these objectives, between July and August 2019 the study conducted a case study by engaging companies that could be considered leaders in the field of meat production, processing, export and distribution, with higher levels of control through supply chain integration than might be expected across the whole industry. It also summarised select livestock policies and programs in Indonesia, particularly those related to beef importation and distribution, Halal and food safety, and labelling – all of which could potentially support the future development of traceability systems in the beef chains.

The research found that the capacity for end-to-end traceability is limited by a lack of integration of product flow data between partners and service providers in this supply chain. While traceability within individual enterprises - especially those playing roles in the exportation and importation of the Australian beef - is quite sophisticated and is captured in enterprise systems, a view of the whole value chain is hampered by a lack of data sharing and use of global data standards. Having no agreed permissioned platform to harvest shared information means that data needed to establish provenance and importantly, expiry date of the product, is not readily available to those servicing the end consumer.

The study further found that in most cases this limited capacity for end-to-end traceability is not necessarily due to the unavailability of the data, but simply because data are not shared or shareable, due to their different format and interpretation of data fields, or the absence of incentives (for example due to lack of queries from consumers) or regulations that require businesses to be accountable for recording the movement and transformations of products being traded, stored and processed. Consequently, great care is taken to record data related to time/date stamps, identification of the product and temperature monitoring of the frozen product, only to be let down in stages close to the consumer through loss of that data on the carton, vacuum pack, or in the delivery leg.

Moving forward, labelling perhaps presents the greatest opportunity for the product. The case study found that this labelling remains on the carton for many distributors, food services and even retailers but the last step, to provide greater assurance to the end consumer. The research found that the lack of an expiry date on the beef carton imported from Australia is a frustration to those needing to make a judgement to serve to consumers particularly the modern supermarkets aiming at improving their food safety. The importance of addressing this issue is also evident given that current regulations in Indonesia do require products to include production date and expiry date on the labelling of animal products entering Indonesia in addition to other information such as on the Halalness.

There is a notable heavy reliance on certification and accreditation under various assurance programs (e.g. Livestock Production Assurance; Food Safety Assurance), as opposed to visibility and data sharing. Looking at the perceptions of business engaged in the case study, it is apparent that the concept of traceability within the Indonesian context is interpreted as matters related to halal assurance. With over 87% of Indonesian population identifying themselves as Muslim, the Indonesian government supported by the Muslims scholars have invested a significant resource in Halal assurance. While certification under an assurance program such as the Halal assurance program often involves establishment of systems that contain evidence that is traceable, it is not necessarily set up for traceability purposes, so capacity to integrate with any other systems is not a requisite in design.

This highlights a possible direction for future work by looking at interoperability between existing systems and leveraging on opportunities and gaps in the current regulatory frameworks, including the food and nutrition information system stipulated in the Indonesia's Food Act No 18/2012, and opportunities to engage key stakeholders including government agencies across different fields and at different levels, as well as multiple industry associations.

Traceability depends on recording all transformations in the chain, explicitly or implicitly. The absence of regulations that require the recording of such transformations is evident in Indonesia. Moreover, the study could not identify private standards (e.g. animal welfare, organic, etc) for beef in Indonesia. Interviews with actors in the chains suggest that consumer concerns are still confined to Halalness and food safety issues as assessed by their assessment on the physical appearance of the beef products. However, this does not necessarily mean that there is no demand for traceability. An improved understanding of this consumer demand as well as their willingness to pay should probably be considered in future work.

Policy uncertainty has been identified as one of the challenges amongst those involved in trading with Indonesia. It is therefore important to continue to monitor policy environments in Indonesia, including during the development of a new initiative or innovation to improve red meat supply chain traceability.

Table of contents

1 Background

1.1 Definition of traceability

Traceability is a capability which services multiple goals in relation to the efficiency and effectiveness of a supply chain. Maintenance of product integrity, chain of custody, verification of pedigree as well as track and trace of the product flow constitute a wider suite of risk mitigation decisions in food supply chains. Achieving traceability is by nature a collaborative activity requiring the sharing of information between entities to effect decision-making.

Food Standards Australia New Zealand (FSANZ) defines traceability as "the ability to track any food through all stages of production, processing and distribution (including importation and at retail). Traceability should mean that movements can be traced one step backwards and one step forward at any point in the supply chain. For food processing businesses, traceability should extend to the ability to identify the source of all food inputs such as raw materials, additives, other ingredients, and packaging."[1]

At present, the key requirement is to be able to trace "one up and one down" in the chain of custody related to a food input or product. Traceability may be achieved across a supply chain by combining the one-up/one down information from individual nodes or custodians, however it may not constitute a visibility capability for that particular supply chain. The data may be required to be held for regulatory purposes but not necessarily shared with other entities in the network to create visibility.

Given the importance of enhancing visibility capability for each of the actors in the chain, traceability is therefore also about the systematic ability to access any or all information relating to a food under consideration, throughout its entire life cycle, by means of recorded identifications. The following figure indicates the concept of end-to-end traceability and data sharing to manage risk and to build up visibility of the product and trace back to the product origin.

[1] FSANZ Food Traceability 2017
http://www.foodstandards.gov.au/industry/safetystandards/traceability/pages/default.aspx

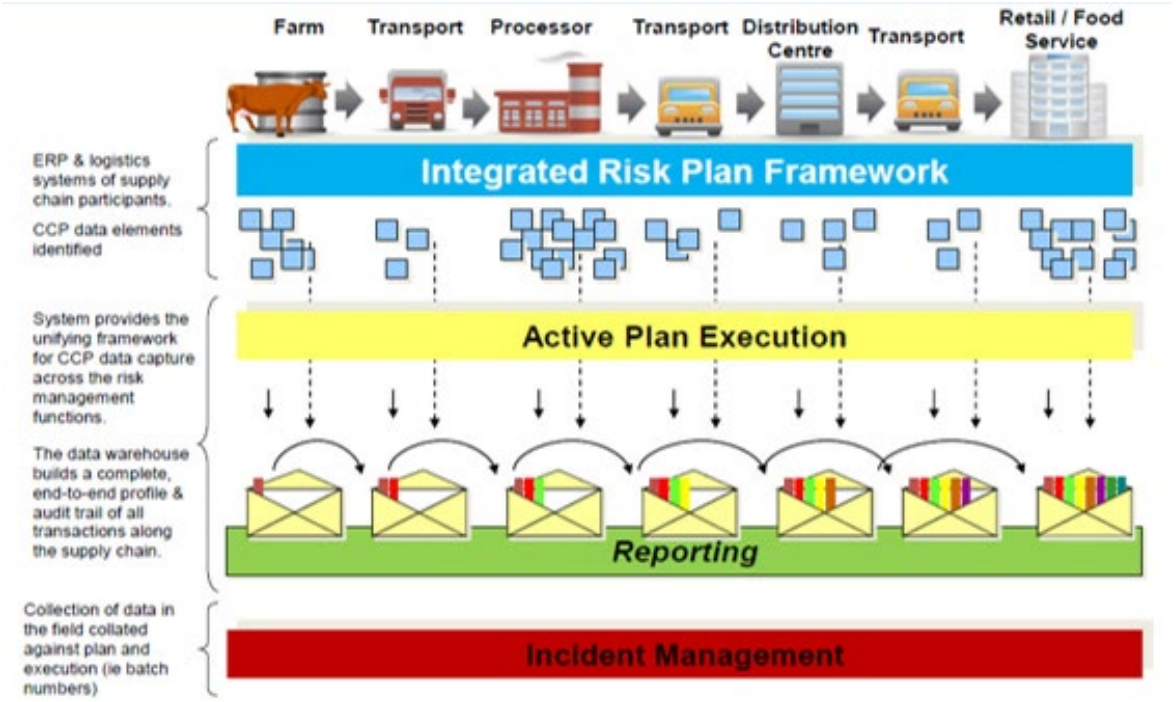


Figure 1 Traceability & Risk Management Concept - Source: Deakin CSCL

1.2 Drivers of demand for traceability

1.2.1 Trade and market access

Indonesia is Australia's fourth largest agricultural export market. Australia's trade in beef and veal with Indonesia is valued at AUD284 million (2018). 75 percent of Australian agricultural production is exported, so market access is critical to the viability of the sector. In 2018, Australia shipped 57,349 tonnes of beef and veal to Indonesia, most as frozen grass-fed beef.

Despite regulatory complexity to export to Indonesia, market opportunities remain evident. The Indonesian population is estimated at 265 million, with Jakarta the key consumption market with over 10.8 million estimated population in 2019. GDP continues to rise in Indonesia and demand for animal-based protein such as beef, chicken meat and dairy remains strong. Future opportunities will be magnified by the strengthening of bilateral trade relationships between Australia and Indonesia. Leveraging on the earlier signing of ASEAN-Australia New Zealand Free Trade Area (AANZFTA), under the Indonesian- Australian Comprehensive Economic Partnership Agreement, which was recently concluded in March 2019, tariffs on Australian-Indonesia beef exports will reduce within five years from 5% and be eliminated by 2023.

One opportunity for the beef sector is to develop and improve traceability systems. Consumer assurance concerns related to food safety and religious and cultural practices are creating an increasing interest in traceability systems in Indonesia for domestic and Indonesian export markets e.g. China. In Indonesia, food traceability initiatives are active, including in products such as palm oil (Widyapratami H., Bagia B., 2018); mangoes (Vanany et al 2016); cocoa (Syahruddin and Kalchschmidt 2012; Cargill 2019); wild-caught tuna (Accenture 2018); and fish traceability and stock systems in Bitung (STELINA 2018).

Meanwhile, a series of beef importation and distribution, food safety, labelling and Halal assurance laws and regulations as well as domestic livestock policy and programs have been introduced to address public interests in consumption of foods that comply with religious dietary requirements (e.g. Halal) and are of good quality, and policy objectives of achieving food and nutrition security and food price stabilisation, among others (See Section 5.2 for further discussion on policy relevant to beef importation). Despite these consumer concerns and policy interests, a solid understanding of recent developments of traceability systems remain wanting.

1.1.2 Australia's National Food Traceability Framework

Efforts to develop food traceability systems as focused by this research are also in line with current developments in Australia. The Australian Government, through the Department of Agriculture, has been working to develop a National Food Traceability Framework, aiming to extend traceability beyond the current mandated one up: one down requirement. Stage 1 of the Framework Project pointed to a need to enhance current traceability in the livestock production stage of Australia's meat supply chains.

"Advancing livestock traceability, potentially by agreeing to consistent implementation and transparent performance assessment regimes, including more frequent audits, regular reporting against performance measures and investment in research to identify initiatives, could improve compliance. A recent assessment of traceability performance also revealed other product groupings with scope for improvement including live animal feed categories."[2]

1.3 The contribution of this research

This research will provide information to help identify systemic gaps in traceability in the Australia to Indonesia beef supply chain. The following stage of this project will be the consideration of solutions to fill these gaps. Traceability gaps may occur in events and processes that are vulnerable to loss of visibility of the product, information that will enable tracking and tracing of the product that is not currently collected, and the ability of existing systems to share data recording the product journey to the end consumer.

Understanding these issues in the context of case study examples is valuable to participants in the red meat export industry in Australia and counterparts engaged in import, distribution and retailing in Indonesia. The summary of relevant policies and programs presented in this report will also assist solution developers, and industry practitioners to better understanding the regulatory environments in which they are operating.

This research builds on previous research identifying Halal risk and mitigation in the Australian-Indonesian red meat supply chain (Jie, Maman, Mahbubi 2015, 2017; Zulfakar, Jie, 2019) and in the Indonesian meat product supply chain (Nusran et al 2019); the positive correlation between supply chain integration and food integrity in global trade (Ali et al, 2018); and the benefits of sharing of supply chain information for traceability (Adam et al 2016; Elphick-Darling and Gunasekera 2017).

[2] Australian Government (2018) *Enhancing Australia's systems for tracing agricultural production and products*, Department of Agriculture, Canberra.

2 Project objectives

2.1 Purpose

The purpose of this project is to examine ways to protect Indonesian consumers, as well as the reputation of Australian beef suppliers to the Indonesia market, through improvements to red meat supply chain traceability. This study achieves this purpose by mapping the processes, players and records used to achieve end-to-end traceability in an Australia-to-Indonesia beef supply chain. Value chain mapping is a necessary pre-cursor to understanding the capacity of the beef industry supply chain in providing levels of traceability that meet the needs of consumers and regulators alike.

3 Methodology

3.1 Mapping the value chain

Analysis of the value chain entails examination of the internal processes a company applies in adding value to an input and delivering an output. The analysis covers all actions in gathering, selecting, synthesising and distributing product, including inbound logistics, the production cycle, outbound logistics, marketing and sales.

For the purposes of this analysis, the value chain associated with being able to trace the product involves the ability at each stage to be able to identify the what, where, when, who and why of the product; the ability to capture that data; and then to successfully share that data with parties along the value chain. This in turn creates traceability in recording and accessing this information which is typically siloed within individual enterprises.

Traceability, by its nature, is a shared capability, engaging individual businesses to upload data to a shared access point while protecting sensitive commercial data of each participant. Traceability in terms of “track and trace” delivers a range of benefits associated with monitoring, planning and scheduling in a product supply chain, such as delivery in full on time (DIFOT) and tampering and importantly, effective product recall.

However, it should be noted that the larger value associated with traceability is related to a range of attributes that can be associated to the product traceability, such as pedigree (provenance and source of inputs); integrity (temperature, humidity, vibration and impact in transit); and chain of custody (verification of identity, liability). It is in these attributes that relate to brand protection and value.

3.2 Approach

Identifying traceability data not only involves “track and trace” of the product. Traceability data may also be contained within other parameters in the value chain such as pedigree/provenance, food integrity systems, and records of custody handovers. The following Table 1 indicates the parameters and the data types that may be recorded.

Table 1 Parameters of Traceability data Source: Deakin CSCL

Approach	The Recorded Data
Traceability or "Track & Trace"	Recording product's location over time
Chain-of-Custody	Recording the product's ownership (and/or control of the product) over time
Pedigree or Material Inheritance	Recording the parent-child material relationship: raw materials to intermediate product to finished goods
Integrity	Recording the physical condition of the product and the process used on the products

The methodology applied involved analysis along four dimensions of the beef supply chain in the case study, being

1. The processes from livestock production to consumption of the beef product by the Indonesian consumer
2. The transactions that take place where information pertinent to product traceability is exchanged between players in the value chain
3. The systems which hold data relevant to the product traceability
4. The key data elements germane to traceability.

Mapping the value chain along these four dimensions enabled identification of the gaps in product traceability and the challenges associated with achieving traceability.

Collation of information and subsequent analysis included:

- desktop research on beef supply chain processes
- identification of relevant regulators and regulatory requirements
- site visits to confirm processes and traceability systems in place, critical traceability events and key data elements related to traceability.

The following figure was developed to illustrate the typical supply chain for cattle and beef exports to Indonesia.

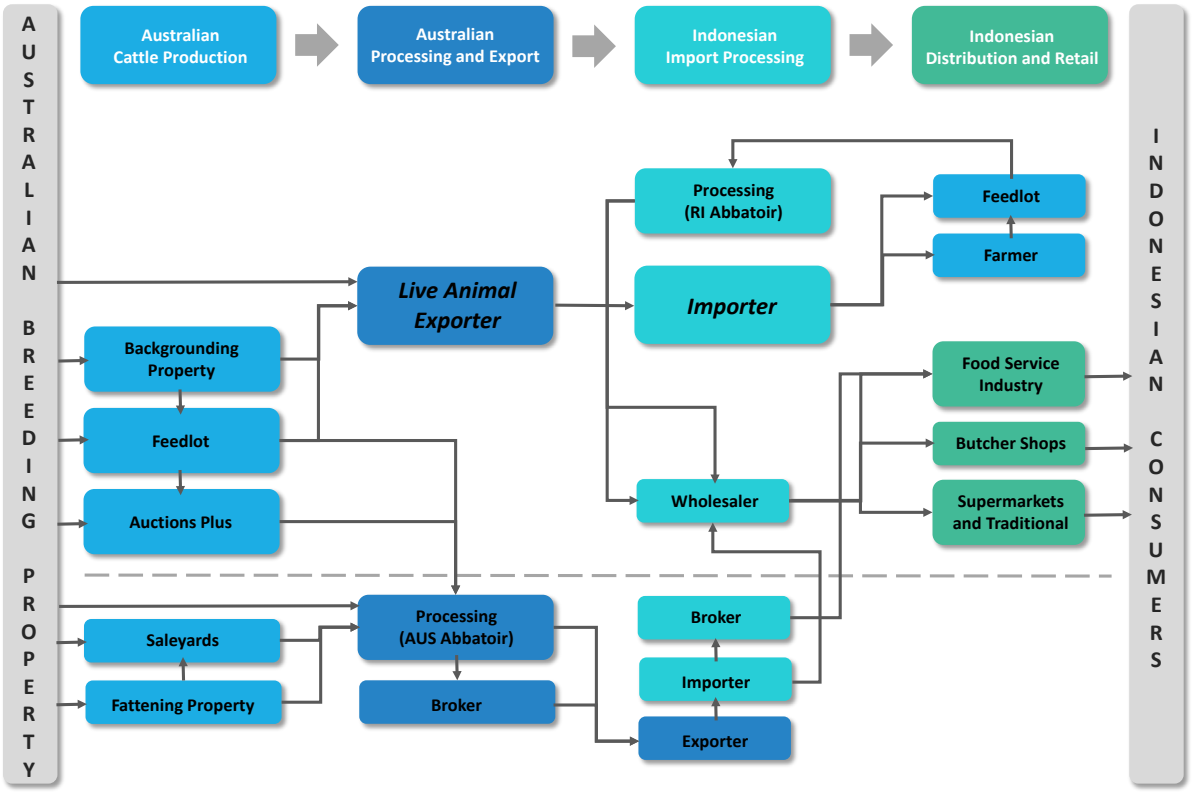


Figure 2 Australia-Indonesia cattle and beef supply chain Source: Maman et al 2018

Figure 2 details the generic supply chain for live cattle and beef to Indonesia. In the use case documented in this report, the integrated nature of the Australian supplier means that fewer intermediaries are involved, with nine (9) key custodians of the product indicated, plus an additional eight (8) engaged in the movement of the cattle and beef, and a further four (4) regulatory inspection staff who may come in contact with the product during the overall process. In addition, numerous other facilitators and regulatory agencies are engaged in enabling the product to flow before the Indonesian consumer is engaged in the process of purchase and consumption. With a minimum of 20 entities having contact with the product across two countries, the need for high levels of synchronisation of data to achieve end-to-end traceability is a challenge.

4 Results

4.1 Production

Australia's **National Traceability Performance Standards** were formed in 2004. They are predicated on the need to trace animals in the circumstance of a biosecurity threat. For cattle, within 48 hours of the relevant Commonwealth Veterinary Officer being notified, it must be possible to establish the location(s) where a specified animal has been resident during its life. Within 48 hours of the relevant Commonwealth Veterinary Officer being notified, it must be possible to establish a listing of all cattle that have lived on the same property as the specified animal at any stage during those animals' lives. Within 48 hours of the relevant Commonwealth Veterinary Officer being notified, it must also be possible to determine the current location of all cattle that resided on the same property as the specified animal at any time during those animals' lives.

4.1.1 Description of processes

Figure 3 Production critical traceability events

4.1.1.1 Identification of the production site

The Property Identification Code (PIC) is an 8 digit identification code which underpins traceability systems, including the National Livestock Identification System (NLIS). Recording of the PIC enables the property of birth and farming of the animal to be traced and it is the link to additional PICs where the cattle may reside during their lifetime. In Queensland, where the case study production takes place, all production sites must be registered as Biosecurity entities with Biosecurity QLD. Queensland livestock owners need Property Identification Codes (PICs) to:

- purchase National Livestock Identification System (NLIS) devices
- access other national systems such as national vendor declarations or waybills
- report movements to the NLIS database.

Using the PIC as the foundation of the livestock production system has limitations, as the application of the PIC in different states varies. It is also not geographically specific, as cattle production may represent only one part of a production site associated with a PIC e.g. mixed farming may produce fodder crops, horticulture and livestock, or the one PIC may be held for multiple production sites e.g. NSW. Use of the PIC entails a risk in identifying a specific geography, as would be possible in using a unique global identification number (GLN) to geofence each production area.

4.1.1.2 Identification of the cattle

The National Livestock Identification System (NLIS) commenced in 1999 and is the basis of identification and traceability of livestock in Australia. The NLIS provides three key data that enable lifetime traceability of cattle –

1. The 8 digit identifier attached to each animal contained on a device (RFID eartag or rumen bolus).
2. The Property Identification Code (PIC)
3. The NLIS database.

The Cattle NLIS Standards were published in 2016 and form the basis of Australia's cattle traceability system https://www.nlis.com.au/Files/1/PDF/NLIS%20Cattle%20Traceability%20Standards%20watermark.pdf.

4.1.1.3 Livestock Production Assurance

Livestock Production Assurance (LPA) is the Australian voluntary assurance program for livestock production. The assurance program covers seven aspects of farm production as follows –

1. Property risk assessments
2. Safe and responsible animal treatments
3. Stock foods, fodder crops, grain and pasture treatments
4. Preparation for dispatch of livestock
5. Livestock transactions and movements
6. Biosecurity
7. Animal Welfare

In terms of traceability the key aspect of the LPA is the provisions for livestock transactions and movements. The LPA National Vendor Declaration enables details of the production site, the cattle description, health status and the time and date the animals departed the production property. A similar declaration will be completed at the buyer's receival point.

By associating the NLIS tags and the LPA National Vendor Declarations (NVD), the movement of cattle can be traced through the Meat Integrity System database. This system covers all movements of the cattle off the property of birth. The eNVD enables cattle owners and transporters to electronically record stock movements directly into the database.

4.1.1.4 Backgrounding

Backgrounding properties provide a means to select cattle for sales channels – live animal export, breeding, feedlot, saleyard sales channels and meat processing. Backgrounding assists the producer to make optimal decisions for animal wellbeing and rates of return. Animals are grouped and acclimatised to a higher grain diet and close proximity of other animals before they are moved to a feedlot or finishing property.

Traceability relies on the LPA NVD and the NLIS tag as the core tracking means for the cattle. Farm records are the other source of information to trace food, chemicals, weight gain and animal health records. The NLIS tags are now associated with the backgrounding property PIC while the livestock are in residence.

4.1.1.5 Feedlot

Feedlots operate under the National Feedlot Accreditation Scheme (NFAS). Processors receiving stock from a feedlot can only source cattle from an NFAS accredited feedlot. As with other facilities in the production value chain, feedlots have a Property Identification Code and all animals received are associated on the NLIS database with this PIC.

4.1.2 Critical Traceability Events – Cattle Production

Critical Traceability Event	Data custodian	Identify	Capture	Shared with
Property of origin/birth	Property owner	Registration as a biosecurity entity Issue of Property Identification Code (PIC)	PIC is imprinted on the NLIS ear tag on individual cattle (RFID device) see example printout.	Biosecurity QLD database NLIS database
Cattle identification	Property owner/ NLIS	Age Sex Tag Number Breed	NLIS ear tag device	Scanned and uploaded to NLIS/farm records
Exposure to contaminated sites	Property owner	Site test results	Farm Records	LPA Auditor
Application of farm chemicals to pasture and fodder crops	Property owner	Date of application Silo/storage/paddock ID and location Area and crop treated Product name Batch no Withholding period WHP Export Slaughter Interval Date safe to feed Treatment application rate and method Treated by (name and contact details)	Farm Records	? LPA auditor Farm consultants
Use of veterinary chemicals	Property owner	Date MOB ID No of stock Product Batch/Lot no expiry date ESI WHP Date safe for slaughter		
Stockfeed (on-farm supply)	Property owner	Feedstuff description Storage location Mob/s fed	Farm Records	LPA Auditor

		Start and finish of feeding period Responsible person		
Stockfeed (off-farm supply)	Property owner	Date received Feedstuff composition and amount Origin of feedstuff Commodity Vendor Declaration/reference number Product tested/Residue Analysis Certificate Storage location Responsible receiver	Farm Records/CVD records	LPA Auditor
Critical Traceability Event	Data custodian	Identify	Capture	Shared with
Animal welfare training	Property owner	Date of training Participants signatures RTO documentation and copies of completion certificates	Farm Records	LPA Auditor
Preparation of livestock for transportation	Property owner	Date No of livestock Description Date and time of yarding Date and time of despatch	Farm Records	eNVD eDEC NVD and Waybill
Livestock Transport to Backgrounding property	Livestock Transport Provider	PIC and address of livestock collection Description of cattle (age, sex, number, breed) Name and Address of receival company and site HGP status Animal fats consumption Ownership By-product stockfeed	eNVD eDEC NVD and Waybill Farm Records Livestock Movement Record	Shared with regulators on request. Permission from data provider?

		Extended Residue Program Status Veterinary Drugs and chemicals Ag chemicals Spraydrift Signature on declaration		
Receival at Backgrounding property	Property owner	Date NVD serial number Owner name Owner address PIC of origin Vendor name and address Number of stock & destination paddock Breed Sex Notes on condition Injury or illness and treatment Deaths Inspection undertaken by Date inspection Report sent to owner/buyer	Farm Records Farm Biosecurity Stock Receival and Inspection Form	Shared with owner and buyer and if needed Farm Biosecurity

Critical Traceability Event	Data custodian	Identify	Capture	Shared with
Livestock transport to feedlot	Livestock Transport Provider	PIC and address of livestock collection Description of cattle (age, sex, number, breed) Name and Address of receival company and site HGP status Animal fats consumption Ownership By-product stockfeed Extended Residue Program Status Veterinary Drugs and chemicals Ag chemicals Spraydrift Signature on declaration	eNVD eDEC NVD and Waybill Farm Records Livestock Movement Record	Shared with regulators on request. Permission from data provider?
Feedlot	Feedlot owner	At receival NVD number NLIS PIC and address of feedlot Introduced animals separated for health and biosecurity assessment Water Food intake	eNVD and Waybill NLIS tag data NFAS	Aus Meat NFAS auditor

4.2 Livestock Transport

Livestock transport is a recurring task in the production stage of this supply chain, as animals are moved between production sites, to backgrounding, feedlot, saleyards and ultimately to processing plants. The required Land Transport Standards and Animal Welfare Standards (2019) are incorporated into the TruckSafe assurance program of the Australian Transport Association (ATA). At present TruckSafe is being merged into the broader Safety Program of ATA.

The livestock transporter must have systems in place to comply with all regulatory and documentation requirements concerning the movement of livestock, including –

- Waybills and National Vendor Declarations

- Health Certificates when transporting cattle across borders
- Multiple conveyance certificate
- Travel permits
- Tick clearance declarations
- Time the animals have been off water at loading and unloading.

Under the TruckSafe requirements, the livestock transporter requirements are detailed as follows

H.1.2 Evaluate animal welfare risks	The transporter must have a system in place to evaluate the risks that have been identified with customers that could compromise animal welfare outcomes.
H.1.3 Provide feedback to relevant parties	Feedback is to be provided to relevant parties (as shown on an NVD for example) on outcomes and any non-conformances against the TruckSafe Animal Welfare module and business expectations.
H.1.4 Tracking and tracing livestock movements	The transporter must have a system in place for the tracking of livestock movements for traceability.
H.1.5 Livestock identification	The transporter must ensure that livestock are identified upon loading, during the journey and at unloading through practical means, i.e. Load plans, effective consignment sheets, NLIS (where applicable).
H.1.6 Non-conformances	Issues of non-conforming (weak, injured, not identified, missing paperwork) livestock are to be recorded, reported and investigated by management.

Figure 4 TruckSafe requirements for traceability Source: Australian Livestock and Rural Transporters Association

Records must be maintained and current and can include –

- Vehicle maintenance logbooks
- Customer orders
- In-transit inspections
- Driver logbooks
- Livestock management sheets
- Waybills and
- NVDs.

MLA's Meat Standards Australia (MSA) also provides standards relating to transport of livestock related to the quality of the meat produced, including -

- Direct consignment cattle are to be processed within 48 hours from dispatch to slaughter, with a maximum of 36 hours in road transport, which can also include a rest period of up to 12 hours.
- Cattle transported by sea or rail are processed no later than the day after dispatch.
- Cattle sold through an MSA accredited saleyard are to be processed within 36 hours of dispatch from the farm.

To optimise the eating quality of beef, the following recommendations should be observed -

- Cattle are to have access to water outside of transport.
- Load cattle quietly, preferably with no use of goads and electric prodders.
- Load cattle at the recommended densities set out in the trucking industry code of practice.

4.2.1 Critical Traceability Events – Livestock transport

Critical Traceability Event	Data custodian	Identify	Capture	Shared with
Livestock transport to processor lairage	Livestock Transport Provider	NVD Number Movement Record No.	eNVD Livestock Movement Record	NLIS database

4.3 Meat Processing

The meat processing stage of the beef export supply chain is one of the key transformation events where traceability of the product is most challenging. Atypical of most supply chains where the product is aggregated at the processing stage and then transformed in a "many-to-one" mode, meat processing involves disaggregation of the product in a one (carcass) to many (for example meat, hide, offal, bone, blood, casings, fat, product for rendering).

4.3.1 Description of processes

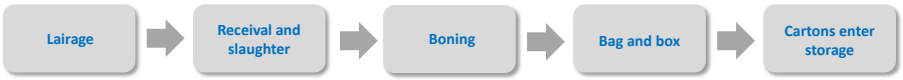


Figure 5 Meat Processing Critical Traceability Events

4.3.1.1 Lairage

Lairage is a short-term holding area for animals being transported to sale, slaughter or export (air and sea shipment). It enables animals to have respite from the stress of transport. Key requirements for animals in lairage are cleanliness and access to fresh water.

In the use case, cattle are kept in lairage for around 24 hours. The system is described as a "tailgate system", where animals are delivered to match the production system, which processes 1,200 animals per day. The lairage has a capacity of 500 animals, so a flow of animals through this system is designed to maintain a 24-hour supply of cattle to slaughter.

The lairage has its own PIC separate from the processing plant, so delivery to this area can be recorded via the NVD and associating each animal's NLIS tag with the lairage PIC.

4.3.1.2 Receival and slaughter

A person must not slaughter or process an animal unless it is accompanied by completed movement documentation which records the property of last residence. This movement documentation may be a Livestock Production Assurance National Vendor Declaration; an alternative document approved in the jurisdiction containing the required movement information; the animal health authority permit when the cattle are not identified with a NLIS device; any state or territory-specific approved documentation, except where an animal resident on a property dies and is collected for processing by a knackery. Movement documents may be provided to the receiver of the cattle by physically accompanying the transported cattle or being electronically transmitted prior to arrival of the cattle at the abattoir.

In a circumstance where the cattle are not identified with a NLIS device, the animal health authority still requires a completed movement document for cattle slaughtered at processors. Permits must be accompanied by the appropriate movement documentation. Copies (i.e. physical/electronic) of movement documents must be kept by processors for two years.

Animals proceed to the kill floor of the processing plant by walking through an 800 race, where the animal's NLIS tag is automatically read and recorded. The animal proceeds to the knocking box for stunning and slaughter. A plastic tag is then placed on the hock at the Achilles tendon to identify the carcass. This carcass/body number is issued by the production system in sequence. The hide is also tagged for identification against the body, as is the offal and intestines using the body ID plastic tag. The offal is then conveyed in segregated lots to a separate evisceration table in the processing plant. The NLIS tag which is still attached to the animal head is also removed once dentition is verified and recorded and is now replaced by the carcass/body identification number.

NLIS tags of slaughtered animals are recorded on the kill sheets for the day and upload to the NLIS system showing the animal as now deceased. The hung carcass is then separated into four quarters and these are allocated a barcoded body number associating the quarter with the carcass.

Picture: Example carcass/body tag

4.3.1.3 Chilling

The four quarters of the carcass are placed in a chiller to lower the core temperate of the meat. Data is recorded on the production system for temperature at 6 points including the surface and the thermal centre of each body quarter, and the air velocity. There is currently no data linking each chiller to the chilled body quarter.

4.3.1.4 Grading

Grading of carcass quality and weight is undertaken using the Meat Standards Australia (MSA) grading system. This process again separates the carcass and body quarters into graded blocks. Six blocks are loaded according to the quality grading to then move the carcass on rails to the boning area.

4.3.1.5 Boning

The boning room is capable of linking the carcass/body number with the batch number of the boned meat cuts. The batch numbers link the 600 body serial numbers entering this process over a 7.6 hour period, with 4,000 cartons of meat that emerge, recorded on an hourly basis. The system records the time and motion hourly enabling the link with data such as employees on the shift and the inputs and outputs.

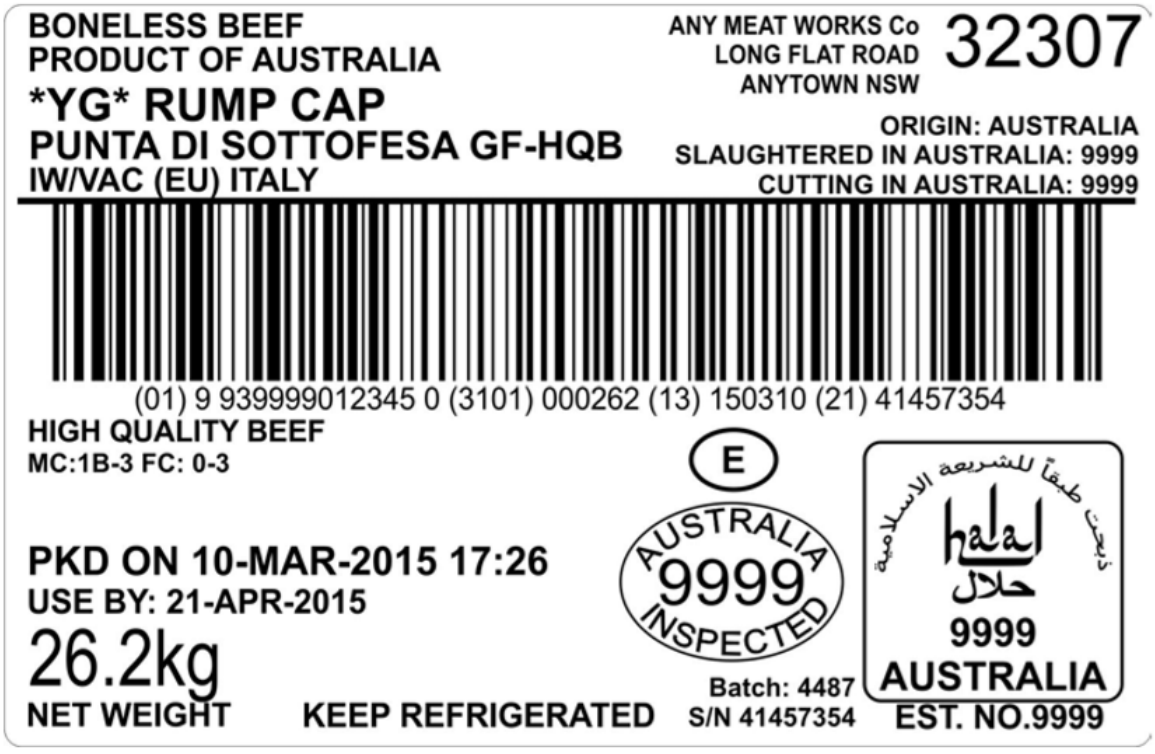
Traceability at this stage reveals the body numbers processed within the hour, so a recall can be achieved on all batches, including the cartons processed in the same hour in the boning room, the boning room operators involved, the body quarter and the carcass IDs associated with the animal NLIS ID.

Furthermore, isotopic analysis can reveal the specific animal, if required. However, this additional assurance is expensive and identification at batch level is the more affordable industry norm.

4.3.1.6 Bagging and boxing

The process to bone, bag and box the boned quarter takes 1 hour and 20 minutes. The meat product is placed in a plastic food grade bag and then placed in the cardboard carton. An average carton contains 20kgs of product. The carton label now becomes the "licence plate" for the product for shipment and delivery to customers in Indonesia.

The carton label records the batch number and the number of pieces in each carton, the date of production, the processing plant identification. The carton is identified with a serial shipping container code (SSCC), which will in turn be associated with storage and transport pallets.



Picture: Template label

4.3.2 Critical Traceability Events – meat processing

Critical Traceability Event	Data custodian	Identify	Capture	Shared with
Lairage	Meat Processor	Animal ID eNVD Livestock Movement Record	LPA NLIS tag eNVD	NLIS database
Receival and slaughter	Meat Processor	Animal ID Carcass ID Carcass quarter/body ID Intestine and Offal	LPA NLIS tag Carcass tag Quarter tag barcode Batch code	NLIS database Meat processor operating system
Boning	Meat Processor	Body quarter ID	Hourly batch record	Meat processor operating system
Bag and box	Meat Processor	Carton ID batch number number of pieces in each carton date of production processing plant ID	Carton barcode	Meat processor operating system
Carton enters storage	Meat Processor	Cartons on each pallet Production date Date for ageing completed (FIFO)	Carton barcode Pallet SSCC	Meat processor operating system

4.4 Meat storage

4.4.1 Description of processes

Figure 6 Meat storage critical traceability events

4.4.1.1 Storage and packing

Halal meat should be stored at the same location where the animal is slaughtered and processed into meat products. The storage facility is co-located on the site of the meat processing plant, with a conveyor transporting cartons from the boning room across to the facility for storage prior to distribution or further retail-ready processing and packaging.

At the storage facility, each carton of chilled product is received and the barcode on the carton is scanned into the enterprise system of the Meat Processing Company. The cartons are placed on a pallet, which is barcoded then allocated to a storage position. Generally 42 cartons (6 per layer x 7 layers high) are placed on each pallet and are now counted as a batch associated with the pallet ID. The pallets are placed to age for 12 days.

Cartons of rump steak may be returned to the processing plant at this stage to be vacuum packed into food service-ready packs for export. They are then returned for cold storage.

The cartons are placed in cold storage at a core temperature of -18°C so that the activity of micro-organisms comes to a standstill and enzymatic degradation processes are suppressed. From this point in the supply chain the product remains cartonised and frozen until delivery to the consumer outlet in Indonesia.

At the Cold Storage Facility, market labelling compliant with Indonesia and container packing is activated by a purchase order placed by the Meat Exporting Company once a Contract of Purchase between the Meat Processor and the Meat Export Company is concluded. Labelling for Indonesia must be in Bahasa and contain the following information (usually in English as well as Bahasa) –

- Description of goods
- Country of origin
- Country of destination
- Establishment of origin (usually Halal establishment number)
- Date of production
- Net weight
- JKT.

Packing for shipment to Indonesia is done on a full container load (FCL) basis. The purchase order is matched with an order reference number at the warehouse, which is in turn associated with barcoded pallets and cartons to be loaded in each container.

4.4.2 Critical Traceability Events – Meat storage

Critical Traceability Event	Data custodian	Identify	Capture	Shared with
Labelling of cartons for Indonesia	Meat Processing Plant	Halal Certificate No. Description of goods Country of origin Country of destination Establishment of origin (usually Halal establishment number) Date of production Net weight JKT	Label and Barcode	Meat export company
Cartons loaded into container	Meat processing plant	Carton ID Order reference number	Barcode scan Packing list	Meat export company
Container seal affixed	Meat processing plant	Seal number	Biosecurity Australia database	Quarantine agency Indonesia

4.5 Meat Export

4.5.1 Description of processes

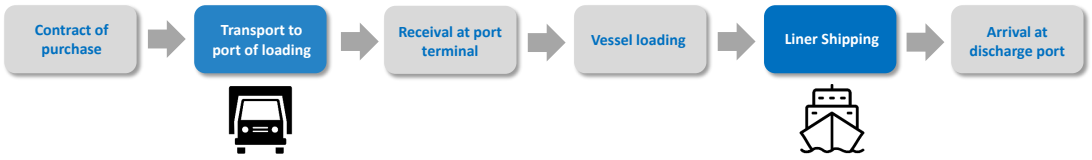


Figure 7 Meat export critical traceability events

4.5.1.1 Preparing for export

Preparation of shipment documentation is an iterative process between the Meat Exporter Company purchasing the product, the Meat Processing Plant export team and the Cold Storage Facility.

The Meat Export Company will buy one month forward of shipment, indicating when the shipment needs to be available in the Indonesian market. A contract of purchase is sent to the Meat Processor and a loading date is agreed.

The Meat Export Company will engage the Shipping Line and make a booking. Shipping instructions from the Shipping Line are issued to the Meat Export Company detailing –

- Vessel name
- Shipping Line name
- Voyage number
- Container release number

- Container yard for collection of empty container for packing
- Vessel receival days.

The Shipping Line will prepare a Bill of Lading which is forwarded to the Meat Exporter for confirmation. The final Bill of Lading is then sent to the Shipping Line and becomes the written evidence of the receipt of the goods by the Line, the contract of carriage and the engagement of the Line to deliver the goods at the destination port to the lawful holder of the Bill of Lading. While the container is in transit at sea, this Bill of Lading is sent to the Meat Importer in Indonesia, allowing the goods to be transferred to the Meat Importer's custody.

The Meat Export Company will conduct a check of labelling requirements and port marks for all meat shipments to ensure they are compliant with Indonesian regulation. The exporter will also provide all required documentation to its customer, the Meat Importer located in Indonesia.

The Meat Exporter will prepare an Interim Halal Certificate for the shipment which is sent to the Australian Halal Development and Accreditation (QLD-based certification body accredited by Indonesian Ulama Council (Majelis Ulama Indonesia/MUI ULAMA) to be stamped and returned.

The Meat Exporter is also required to obtain an embossed Health Certificate from Biosecurity Australia, which is a country requirement for Indonesian meat imports. This document is couriered and cannot be lodged electronically, as is the case for other export markets.

Containers cannot be received at the Australian container port terminals unless they are pre-approved. This avoids extended delays at the port terminal gate and makes for more efficient operations. Normally, it is the responsibility of the Meat Export Company to submit a Pre-Receival Advice (PRA). However, under the Incoterms (FAS – Free Alongside Ship) the case study Meat Processing Company or wharf cartage transport carrier will prepare the PRA as the shipment is the Meat Processor's responsibility until delivered at the loading port terminal.

The Container Terminal Operator is able to check the container in its 1-Stop Pre-Receival Advice database, which is lodged through the 1-Stop web portal or via direct EDI exchange.[3] The PRA details –

- Container drop-off
- Export container number
- Verified Gross Mass of the container
- Commodity code
- Destination.

Pre-Receival Advice (PRA) is a form detailing a description of a container prepared by an Exporter, Forwarder, Packer or Trucking Company. PRA message is sent to Terminals when Containerised Cargo is bound for Export or Domestic movement. This message is sent to the Loading Port of departure, who will respond with a message (APERAK) indicating that the PRA was accepted or rejected. You need to have an accepted PRA before your container is allowed entry to the terminal.

Currently, the following terminals that use PRAs are:

- Patrick
- DP World
- AAT

[3] https://www.1-stop.biz/Services/Documents/1-Stop%20Gateway/1-StopGatewayPRA-CUST-User%20Guide.pdf.

4.5.1.2 Transport to the port terminal

The Transport Company receives transport instructions from the Cold Storage Facility. A vehicle will be dispatched to collect an empty container matching the export container number and container release number, from the nominated empty container park, normally owned by or supplying the Shipping Line. The driver will then deliver this empty refrigerated container to the Cold Storage Facility in time for it to be packed and delivered to the container terminal at the port of shipment. Once packed, the full container will be sealed and its Export Container Number (ECN) or container ID recorded against the seal number. This seal will only be broken by Quarantine authorities at the Port of Discharge, Tanjung Priok port in Jakarta.

The Transport Company will arrange a vehicle booking slot to deliver the container to the required port terminal, to await loading on the vessel. Bookings for access to port terminals in Australia are made by the Transport Company through a vehicle booking system which controls access and manages terminal capacity. This system records the registration number of the vehicle as it arrives, the weight of the container, the export container number, and the temperature of the container.

1-Stop database records the PRA acceptance, when the container is gated to the terminal and when the container is loaded. 1-Stop interfaces with the Meat Processor and Meat Export Company in the following formats –

- Verified mass – EDIFACT 1.2
- PRA messaging – XML, EDIFACT 2.9, APERAK, CSV and XSD.

The company is developing APIs for information/port data in late 2019 and has plans for APIs for the Vehicle Booking System and a payment system called ComPay.

The terminal will allocate a “slot” for the container to await loading on the vessel. The container will be plugged into power to maintain refrigeration of the container.

4.5.1.3 Vessel loading

Once the vessel has moored and is ready to load, the container will be brought to the ship by a straddle carrier and the ship crane will lift and position the container on board.

The container is loaded at the Brisbane port terminals and the Meat Export Company is notified when the vessel has departed by the terminal operator through the 1-Stop system. Estimated and actual times, export receival start and cut-off dates are also accessed via 1-Stop.

4.5.1.4 Liner shipping

The port of discharge maintains a live feed of shipping movement against schedules. Once the vessel is exiting or entering the port shipping channel, vessel traffic management will be notified, and a subsequent message sent to the Export Meat Company that the vessel has departed the port.

During the voyage, location and temperature data is available to shippers via the shipping line customer portal, or from data loggers within the container. Transmission can be limited by communication networks while at sea and loggers may not transmit until within range of a network. There may also be interim port stopovers. The container may be re-positioned during these unloading/loading events.

Customers are encouraged to enter the Bill of Lading number, container number, or booking number, to track the shipment. The example below is from Maersk, providing tracking of a specific container.

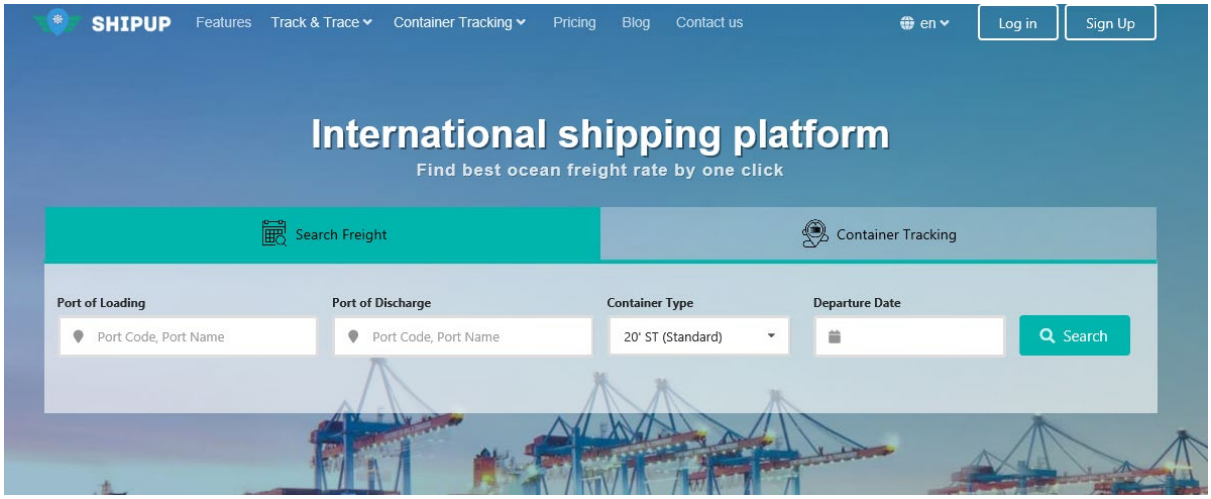


Figure 8 Container Tracking portal Maersk Shipup

A Partlow Chart or data loggers placed in the container record data on the temperature, humidity and impacts on the container during transport. On entering and leaving the container yard; when being loaded on to a train or truck; parked in the port terminal and during the voyage on board ship. Throughout the journey, modems notify staff of the Shipping Line of any irregularities and intervention can be undertaken.

4.5.2 Critical Traceability Events – Meat Export

Critical Traceability Event	Data custodian	Identify	Capture	Shared with
Contract of purchase	Meat Exporter	Quantity No of cartons Description of goods Pack type Source Establishment number Shipment month Port of loading Destination Freight Marks Incoterms code Purchase terms Payment terms Special conditions	Emailed document	Meat Processor
Prepare for export				
Transport to port of loading	Meat Processing Company Transport company	Proof of delivery PRA Release	Transport POD readout PRA release no. from 1-Stop system (EDI or website)	Meat Exporter
Receival at port terminal	Container Terminal Operator	Notice that container received	1-Stop system notification	Meat Processing Company
Vessel loading	Container Terminal Operator	Notice that vessel is loaded	1-Stop system notification	Meat Exporter
Liner shipping	Container	Location Temperature	Container Tracking System	Meat Export Company
Arrival at discharge port	Shipping Line	Email confirmation that vessel has arrived		Meat Exporter Meat Import Company

4.6 Meat Import

The Indonesian Departments of Agriculture and Trade determine the volume and product mix that any importer can achieve. The Licence to import is for a 6-month period and an importer is required to use 80 percent of the permit allowed. An importer must have a Letter of Recommendation and Import Permit for each product e.g. tails, loin.

Imported Australian grass-fed frozen beef is sold into four major channels in Indonesia, being –

- Food manufacturing
- Supermarkets
- Food service
- Butchers and wet markets.

4.6.1 Description of processes

Figure 9 Meat Import Critical Traceability Events

The process of import commences when the Australian Meat Export Company notifies that the vessel has arrived at the Port of Tanjung Priok.

4.6.1.1 Customs clearance

Port clearance in Indonesia relies on the importer having all correct paperwork submitted and all fees paid. In 2015 major steps to reduce clearance delays in Tanjung Priok were enacted, including electronic lodgement of import clearance documents. Importers must have an identification number (NIK) issued by the Director General of the Customs and Excise agency. They must also have an Importer identification number (API).

The Importer is required to lodge information/copies of –
Basic documents -

- Commercial invoice
- Bill of Lading
- Certificate of Insurance
- Packing lists detailing carton ID
- Import permit
- Customs Import Declaration.

Further documents and information for meat imports -

- Halal certification
- Correct Country of Origin labelling
- QA certificate
- Health Certificate
- Number of cartons
- Correct product identification e.g. frozen beef
- Port of loading
- Discharge port
- Slaughter dates - meat must be sold within 6 months of import and within 2 years of slaughter, so the requirements for slaughter dates are important.
- Container number
- Container seal number
- Port mark.

4.6.1.2 Quarantine inspection

Once unloaded at the port terminal, the container is placed on power to maintain refrigeration. The container will typically spend 20 hours in port clearance. All required documentation is uploaded electronically into the Customs and Quarantine system. Quarantine inspection takes place during this period. Quarantine inspectors will break the seal placed on the container and inspect a random sample of product and documentation.

Once the quarantine inspection is complete, the Importer will be notified of the status of the container – green channel is cleared; yellow channel requires more information; red channel will require physical inspection. Once cleared by Quarantine, the Importer requires a container seal be attached to the container to replace the previous seal. This is to ensure the security of the container, given some containers may be transported as is for direct delivery to customer locations in Java.

4.6.1.3 Transport to cold storage

The Meat Importer will normally contract transport to pick up the container from the port terminal. In the case study supply chain, the Importer is also owner of the transport company, so transport instructions are part of the importer's internal operations system and conducted electronically. The transport receives a pick up order from the system, covering the container details (container number, shipping line, 20 or 40 foot reefer/hi cube reefer) and the discharge terminal details. There is no pre-receival advice to the terminal operator and no vehicle booking system at the terminal. The vehicle arrives at the port gate with the paperwork and queues to have the stevedore load the container. The trip from the port to the importer's cold storage distribution centre takes around 3 hours and is usually conducted at night when traffic congestion is lighter.

4.6.1.4 Receival at Importer Distribution Centre

The case study Importer distribution centre has four loading docks. The vehicle is engaged at the dock and an inflatable seal is activated around the container door to maintain cold chain.

The Importer uses a Microsoft Dynamics AX Warehouse Management System which interfaces with the Meat Importer Company's SAP system. The delivery order and container number are verified in the system. The cold storage DC administrative staff match the purchase order against the container manifest.

The Transport delivery document is then signed and stamped. A photo is then taken of the container prior to the seal on the container being removed and its number recorded.

4.6.1.5 De-vanning and storage

The container is unloaded (de-vanned) and the cartons are placed on plastic pallets. It takes up to 3 hours to de-van. Each barcode is scanned on each carton and the system checks the quantity and item. Trace back of product is via the scanned carton, associated country of origin and invoice. All cartons are scanned in and then out of the facility. The pallet loaded with cartons is then shrink-wrapped and allocated a label detailing FIFO (first in-first out) code for storage. Frozen storage is in high density mobile racking in a 12-metre high facility. Every hour the temperature is monitored, and generators are installed for power backup.

Pictures: Meat Importer Company cold storage facility operations

4.6.1.6 Pick and pack

Picking is activated by a work order (RMA) from the Meat Importer Company. The work order details the customer name and account number, the sales order number, quantity, item ID, item name and the price per kilo. An internal barcode is allocated which links the work order with the carton. The sales are made on the basis of full cartons.

The pallets are brought to the outbound area adjoining the loading docks for breaking down into individual cartons. Each carton is scanned against the work order. A scannable customer shipment label is then assigned to each order detailing the customer name and location. RFID pick systems are not installed so inventory management is heavily reliant on barcoding and allocation to pallet positions in the warehouse management system. It was noted that the equipment had been tried but in temperatures of -20c the equipment had failed.

4.6.1.7 Outbound distribution/dispatch

Orders are loaded on reefer containers with a mix of Halal frozen products for inter-island transport e.g. Kalimantan, Sumatra, Sulawesi, Bali. Product is also loaded into the fleet of refrigerated rigid trucks for regional deliveries on Java e.g. Bandung. Small refrigerated vans undertake delivery to retail outlets within Jakarta's network of narrow streets, including a number of small outlets established by the Meat Importer Company for food service distribution and end consumer sales.

Checking of cartons for the mixed shipments to other islands is done manually by a loading clerk as a check against the route plan designed for most efficient customer distribution. The distribution centre operates 3 shifts across a 24-hour period – the first for outbound distribution loading, the second for inbound and the third for overnight pick and pack. Trucks are loaded for dispatch between 1.00am and 6.00am each day.

Trucks and barges are used. Containers are plugged in on barges and gensets are used to maintain the cold chain during distribution. Island outlet replenishment involves around 20 container shipments each week.

4.6.1.8 Biosecurity monitoring

Indonesian quarantine officers conduct random checks of the Meat Importer Company distribution centre. Additionally, provincial island biosecurity officers also conduct inspections on a province-by-province basis, due to specific biosecurity requirements associated with protecting island ecosystems. This can require specific entry permits (SKI) that attract a per kilogram fee, which adds to the cost of inter-island distribution.

4.6.1 Critical Traceability Events – Meat Import

Critical Traceability Event	Data custodian	Identify	Capture	Shared with
Port clearance	Meat Importer	Correct product ID Number and ID of cartons Port of loading Discharge port Slaughter dates Container number Container seal number Port mark	Commercial invoice Bill of Lading Packing list Scan of carton barcodes Certificate of Insurance Customs Import Dec Health certificate Container seal	Directorate General of Customs and Excise Indonesia Indonesian Agricultural Quarantine Agency (IAQA)
Transport to Meat Importer DC	Meat Importer/ Transport	Transport instruction Container number Importer container seal number	Container number on Transport Instruction checked manually	Meat Importer
Receival at Meat Importer DC	Meat Importer	Container number Delivery order Purchase order	Photograph Barcode scan into WMS – Microsoft Dynamics AX system	Meat Importer ERP system

De-vanning and putaway	Meat Importer	Carton ID Country and processor origin Product ID Product weight Slaughter date	Barcode scan recorded in WMS system Carton label	WMS system
Critical Traceability Event	Data custodian	Identify	Capture	Shared with
Pick and pack	Meat Importer	Customer name Customer account ID sales order number, quantity, item ID, item name	Customer order Work order Scanned barcodes on each order in WMS New customer order label barcode	Meat Importer ERP system WMS
Dispatch	Meat Importer	Customer Name, Customer account number/ID, Order ID, picking list, work order Carton IDs	Manual checking that items loaded match Customer Order	Meat Importer ERP system WMS

4.7 Sales channels

Retail grocery continues to be dominated by traditional outlets – wet markets and small on-street vendors. The figure below shows the lack of penetration of the hypermarket and supermarket, while the minimarket is gaining market share.

	2012	2013	2014	2015	2016	2017
Convenience Store/Minimarket	6.26	7.29	7.76	8.05	9.51	10.38
Hypermarket	3.24	3.26	3.22	2.94	2.87	2.81
Supermarket	5.43	5.57	5.46	5.04	5.32	5.45
Traditional	93.24	88.72	83.02	79.14	85.05	90.48

Figure 10 Retail grocery channels Indonesia Source: USDA 2018

4.7.1 Description of processes

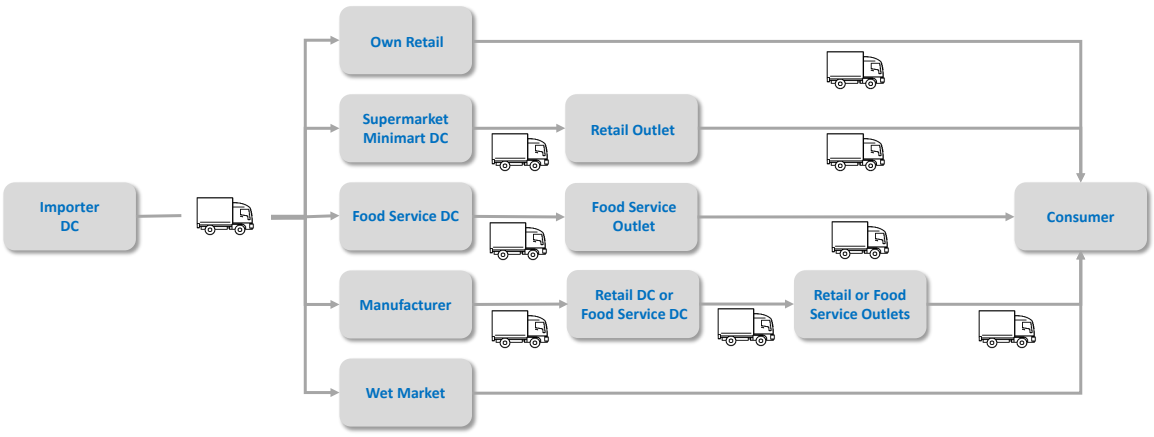


Figure 11 Meat Import and Distribution Critical Traceability Events

4.7.1.1 Supermarkets and minimarts

Modern format supermarkets are the focus of retail distribution for the case study Meat Importer Company. Larger supermarkets are operated by four larger scale retailers – Carrefour/Trans Mart, Giant, Hypermart and Lotte Mart.

It is notable that an emerging younger group of Indonesian consumers with disposable income, who could be termed a "middle class", are seeking the retail experience of buying and eating at small minimarts which are close to residential areas and have refrigerated goods available. These younger consumers have been exposed to global consumer expectations for modern retail formats.

Consumers strongly rely on Halal certification in retail and restaurant outlets. The display of Halal Certificates is mandatory and provides a level of consumer assurance regarding the life and death of the animal and the halalness of the supply chain. The Halal certificate expires each 12 months and must be renewed. Inspections are conducted before New Year's Eve and at Eid al Fitr.

Indonesian consumers are provided with less information on meat product labels than their Australian counterparts. Meat is specified as suitable for certain dishes on the labels. In terms of traceability, the point of sale barcode relates to the retail pack and the retailer's ERP system.

Pictures: Supermarket meat labelling and display of Halal Certificate, Giant Supermarket Tangerang Selatan, Banten

Fresh meat in supermarkets is given a shelf life of three days. Cartons of frozen meat from Australian suppliers do not have an expiry date on the label, so assessing the shelf life is problematic. The retailer adds an expiry date manually to the cartons and meat packs, as they are placed in cold rooms at the retail outlet for up to three months.

Retailers are concerned about food safety and have no information on how cold chain has performed through the shipping leg, in land transport, or when the container has been opened for inspection at the port or loading dock.

Retailers have the carton ID, the lot number associated with that carton, the supplier barcode which is linked with the vacuum pack code for meat portioned. Vacuum pack labelling is maintained on the pack in storage to enable product recall. Retail packs made up from cartons of meat are allocated a point of sale barcode consistent with GS1 global standards. Each store orders manually and the frequency of replenishment varies, generally involving weekly deliveries. Stores often prepare their own retail packs, with small cold rooms in the store.

While traceability is a concern expressed by consumer in the more upmarket stores, the typical consumer makes buying decisions largely based on the halal assurance system and the cost of the meat.

Food safety associated with temperature and expiry dates have improved product traceability, with the retailers creating specifications and higher standards for suppliers consistent with ISO 22000-22005. Very few domestic suppliers are able to comply with the retailer standards. Over the past three years, working with suppliers on the implementation of food safety standards, there has been a significant improvement in supplier and retail outlet compliance in the areas of temperature monitoring, application of expiry dates and pest control.

4.7.1.2 Importer retail outlets

The Meat Importer has established small footprint retail/wholesale outlets, which enable food service chefs to come and sample the imported products. These outlets are also open to end consumers. Frozen beef is available at these outlets in retail-ready packs and in larger wholesale volumes. These outlets have spread beyond Jakarta to other locations in Java and other islands using the cold chain infrastructure established by the importer.

Chefs may purchase product directly from these outlets, rather than relying on the wet market for supply. There are 12 of these store formats in Jakarta, moving product closer to consumers and encouraging cafes and smaller restaurants to use frozen and refrigerated product.

As with the supermarket, the labelling on these products does not enable the buyer to view information on country of origin or production date. The labelling advises the customer the product is, for example, “Dading Rawon” or beef suitable for beef black soup, its weight and price and a best before date.

4.7.1.3 Food manufacturing

Food manufacturers source the frozen cartons of Australian meat product from the Meat Importer. In the case study there is no wholesaler intermediary. The cartons are delivered on pallets and stored by production date on the carton label until called forward to the production floor through the production planning schedule. Barcode scanning of cartons is undertaken at the loading dock on receival.

The manufacturer’s food service customers such as fast food franchises receiving the products require traceability of product code and the source of ingredients.

The food manufacturer uses the ISO22000 food safety system and conducts an annual simulation exercise on traceability. Changing the culture to standardise and embrace a systems approach has been a major focus of the quality control staff.

The food manufacturer uses a serialised code to link the lot code to a batch number consisting of five cartons. The production code allocated to each product enables the link to the lot number which is associated with the purchase order. Within two hours, the company can locate the production code records at each of its factories. Laboratory tests on a sample of products also assists in any recall where the question of cause and accountability is examined across the manufacturer, the distributor and the hotel or food service. It is important to note that an individual product may contain 17 ingredients with the meat representing only one of these ingredients.

The manufacturer operates an inbound and outbound warehouse to store inbound ingredients and outbound finished goods. Risks related to cold chain management are managed by regular temperature monitoring in the warehouses and placement of data loggers in transport during distribution. The Sales Order activates the pick and pack and outbound delivery process. For the inbound deliveries there is a manual tally sheet receival system and no proof of delivery verification. Once the carton is unloaded it will be scanned and the ID recorded in the production system.

Confirmation of delivery to customers is also a paper-based system, with the receiver and driver signing the delivery printout. Tracing missing cartons of product in transport is difficult. Refrigerated transport is owned by the food manufacturer.

4.7.1.4 Food Service

The Meat Importer Company supplies to a range of food services, including restaurant chains across Indonesia.

The restaurant chain in the case study owns a Distribution Centre which is operated by a 3rd party logistics company (3PL). The distribution centre has a number of KPIs to meet in relation to traceability and food integrity. The warehouse is certified as a halal establishment. The operator has quality control staff who manage all specifications of the food service. A warehouse management system is in place to manage inventory delivered from a range of suppliers. A first in-first out system is applied to the meat cartons, based on expiry dates. In the case of cartons of frozen beef, the slaughter date must be used.

Frozen meat is received in the carton and will be delivered intact to the restaurants. The carton ID and slaughter/production date is recorded manually at each restaurant. It is placed in refrigerated transport (set at 8-10c) along with chilled products and delivered by contracted transport to the restaurant outlets. Duration of deliveries can be eight hours in traffic. The product is placed in cold room freezers at the restaurant. Each day the whole cartons are brought out in date sequence and thawed in the refrigerator. Meat portions are cut and placed on plastic in the cool room before meal preparation and consumption on the following day.

Beef is the second most popular meat after chicken for restaurant consumption. The highest priority of restaurant patrons is the halalness of the meat. The frozen meat is preferred as an input, given the product is highly spiced, tenderised and frequently cooked for a long period. Meat is never consumed in a rare state, which is against Halal principles.

In the instance of a recall, the product can be traced back to the supplier. The product in stock will be removed from circulation and any portions or cartons at the outlet from the supplier with the same production/slaughter date will be quarantined.

4.7.1.5 Wet market

The wet market is a traditional meat outlet for Indonesian consumers and restaurant buyers. Some frozen beef products, including offal, are sold into the butchers in wet markets. The majority of meat sold is fresh slaughtered hot carcasses slaughtered at abattoirs outside Jakarta the evening prior to sale. The butchers bone the meat on the premises and sell direct to end consumers or chefs.

There is no traceability beyond the butcher's own record of purchase, which may detail the carton ID and the slaughter date. There is no refrigeration at many wet markets and the butchers are optimistic that all product will be sold each day.

Feedback from the wet market butchers is that consumers prefer the fresh meat, the thawed frozen cuts discolour rapidly and the meat is reported to have a peculiar taste described as metallic, which the butchers put down to "some chemicals used".

President Joko Wododo has committed to invest in infrastructure upgrades to local wet markets in Indonesia and this program has commenced. However, it is unsure whether this will stem the loss of market share which appears to be transferring to the new modern minimarkets.

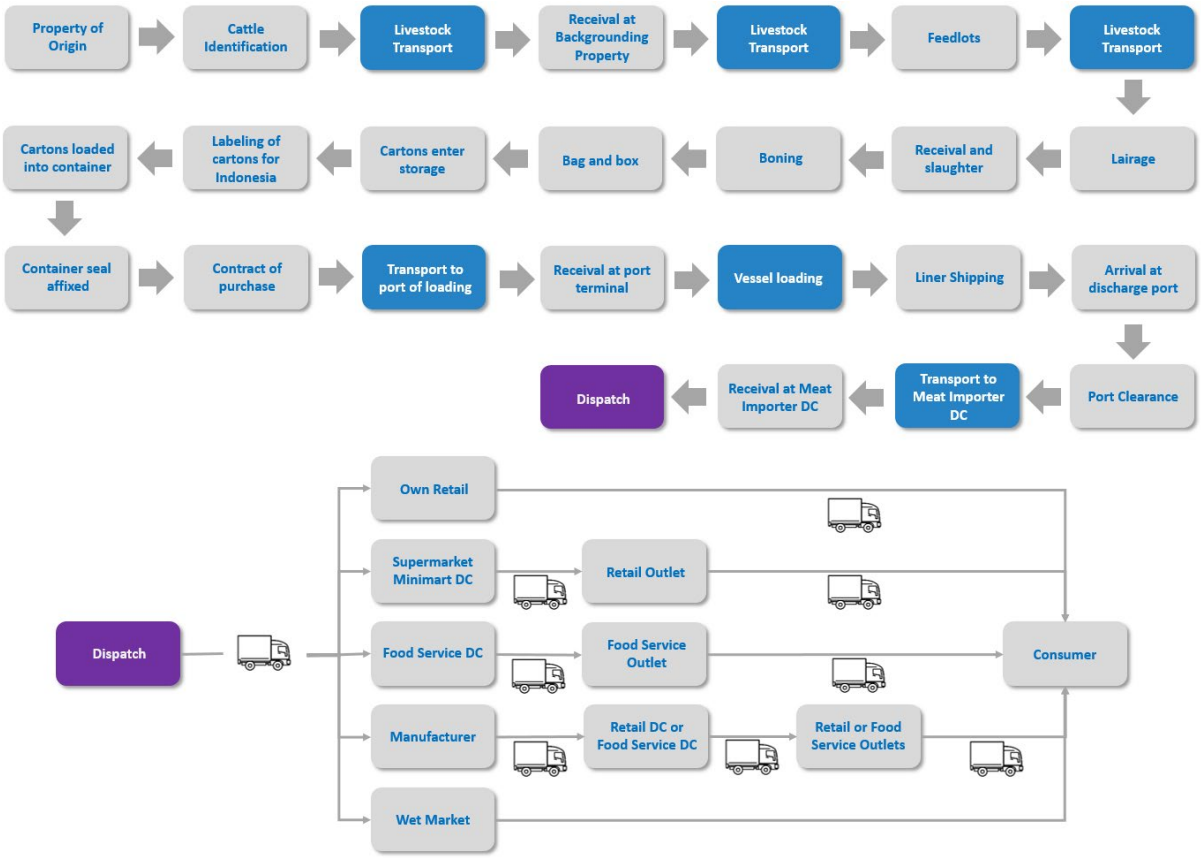
Pictures: Wet market, Pasar Mayestik, Jakarta

4.7.2 Critical Traceability Events – Sales Channels

Critical Traceability Event	Data custodian	Identify	Capture	Shared with
Receival at supermarket or food service DC	DC operator	Carton barcode ID Production/slaughter date in lieu of expiry date	Manual or barcode scan into WMS	Retailer/food service ERP system
Receival at manufacturer warehouse	Manufacturer	Scanned carton barcodes Production/slaughter date in lieu of expiry date	Barcode scan	Production system B2B Customer on request
Transport to food service or retail outlet	Transport operator	Delivery docket	Paper-based copy signed by receiver and transport operator	Retailer/food service ERP system
Receival at food service/retail outlet	Receiver	Delivery docket manual reconciliation with supply order system	Manual from delivery docket and on-line order system or paper record of product received	Retailer ERP system and/or order sheets in-house
Sale to consumer	Food service	Weight Price Best before Expiry date	POS device	Retailer/food service ERP system

5 Discussion

5.1 Critical traceability events



5.2 Traceability gaps

5.2.1 Labelling

The case study Indonesian manufacturer, food service and supermarket companies raised concerns regarding the lack of **expiry date information on the carton labels**. Expiry date is a key item of information which is required for food safety purposes by these buyers. The cartons of frozen beef supplied into the market have slaughter date and packing date. An expiry date located on the vacuum packs inside the carton would also be very useful.

Another traceability gap is the labelling requirement for including all ingredients. According to Article 15 of The Regulation of the National Drug and Food Control Agency (Badan Pengawas Obat dan Makanan or BPOM) No. 31 Year 2018 on processed food labelling, (1) “processed foods produced using more than one ingredients must include the percentage of the *main* ingredients in the list of ingredients”; (2) “main ingredients defined in (1) are the ingredients used to produce processed foods with the highest quantity and/or ingredients that can provide identity of the products”. **There is no clear requirement for producers to include all ingredients used in food products** (except the main ingredients, the use of alcohol, water, food additives, etc). Hence, there is a possibility of consumers to not have access to all ingredient information and other meats, such as the mixture of the Australian beef and other types of meat.

Additional labels which identify the product in the distribution or buyer systems are **not interoperable with the original identifier – the carton barcode**. The systems treat the product as a new product for distribution purposes and effectively "oversticker" the original identifier.

The new barcodes are often not consistent with global data standards and are derived from an enterprise system, so they can only be linked to the original barcode through the Warehouse Management System or Retailer ERP system of the buyer. The originator now becomes the buyer and the information recorded on the original barcode is unavailable to ongoing customers.

Given the paucity of label information for consumers, the loss of the country of origin and processor data means this absence of data is exacerbated and traceability for the end consumer is difficult.

5.2.2 Manual systems

Manual systems persist at each stage of the value chain, making it vulnerable to human error. For example, microbusinesses involved in livestock transport are at **risk of loss or damage to hard copy records and failure to lodge records in on-line systems** create a risk to traceability.

5.2.3 Verification at custody handovers

Verification that the correct freight has been loaded on the correct vehicle is either a manual system or non-existent. This can lead to disputes over lost cartons or pallets and it can elevate traceability risk. The need for **mobile devices or Application Programming Interfaces (**APIs) to link transport operators to transport management and warehouse management systems is evident, given the lack of proof of delivery tracking.

There is a lack of proof of delivery systems and the transport labels are designed for the distributor enterprise system as opposed to the transport task. Labels that are consistent with **global data standards** such as the EPCIS standard would enable tracking and capture using hand held mobile devices to integrate with enterprise systems of suppliers and customers. This is not currently possible, so orders are often via telephone or email and reconciliation of supplier invoices are therefore manual. The use of global data standards allows the data from the carton label to be associated with the pallet, and in turn, the container, truck, barge or vessel. EPCIS data relates to transport events such as pick up time and date, product ID, transport assets such as pallets or containers and the proof of delivery.

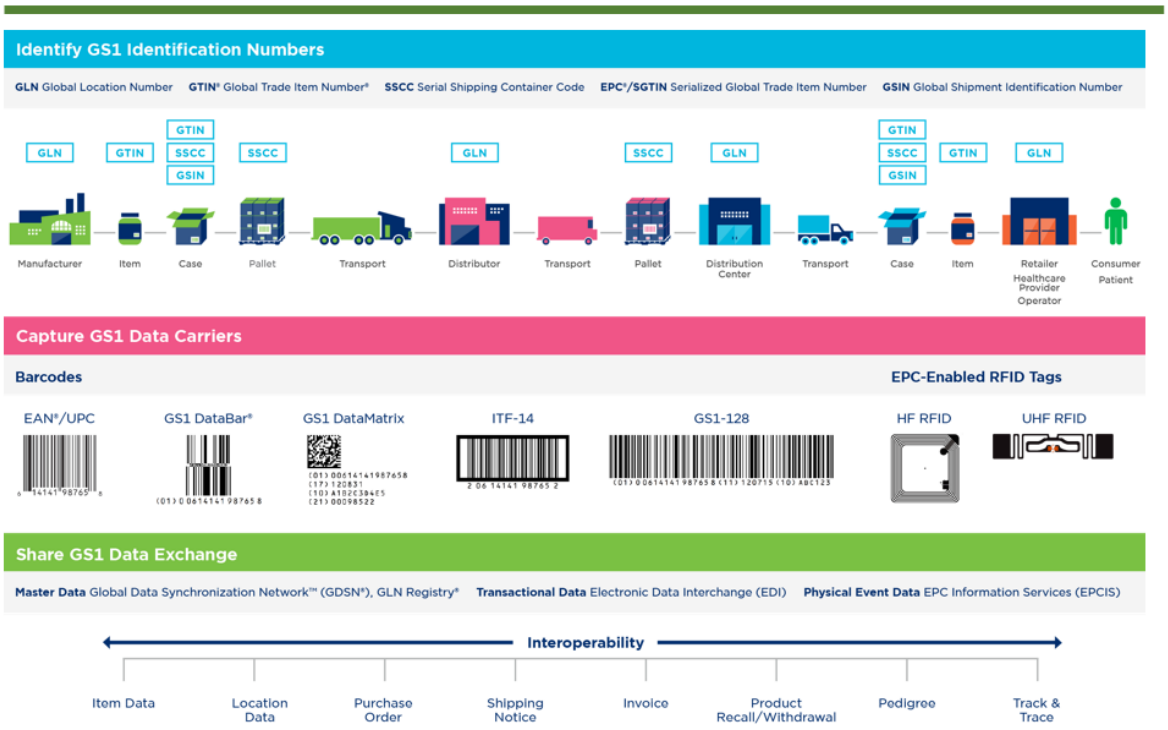


Figure 12 GS1 data standards in supply chain Source: GS1 Australia

5.2.4 Sharing information with non-commercial partners

Each company in the case study understood the importance of traceability within their own identified critical risk parameters, such as biosecurity or food safety. Most of the companies beyond the point of animal slaughter have accreditations with food safety standards (with the exception of the wet market butchers) and undergo regular audit. Inputs and outputs are recorded and most have enterprise level systems to manage inventory and distribution.

However, the concept of end-to-end traceability is not enacted, despite "paddock to plate" notions. **End-to-end traceability is an activity viewed as "external" to the firm**. It is undertaken by a regulator and each company understands that it has a part to play and information to be supplied in the case of an incident or product recall.

In the production phase of the supply chain in particular, data would be more efficiently accessed through the MLA Meat Integrity System by the regulator before contact with each individual business or property to have held custody of the animal in the supply chain.

The B2B customers have reason to trace product on occasion, for example, a manufacturer discovering animal hair in product. In this case, the customer relies on their immediate "one back" supplier, to trace back to their supplier, or supplier's supplier, to address the issue. There is no immediate access to information posted by the producer or the processor, other than the visible information captured in the original barcoding at the processing plant.

Companies with no direct commercial relationship to a custodian of the product, such as the producer and shipping line, can fail to see the value of sharing information. They can also fail to appreciate the value of the information they hold. For example, the retailer in Indonesia is keen to find out the evidence that the cold chain has been maintained from the time the meat has left the processing plant. This information is currently not available to the retailer, however it is held within enterprise-level data by at least eight entities –

- the processor's cold storage facility,
- the road transport operator conducting wharf cartage,
- the port terminal operator,
- the shipping line,
- the Indonesian wharf cartage,
- the meat importer distribution centre,
- the refrigerated transport delivery, and
- the retailer's own distribution centre/3PL warehouse.

Temperature data will be in a variety of formats, from in-carton or in-container data logger readouts, charts attached to container or cold storage thermometers etc.

Australian producers are concerned to deliver the best product into the marketplace. However the commercial relationship usually completes at the port, under the most common free-on-board (FOB) trading terms. Tracking the product beyond this point is relevant to other parties outside the commercial arrangements of the producer.

5.2.5 Consumer demand for traceability

Hobbs (2016) concludes from research conducted in America, Europe and in Asia, that consumers have an interest in the provenance of food - beyond food safety assurance.

> "Even in the absence of a direct consumer willingness to pay for meat traceability itself, however, the demand for credence quality attributes provides an incentive for firms to invest in traceability as a means of delivering product differentiation (Boecker et al., 2013)."

Hobbs also concludes that studies show that branded product attached to provenance and brought to market in Europe and Asia can be demonstrated to attract a consumer "willingness to pay" premium for proof of provenance. However, the case study target market is not the premium Indonesian market and the product is not branded in marketing to the end consumer. The product is aimed at the broader consumer market of household purchases and family restaurants. It is in this context that the following conclusions are reached.

Companies providing meat product direct to end consumers (retailer, food service) report that **Indonesian consumers are largely focused on price and halalness** as the primary factors driving their decision to consume beef. Country of origin of the food consumed is a concern of described "high end" consumers.

As all imported beef is required to be certified as halal, the **Australian frozen product may well have met higher standards than its domestic counterpart**, given less than 40 percent of Indonesia's food businesses, estimated at 1.25 million in 2014, ae not yet certified as Halal. **Halal assurance forms a trust capital between the retailer/restaurant and the consumer.**

In the case study companies, the driver of traceability is to deliver a safe, wholesome, halal product and to be able to allocate liability should that fail. The balance of cost and affordability associated with more precision or depth in traceability systems versus willingness of the consumer to pay, leads to a **"fit for purpose" approach**.

5.2.6 Quality Assurance programs and traceability

Throughout Indonesia efforts are being made to adopt quality systems and improve traceability and cold chain capability, through adoption of standards and use of technology. The recent National Dialogue on Cold Chain Infrastructure and Strategy convened by the Indonesian Cold Chain Association (ARPI), the work to harmonise ASEAN trade nomenclature, BULOG's work to promote adoption of the warehouse receipt, are all examples of industry and government progressing with improvements that will benefit traceability. The formation of the Indonesian Animal Logistics Forum (FLPI) in 2015 represents sustained efforts by industry, government and academia to work towards improving livestock management in logistics.

The assurance programs and work underway will undoubtedly improve the processes and use of technologies to create traceability. An example is the proposed adoption of a cattle traceability system based on adoption of RFID technology.[4]

5.3 Indonesian regulatory systems related to beef imports[5]

5.3.1 Overview of Indonesian livestock policy

The policy environment of the Indonesian livestock industry has been largely shaped by the government's pursuit of **beef self-sufficiency**. In the early years of the Susilo Bambang Yudhoyono presidency, the Indonesian government announced the country's commitment to achieve self-sufficiency in beef by 2005, a target which was then postponed to 2010, and further extended to 2014 (Permani et al. 2016). This long attempt at trying to achieve livestock self-sufficiency has been rolled out through both subsidies and trade constraints, both of which are aimed at reducing import reliance.

A recent statement by the Ministry of Agriculture expressing its optimism to achieve beef *and buffalo meat* self-sufficiency by 2026 [6] indicates the continued importance of understanding various government policies and programs related to self-sufficiency, which to an extent may impact the implementation of both public and private initiatives including those to improve traceability in the beef chains.

[4] http://www.flpi-alin.net/sites/default/files/Presentasi-Traceability-Sapi%20%28Grup%201%29.pdf.

[5] Discussions on relevant Australian regulatory systems are outlined in the earlier sections. These include Australia's National Traceability Performance Standards, NLIS, LPA, and LPA NVD in Section 4.1; the TruckSafe assurance program in Section 4.2; the Meat Standards Australia grading system in Section 4.3; various requirements for meat export in Section 4.5 and Indonesia's import regulations in Section 4.6. Appendix 7.1. provides a comparison between Australian halal requirements and that of Indonesia i.e. Law 33 of 2014.

[6] https://bisnis.tempo.co/read/1219524/kementan-swasembada-daging-sapi-tercapai-di-2026/full&view=ok

The concept of self-sufficiency is highlighted in the **Law (*Undang-Undang* or UU) Number 41 of 2014** on Livestock and Animal Health. More specifically, Article 36B states that live animals and animal products can be imported if the production and supply of domestic animals and animal products are not sufficient to meet consumer demand. Law Number 41 of 2014 also stipulates animal disease prevention (Article 41), and various aspects related to food safety including on monitoring, inspection and test of animal products and requirements for veterinary and halal certification (Articles 58 and 59), among others. This food safety aspect is to be further discussed in the next section.

One characteristics of the many livestock policy and programs in Indonesia is their smallholder focus, particularly through efforts towards increasing national beef cattle population. According to the Ministry of Agriculture's 2018 Livestock and Animal Health Statistics Book[7], between 2014 and 2018 the Indonesian beef cattle population has increased from 14.7 million to 17 million representing an average annual growth rate of 3.7%.

As mandated by the **Decree of Minister of Agriculture (MoA) No. 48//Permentan/PK.210/10/2016**, one priority program currently implemented by the Indonesian Government is special efforts of accelerated increase in pregnant beef cattle and buffalo population or known as UPSUS SIWAB. The efforts comprise of two main programs, namely increasing population through enhancing artificial insemination and intensification of natural mating, and are considered as a follow-up initiative to earlier beef and buffalo meat self-sufficiency programs in 2000-2004, 2005-2009, and 2010-2014.[8]

This smallholder farmer focus is also accentuated by the issuance of an earlier regulation i.e. the **Government Regulation (PP) No 6/2013** on farmer empowerment providing further support for livestock farmers. Some of this support is related to imported animal and animal products. For example, Article 43 states that ministers, governors and regents/mayors aligned with their authority facilitate promotion and marketing of animals and animal products including through provision of information system of animal markets (d) and requiring modern markets to prioritise sales of domestic animal products (e). Meanwhile, Article 45 stipulates that animal product price protection is done through determining the quantity and types of animal products that can be imported as well as the type of business entity in the originating country (1a) taking into consideration the domestic demand and supply of animal products.

In addition to policy priority in improving smallholder farmer, there has been an increased interest in enhancing partnerships in the Indonesian livestock industry. For instance, Article 37 of **Law (UU) No. 41 of 2014** stipulates that the government provides support and facilitates the development of animal product processing industry that prioritise the use of domestic materials. Furthermore, the MoA issued the **Decree of MoA No.13/Permentan/PK.240/5/2017** on livestock business partnership to improve the scale, efficiency, capacity, market access, competitiveness of farm business and other livestock business entities. Efforts towards enhancing partnerships are also implemented through facilitating investments in the industry including foreign direct investments as well as the provision of tax allowance facility. The **President Decree Number 44 of 2016** about lists of business fields that are closed to and business fields that are open with conditions to investment excludes beef related business fields. Meanwhile, the **Government Regulation (PP) Number 9 of 2016** about Tax Allowance Facility for Investment in Certain Business and/or in Certain Regions includes beef cattle breeding and farming.

[7] http://ditjenpkh.pertanian.go.id/userfiles/File/Buku_Statistik_2018_-_Final_ebook.pdf?time=1543210844103

[8] http://pse.litbang.pertanian.go.id/ind/index.php/22-informasi-berita/199-evaluasi-konsep-dan-implementasi-upsus-siwab

In short, based on the above policy overview, it can be seen that while these regulations focus on the development of domestic livestock industry including efforts to improve smallholder farmers and facilitate investments in the industry, they also touch on matters related to the importation of animals and animal products including beef. The regulations highlight that this importation is contingent on both domestic supply and demand for animal products indicating the continued linkages between domestic industry performance, and government's attitude towards beef importation.

5.3.2 Policy related to traceability

Narrowing down the discussion to policy related to traceability of Australian beef exports, the following policy overview is structured based on the relevant concepts of traceability. The existing studies highlight numerous definitions of traceability but most point at "the ability to trace" the history of a meat product – that is where and when it came, and to where and when it was sent. To this end, the traceability systems have been introduced by both public and private sectors to respond to information asymmetry resulted from food safety and food quality attributes.

A study comparing between traceability regulations and requirements in 21 countries suggests that regulations relevant to traceability include those related to: (i) imported products, and the nature of required documentation for imports; (ii) the existence of an electronic database(s) for traceability and, if present, its accessibility; and (iii) labelling regulations to allow consumer access and understanding of traceability (Charlebois et al. 2014) See Figure 13 for more detailed cross-country assessment questions). Based on the overall world ranking scores of countries based on comprehensiveness of traceability regulations for both domestic and imported products, Australia is ranked "average".

Traceability assessment questions

1. Are there specific regulations/policies on national level for domestic products? When did these policies come into effect?
2. Are there specific regulations/policies for imported products? What documents required for import products to address traceability?
3. What is the clarity of the system of authority responsible for traceability regulations?
4. If no specific regulations, are there voluntary practices by industry?
5. What products or commodities are being regulated for traceability?
6. What kinds of identifiers are being used for tracking/registering of imports (e.g., ear tags, barcodes, RFID)?
7. Are Global Food Safety Initiative (GFSI) benchmark standards recognized?
8. Are GS1 services (i.e. traceability tools and coding standards) available?
9. Is there an electronic database system used for monitoring imports/export and their traceability? Are these systems accessible by importing countries?
10. What information on packaging labels is available for the consumer to understand traceability?

Figure 14 Traceability assessment questions Source: Charlebois et al 2014.

In a similar vein, another study suggests the classification of the roles of livestock traceability systems into at least three aspects: (i) ex-post cost reduction, (ii) allocation of liability; and (iii) ex-ante quality verification function (Hobbs 2016), as further defined in Table 3. These first and third roles identified by Hobbs (2016) are associated with the delivery of initiatives such as labelling as well as the use of electronic database as pointed out by Charlebois et al. (2014), while the second role has an overarching objective of providing a regulatory framework for the traceability systems including through policy related to beef importation, food safety, and production and distribution of food products, among others.

Within the context of Indonesia, a regulatory framework specific to food traceability is non-existent. Based on interviews with key industry players, the concept of traceability is largely interpreted as either an integral part of or with a focus on compliance with the Halal certification requirement. This section therefore discusses relevant regulations and initiatives to the three aspects that are potentially related to traceability, namely (i) beef importation and distribution; (ii) Halal and food safety; and (iii) labelling.

Table 3 Roles of Meat and Livestock Traceability System

Roles of meat and livestock traceability system	Initiatives	Indonesian context

Ex-post cost reduction
*** To limit the scope, scale and cost of food safety and/or animal disease problems**
	• Cattle identification (e.g. Australia's NLIS)
	• Beef labelling (e.g. EU to identify where the animals were born, reared, slaughtered and processed)
		• Restrictions on importation of beef
		  ○ MoT Decree 59/2016, amended by MoT Decree 13/2017 and MoT Decree 20/201 on provisions of animal and animal products exportation and importation
		  ○ MoA Decree 34/2016 on importation of meat, carcasses, offal, and/or its processed products
		• Restrictions on distribution of beef
		  ○ BPOM Regulation 27/2013
		  ○ MoT Decree 20/2017 on registration of businesses distributing staple foods (including beef)
		  ○ MoT Decree 96/2018 on reference floor and ceiling price
		  ○ Requirement for cold chain activities: Article 19 f MoT Decree 59/2016; Article 31 of MoA Decree 34/2016
		  ○ Entry of alternative meat products e.g. Indian buffalo meat: Article 22 of MoA Decree 17/2016
		• Halal assurance
		  ○ Law 33/2014
		  ○ Government Regulation 31/2019
		  ○ Other regulations with reference to Halal matters
		• Animal disease prevention
		  ○ MoA Decree 44/2014
		  ○ Article 41 of Law 41/2014
		  ○ Article 9 of MoA Decree 34/2016
		  ○ Quarantine Law 16/1992
		  ○ Importing from a country that is not free from FMD: MoA Decree 17/2016, MoT Decree 59/2016
		• Labelling
		  ○ Article 30 of Food Act 7/1992, amended by Article 96 of Food Act 18/2012
		  ○ Article 16 of MoT Decree 59/2015, and Article 17 on packaging requirement
		  ○ Article 18 of MoA Decree 34/2016
		  ○ BPOM Regulation 31/2018

Allocation of liability
*** To facilitate the allocation of liability for food safety breaches**
	• A legal framework for traceability across all food products (e.g. EU's General Food Law)	• None specific on traceability
		• Food Act
		  ○ Food Act 7/1992
		  ○ Food Act 18/2012

Roles of meat and livestock traceability system	Initiatives	Indonesian context
Ex-ante quality verification function *To facilitate the provision of information on quality attributes to consumers	• Private standards e.g. non-GMO animal feed, animal welfare standards, or other mandatory regulations	• Mandatory halal certification (see relevant laws above) • ASUH (safe-healthy-wholesome-Halal) initiative ○ Article 58 of Law 41/2014 • No private standards found in the case study

Notes: MoA and MoT refer to the Minister of Agriculture, and Minister of Trade, respectively. Within the Australian context, these roles of the meat and livestock traceability system are captured by the National Traceability Performance Standards. In accordance with this, the NLIS is required to facilitate the traceability of animals.

Source: Authors' compilation based on the classification of roles of meat and livestock traceability systems by Hobbs (2016)

5.3.2.1 Beef importation and distribution

Australian beef exports to Indonesia continue to face both opportunities and challenges. Trends in these beef exports are influenced by a number of factors including Australia's domestic livestock prices, competition from the entry of other alternative meat products into Indonesia including Indian buffalo meat and, expected in 2019, Brazilian beef, as well as regulatory complexity with regard to animal and animal products' importation in Indonesia. Indonesia's pursuit towards self-sufficiency also implies that imports of feeder cattle are generally seen more favourable than importing boxed beef given the potential economic gains from feedlotting - and impacts on the country's objective to increase its national cattle population.

In terms of opportunity, however, the Australian beef getting into Indonesia can access tariff reduction under the **ASEAN-Australia New Zealand Free Trade Area (AANZFTA)**.[9] Under AANZFTA base tariff of up to 5% eliminated for most tariff lines by 1 January 2020 including frozen meat of bovine animals carcasses and half-carcasses (HS code 020210), other cuts with bones in (020220), and boneless (HS code 020230). Despite this tariff concession, import licenses have been long considered as a major irritant for many Australian exporters into Indonesia. To this end, the completion of the negotiations for the **Indonesia-Australia Comprehensive Economic Partnership Agreement (IA-CEPA)** marked a significant milestone in the two country's bilateral trade relationships. The key outcomes of IA-CEPA includes Indonesia's guarantee automatic issue of import permits for key products such as live cattle and frozen beef, and for frozen beef, a tariff cut to 2.5% (from 5%) and access for unlimited volume commencing at entry into force, and elimination of tariff after 5 years.[10]

[9] The AANZFTA entered into force of on 1 January 2010 for eight of the Parties, namely: Australia, Brunei Darussalam, Malaysia, Myanmar, Philippines, New Zealand, Singapore and Viet Nam. On 12 March 2010, the AANZFTA entered into force for Thailand and subsequently in Lao PDR and Cambodia on 1 January 2011 and 4 January 2011, respectively. Indonesia ratified the Agreement on 6 May 2011.

[10] https://dfat.gov.au/trade/agreements/not-yet-in-force/iacepa/Pages/ia-cepa-key-outcomes-for-australia.aspx

Provisions of Animal and Animal Products Exportation and Importation have been regulated by the Decree of **Minister of Trade (MoT) No 59/2016**, which was further amended by **MoT Decree No 13/2017**, then **MoT Decree No 20/2018**. MoT Decree No 13/2017 amended the earlier Decree to reflect the increased **weight limit of imported feeder cattle** from a maximum average of 350 kg to 450 kg (Appendix II). MoT Decree No 20/2018 also amends Article 10 of the initial Decree that import permit must be obtained from Director General (previously the Minister). In the subsequent amendments, Article 29 in MoT Decree 59/2016 was removed i.e "animal and animal products not included in the Appendix of this Ministerial Regulation may be imported after obtaining import approval from the Director of Importation by attaching the Recommendation".

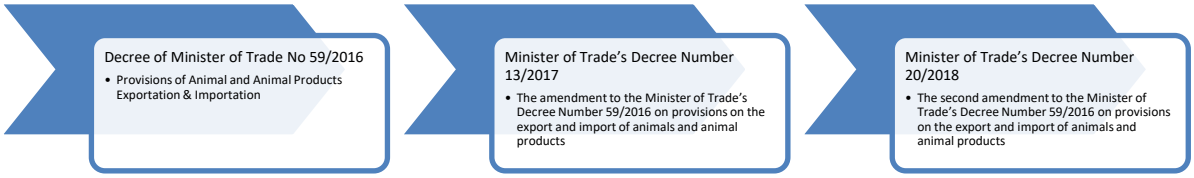


Figure 15 Amendments in MOT Decree on Provisions of Animal and Animal Products Exportation and Importation

The MoT Decree No 59/2016 covers a wide range of topics from import approval requirements to labelling requirements. On **import restrictions**, Articles 7 and 8 of the Decree state that animal and animal products importation is restricted, and this importation could only be done by companies that own API (*angka pengenal impor* – import identification number), state-owned enterprises (BUMN) and regionally-owned enterprises (BUMD). A flexibility for BUMN to import from a country that is not completely free from animal disease to maintain food security, availability and price stabilisation is stipulated in Article 9 of the Decree. This importation can only be done after the BUMN is delegated by Minister of BUMN, who will base the decision on economic coordination meeting at the ministry level with inputs from the MoA.

The MoT Decree No 59/2016 also regulates on **import approval requirements**. Articles 11 and 14 state that these requirements must be submitted electronically (http://inatrade.kemendag.go.id/) to including the import identification number (API), evidence of ownership of cold storage, a recommendation from the Minister of Agriculture and BPOM.

In addition to beef, **offal importation** by Indonesia increasingly presents opportunities for Australian exporters. Driven by the relaxation of beef offal cut restrictions since 2016[11], Indonesia's demand for Australian beef offal has increased significantly. According to the MLA, in 2017–18, Indonesia imported roughly 27,800 tonnes and became Australia's largest destination for beef offal exports.

The Ministry of Agriculture has also issued a number of regulations impacting the importation of beef and other animal products. The **MoA Decree No 34/2016** on importation of meat, carcasses, offal and/or its processed products (effective since 19 July 2016) broadens the type of carcass and bovine meat that can be imported to include prime cuts, secondary cuts, manufacturing cuts, fancy meats and offal including liver, heart, lung, tongue and lips.

[11] As stipulated by the Ministry of Trade (MoT) Decree No 37/2016 on the amendment to MoT Decree No 5/2016 on animal and animal products exportation and importation.

Whilst not directly related to boxed beef importation, another policy that is affecting Australian exporters is the '**5:1 feeder to breeder' import policy**, as stipulated by **MoA Decree No 2/2017** on the amendment to the MoA Decree No 49/2016 on large ruminant importation into the territory of Indonesia. The policy requires importers to import one breeder for every five feeder cattle for feedlotter, and 1:10 for farmers' cooperatives and farmer groups. Article 15 of the Decree also specifies the average maximum weight of 450 kg for feeder cattle based on the PIB (notification of imported goods), and the maximum feeder cattle age of 48 months proven by a letter from the country of origin, and a minimum 4 months of fattening period as proven by a certificate of release. Coming into effect in October 2016, the first audit to evaluate its performance was expected to occur in December 2018 and will be subsequently conducted every two years thereafter.

In terms of the **distribution of imported beef** that enters the Indonesian markets, there are at least four key aspects that should be considered. These include: i) registration of staple food distributors; ii) the price aspect; iii) the requirement for cold chain facilities; and iv) entry of alternative meat products.

Firstly, on **the registration of distributors**, **the MoT Decree No 20/2017** on the registration of businesses distributing food staples require distributors, sub-distributions and agents to acquire a registered licence to distribute the staple foods including beef. The MoT delegates the issuance of the registered licence to the Director General, who then delegates to the Director of Distributor for Staple Food and Essential Item. The application process and registered licence is free of charge and shall be renewed after five years.

On **the price aspect**, food price stabilisation including beef has long been a policy interest by the Indonesian government for example through initiatives such as market operations. **The MoT Decree No 96/2018** on the amendment to the MoT Decree No 58/2018 and MoT 27/2017 on reference floor and ceiling prices stipulates the floor price at the farmer level and ceiling price at the consumer level for eight commodities, namely corn, soybean, sugar, cooking oil, shallots, meat, chicken broiler, chicken broiler eggs. It should also be noted that as one of the staple foods, 'meat' is not subject to value added tax as stipulated by the Minister of Finance Decree No 116/2017 on the staple goods that are not subjected to VAT (PPn). The Regulation defines meat as fresh meat originated from livestock meat and poultry bone or boneless without being processed, including chilled, frozen, chalked, salted, pickled, or preserved by other means.

Table 4 Floor & Ceiling price MoT Decree 96/2018

Commodity	Ceiling price (IDR)
Frozen buffalo meat and beef	Rp 80,000/kg
Fresh/chilled beef	
1. Forequarter (elaborated as forequarter, blade, shank)	Rp 80,000/kg
2. Hindquarter (elaborated as rump, topside, knuckle, outside)	Rp 105,000/kg
3. Brisket	Rp 80,000/kg
4. Trimmings/CL	Rp 50,000/kg

Note: No floor price for these commodity categories.

The third key aspect with regard to distribution of imported beef in Indonesia is **the requirement for cold chain facilities**. Article 19 of MoT Decree No 59/2016 states that animal products as listed in Appendix II can only be imported for the purposes of use and distribution by industries, hotels, restaurants, catering, wet markets that *have cold chain facilities* and/or other certain purposes. Similarly, as stipulated in Article 31 of **MoA Decree No 34/2016**, carcass, meat and its derivatives can be distributed to hotel, restaurant, catering, manufacturing, markets and other certain purposes that *have cold chain facilities*. The Decree also regulates that frozen meat, carcass and offal can be stored for maximum 6 months since arrival stored in a frozen condition at -18° C, and 3 months for chilled products stored in a frozen condition at 4° C (Article 8). The lack of cold chain facilities in many wet markets in Indonesia point out challenges for Australian beef exports to enter these markets and comply with regulations.

Lastly, the distribution of imported beef in Indonesia has also been influenced by **the entry of alternative meat products** particularly buffalo meat from India since 2016. Recent observations suggest that this buffalo meat has been distributed by BULOG through market operations sold at Rp 80,000/kg especially in periods leading up to religious celebrations such as Eid-al Fitr when demand for meat typically reaches its peak. There isn't enough information on the distribution of this buffalo meat in the wet markets. This entry followed the relaxation of importing meat from a country that is not free from FMD, as explained in the next section. More specifically, Article 22 of the **MoA Decree No 17/2016** states that the purposes of importation of boneless meat including from a country that is not free from FMD shall be to stabilise food prices through market operations, as well as to supply meat demand in the aftermath of natural disasters, and fulfil demand for raw materials from the processing industry.

With regard to the distribution of processed foods, the Supervision of Drugs and Food Imports into Indonesian Territory is regulated under the Head of the National Drug and Food Control Agency (Badan Pengawas Obat dan Makanan or BPOM) **Regulation No. 27 of 2013**. Under the Regulation, in addition to a distribution permit (*izin edar*) and any applicable import requirements, food importers must obtain an Import Certificate (SKI). Furthermore, In Article 4, the imported processed food products must have at least 2/3 of the storage life.

5.3.2.2 Halal and Food Safety

Taken from an Arabic word which means lawful or permitted, Halal applies to all facets of a Muslim's life but is commonly used in relation to consumable products such as food and beverages including meat products, cosmetics, and pharmaceuticals, among others.[12] With over 87% of Indonesian population identifying themselves as Muslim, the Indonesian government supported by the Muslims scholars have invested a significant resource in Halal assurance.

Providing a legal and regulatory framework for the enforcement of Halal laws, **the Law of the Republic of Indonesia Number 33 of Year 2014 on Halal Product Assurance** was issued on 17 October 2014 mandating that it would be implemented within a five-year time frame and undertaken gradually by product categories with food and beverages to be implemented within the first year.[13] In terms of governance, the Law No.33/2014 identifies five groups key in delivering halal assurance, namely the Ministry of Religious Affairs, Indonesian Ulama Council (MUI), the Halal Product Assurance Organising Agency (BPJPH), the Halal Examination Agency (LPH) and other Indonesian Ministries with control of drugs, food, industry, agriculture and standardisation and accreditation.

[12] For further information about Halal: https://www.icv.org.au/about/about-islam-overview/what-is-halal-a-guide-for-non-muslims/

[13] For further background information on the Law 33/2014, see AMPC (2017)

Recently, the **Government Regulation (PP) No 31/2019** on Implementing Regulations for Law No 33/2014 on halal product assurance was issued. Article 2 of PP No. 31/2019 states that products and services that are entering, distributed and traded in Indonesia must have a halal certificate. In the same vein, Article 58 of the Law No 41/2014 states that animal products produced in or brought into Indonesia must have a halal certificate in addition to a veterinary certificate.[14] Article 68 of PP No 31/2019 further states that such services include those related to slaughtering, processing, storage, packaging, distribution, sales and services.

Looking at the implementation arrangement, Article 4 stipulates that the halal assurance is implemented by the Minister of Religious Affairs, and to deliver this, the BPJH will be formed under and reporting to the Minister in cooperation with relevant ministries, LPH, and MUI, as well as international bodies, as summarised by Table 5. According to Article 67 of Law No 33/2014, this mandatory halal certification will come into effect five years from the legislation of the Law, or on 17 October 2019.

Table 6 Description of cooperation between BPJPH and other institutions according to PP No 31/2019

BPJPH			
Relevant ministries	LPH	MUI	International cooperation
• Industry, trade, health, agriculture, cooperatives and small and medium enterprises, foreign affairs, and other e.g. food and drug control agency, accredication, etc. (Article 5-19) • E.g. the development of halal industry zone (Industry); • Monitoring of halal products traded (Trade); • Determining standards for slaughterhouses and slaughtering guidelines (Agriculture), • Support for cooperatives and SMEs (Cooperatives and SMEs); • Facilitate international cooperation, promotion of halal products in overseas, and provision of information on foreign halal certification institutions (Foreign Affairs)	• Verification adn testing of a product's halal status, as determined by BPJH	• Certification of halal auditors, including education, training and competency test for auditors (Article 22) • Determination of a product's halal status. LPH to provide halal test results, and BPJPH to verify the results and present to MUI halal fatwa assembly, whose decision will be conveyed to BPJPH and serve as a basis to issue a halal certificate (Article 23) • Accreditation of LPH through sharia compliance assessment by MUI, facilitated by BPJPH (Article 24)	• Development of halal assurance (through technological development, human resources, and facilities and infrastructure of halal assurance, Article 26); compliance assessment and/or recognition of halal certificate (Article 25) • This international cooperation is implemented by BPJPH in coordination and consultation with MoRA and Ministry of Foreign Affairs, and in line with foreign politics, national laws and regulations, and international norms.

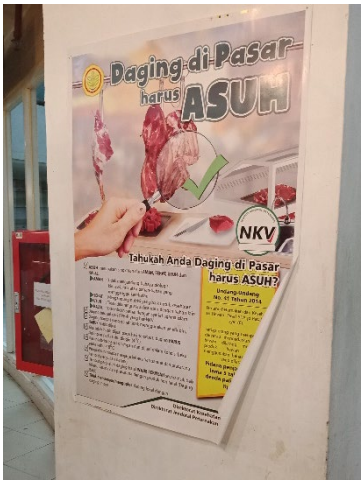
Source: Authors' compilation

PP No 31/2019 also regulates **the registration process of halal certificates from overseas**. Article 64 stipulates that halal products certified by foreign halal certification bodies that have a partnership on recognition of halal certificates with BPJPH are not required to apply for a halal certificate (in Indonesia). This foreign halal certificate must be registered at BPJPH before the products can be distributed in Indonesia.

[14] Article 59 of Law No 41/2015 states that each individual who brings in animal products to the territory of Indonesia must obtain permit from Ministry of Trade after receiving recommendations from a) the Minister of Agriculture for fresh animal products; or b) Head of BPOM for processed animal products.

In addition to the Law No 31/2014 and PP No 31/2019, there are a number of **other regulations concerning red meat in Indonesia with reference to halal matters**. These include:

- Ministry of Agriculture Number 58/Permentan/PK210/11/2015 on Importation of Carcass, Meat, and/or its Derivatives into the Territory Of The Republic Of Indonesia
- Ministry of Agriculture Number 17/Permentan/PK.450/5/2016 on Importation of Boneless Meat in Certain Circumstances From A Country or a Zone Within a Country
- Ministry of Agriculture Number 34/Permentan/PK 210/7/2016 on Importation of Carcass, Meat, Offal and/or Their Processed Products into the Territory Of The Republic Of Indonesia
- Ministry of Trade of The Republic Of Indonesia Number 59/M-Dag/Per/8/2016 on Provisions of Animal and Animal Products Exportation and Importation
- Ministry of Religious Affairs of The Republic Of Indonesia Number 42, Year 2016 on the Organisation and Functioning of the Ministry of Religion



Picture: A banner on the 'ASUH' concept displayed at a local wet market in Jakarta to provide information for meat sellers.

In the context of the livestock industry, the socialisation of the Halal concept by the Indonesian government has been combined into a wider food safety campaign, known as **the ASUH program** or *aman-sehat-utuh-halal* (or safe-healthy- wholesome-halal). This ASUH concept is stipulated in Article 58 of **the Law (UU) Number 41 of 2014** on Livestock and Animal Health.

The Indonesian Ministry of Agriculture has implemented a number of initiatives to socialise this ASUH concept. As part of this campaign, the key messages are to introduce conditions when the ASUH target is met:

- A (*aman* or safe) -- the products do not contain biological, chemical and physical ingredients and other substances that can adversely impact human's health;
- S (*sehat* or healthy) -- the products contain good nutrition for human's health;
- U (*utuh* or wholesome) -- the products are not mixed or contaminated with other substances;
- H (halal) -- the products are slaughtered according to the Islamic laws.

Practical recommendations are also provided as part of the ASUH campaign. For example:

- The meat products must come from animals slaughtered at slaughterhouses with NKV (or nomor control veteriner or veterinary control number);
- Meat products that couldn't be sold on the day must be stored in 4° C;
- Frozen meat must be stored and sold in a frozen condition at -18° C;
- Halal meat must be separated from non-halal products (e.g. pork); and
- Local meat must not be mixed with imported meat.

Article 58 of the Law No 41/2014 states that monitoring, inspection and test of animal products are conducted sequentially at a production facility, slaughterhouse, storage and collection points, when the products are fresh, before being preserved and during the distribution after being preserved.

The success of the ASUH program is yet to be identified. However, based on field observations, it can be seen that many meat sellers at wet markets do not have the necessary equipment such as freezer and fridges to sell imported frozen beef accordingly. Furthermore, despite the requirement to use NKV-registered slaughterhouses, there is no traceability system put in place to track the movement of meat products up to the consumer level for neither local nor imported meat.

As part of the food safety measures, the Indonesian government particularly the MoA also addresses the issues of **animal disease prevention**. The MoA Decree No 44/2014 on the amendment to the MoA Decree No 94/2011 was issued regarding the place of entry and exit of animal disease carrier and plant disease quarantine. Likewise, Article 41 of the Law (UU) Number 41 of 2014 also addresses animal disease prevention. Article 9 of the MoA Decree No 34/2016 requires that large ruminant meat must only come from countries that are free from foot and mouth disease (FMD), Rift Valley Fever (RVF), Sheep and Goat Pox, Peste des Petits Ruminants (PPR), and Scrapie. Indonesia also has Law No 16/1992 on animal, fish and plant quarantine.

The MoA, however, also regulates importation of boneless meat under certain conditions from a country or zone through the issuance of the **MoA Decree No 17/2016**. This Decree defines that in certain circumstances, the importation of frozen boneless meat (from cattle and/or buffalo) into the territory of Indonesia from a country which has fulfilled the importation requirements and procedures for animal products is permitted. Article 5 of the Decree defines that the originating country includes a country that is free from FMD, or a country that is not free from FMD but has implemented an official program to control FMD as set by the World Organisation for Animal Health (WOAH/OIE). This importation shall be carried out by BUMN as assigned by the Minister of BUMN.

Similarly, Article 9 of the **MoT Decree No 59/2016** provides a flexibility for BUMN to import animal products from a country that is not completely free from animal disease to maintain food security, availability and price stabilisation is stipulated. This importation can only be done after the BUMN is delegated by Minister of BUMN, who will base the decision on economic coordination meeting at the ministry level with inputs from the MoA.

To look at the topic of food safety and traceability from a wider perspective of food system, a reference is made to the **Act (*Undang-Undang*) No 7/1996 on Food**, which was approved by the Indonesia's House of People's Representatives. To an extent, the Food Act touches on issues regarding the food system ability to ensure food safety and quality systems. More specifically, the Food Act states that "the facilities and or infrastructure which is used directly or indirectly in the food production activities or process, storage, transportation, and or distribution must fulfil the sanitation requirements" (Article 5). Furthermore, Article 6 states that "any person responsible in the executive of food production activities or process, storage, transportation and or circulation shall: a) meet the requirements on sanitation, security and or safety of humans; b) execute a periodic sanitation monitoring program; and c) execute the supervision on the fulfilment of the sanitation requirements". The quality warranty system is highlighted in Article 20 i.e. "any person who produces food for trading must establish a quality warranty system in line with the type of food produced". It can be seen that capacity to ensure and monitor food safety and food quality has indeed been within the interest of food industry in Indonesia, as required by the existing regulations.

The Food Act was later amended in 2012 through the issuance of the **Food Act No 18/2012. Government Regulation No 17/2015** was later issued to support the implementation of the Food Act.

5.3.2.3 Labelling

Food labelling in Indonesia was regulated under **the Food Act No 7/1996**, which was later amended by the **Food Act No 18/2012**. Article 30 of the 1996 Food Act states that "any person producing or importing into the territory of Indonesia food which is packed for sale is obligated to place a label on, within, and/or at the packing of the food". This label shall at least contain information concerning: the name of the product, the list of materials used, net weight or net contents; name and address of the party which produces or imports the food into the territory of Indonesia; information on halal; and the expiry date, month and year. In addition to this information, Article 96 of the Food Act No 18/2012 requires the inclusion of date and production code, distribution permit number for processed foods and origin of specific ingredients.

Similarly, for animal products, in the MoT Decree No 59/2016, the **labelling requirement** is stated in Article 16. A product's label must be written and printed in Indonesian language in a clear and easy-to-understand way and contains at least the following information: net weight, the name and address of the manufacturer, halal status, production date, expiry date, distribution permit for processed food, and origin of specific ingredients. Furthermore, Article 17 addresses **the packaging requirement**, which includes the use of approved materials for packaging and recycle logo for plastic use.

With regard to **the importation of carcass, beef, offal and/or its processed products**, Article 18 of the MoA Decree No 34/2016 states that **the labelling requirement** must use Indonesian language and English and include: a) country of destination – Indonesia; b) veterinary control number (NKV); c) slaughter date, cutting date and/or production date; d) quantity, types and specification of carcass, meat, offal and/or its processed products; and e) a halal sign.

Picture: Example of labelling of boxed beef exported to Indonesia, written in both English and Indonesian language.

5.3.3 Policy consideration

The above non-exhaustive list of relevant policies and programs highlight opportunities for future development of traceability systems in Indonesia. It is widely known that traceability depends on recording all transformations in the chain, explicitly or implicitly. The absence of regulations that require the recording of such transformations is evident in Indonesia. Moreover, the study could not identify private standards (e.g. animal welfare, organic, etc) for beef in Indonesia. Interviews with actors in the chains suggest that consumer concerns are still confined to Halalness and food safety issues as assessed by their assessment on the physical appearance of the beef products. However, this does not necessarily mean that there is no demand for traceability. An improved understanding of this consumer demand as well as their willingness to pay should probably be considered in future work.[15]

Despite the absence of a specific regulation on traceability, the development of traceability systems should take into consideration opportunities and gaps in the existing regulatory frameworks. For instance, while the Food Act No 18/2012 does not refer to the specific aspect of traceability, there is an attempt to better manage information and data in the food system. Article 75 of the Food Act on the **food and nutrition information system** requires government and regional governments according to their respective authority to build, arrange, and develop an integrated food and nutrition information system. This system can be used for planning, monitoring and evaluation, food price and supply stabilisation, and early warning system of food and nutrition crisis.

Furthermore, Article 76 states that this system shall cover collection, processing, analysis, storage and presentation and dissemination of data and information about food and nutrition. Data and information on food and nutrition must contain at least the following: types of food products; food balance; location, area and food production zones; market demand; market opportunities and challenges; production; price; consumption; nutrition status; export and import; estimates on supply; estimates on planting and harvesting seasons; climate forecasts; food technologies; regional food demand; forecast on fish catches.

The effective implementation and successful development of the above food and nutrition system can be a basis for or be an integral part of future development of traceability systems in Indonesia.

Future work should also explore engagement with various industry associations. Known industry associations include NAMPA (meat processors), meat distributors (ADDI), slaughterhouse association (APPHI), small-scale meat processors (ASPERDATA), feedlotters (GAPUSPINDO), among others. These associations to an extent may play a role in shaping the country's livestock industry though the self-sufficiency objectives seems to still be largely driving the policy decision making in Indonesia. Whilst all have interests in maintaining food safety, each may assign different degrees of importance with regard to the concept of traceability particularly in the context of clarity in rules of origins (e.g.

[15] Willingness to pay for traceable meat attributes has been a subject of a growing number of empirical studies with most of the studies conducted in developed countries such as the US and a number of European countries and based on choice experiments (See Cicia and Colantuoni (2010) for an overview of these studies). There is an increased number of studies looking at the topic in emerging economies particularly China (Ortega et al. 2016; Zhang et al. 2012). A preliminary search of literature suggests there hasn't been any study addressing demand for beef traceability in Indonesia. Studies on relevant topics include the WTP certified organic fruit and vegetables, shrimp and poultry (Toiba et al. 2012); the WTP for imported offal (Tenrisanna 2015); and the planned consumer survey on WTP for 'better quality beef' as part of the ongoing IndoBeef's socioeconomics research program (more information: https://www.indobeef.com/s/IndoBeef-Socioeconomics-August-2018.pdf).

Australian beef). Making reference to FAO (2016), identifying like-minded and relevant industry associations is necessary to ensure the effective implementation of a chain integrity system.

Future efforts to develop traceability systems should note that the above policy overview is current at the time of this report preparation, and is by no means exhaustive. Policy uncertainty has been identified as one of the challenges amongst those involved in trading with Indonesia.

It is therefore important to continue to monitor policy environments in Indonesia, including during the development of a new initiative or innovation to improve red meat supply chain traceability. For example, GS1, the global not-for-profit data standards body, is currently working with Deakin University to develop a framework of data standards and protocols to enable end-to-end food product traceability, based on open, technology and solution-agnostic approaches that will allow enterprise systems to be interoperable. This initiative is industry-led through Deakin's Food Traceability Lab.

5.4 Limitations of the value chain mapping

The value chain mapping was conducted on one supply chain of frozen beef products into the Indonesian market. It does represent a significant volume of beef products entering the Indonesian market and a cross-section of sales channels in that market.

However, the production system is vertically integrated, as is the import and distribution system of the beef importer. Therefore the levels of control of the product and opportunity for traceability is much more extensive in comparison to a producer selling via an on-line or saleyard auction system, or an importer selling through to a wholesaler in the destination market, involving more parties.

The case study could be considered a high performing supply chain, where the pastoral company, the meat processor and the meat import company evidence invested in infrastructure (e.g. state-of-the-art cold storage) enterprise level systems and embraced assurance programs.

6 Bibliography

Ali et al (2017) “Food Supply Chain Integrity: the need to go beyond certification”, *Industrial Management and Data Systems*, Vol 117 No 8, pp 1589-1611.

Australian Government (2018) *Enhancing Australia’s systems for tracing agricultural production and products*, Department of Agriculture, Canberra.

Boecker, A., Hobbs, J.E., Kerr, W.A., Yeung, M.T. (2013), “Traceability: regulatory requirements and consumer acceptance”, *Canadian Food Insights* 1 (1), 35–37.

Charlebois, S., Sterling B., Haratifar S., and Sandi Kyaw Naing SW, (2014), "Comparison of Global Food Traceability Regulations and Requirements." *Comprehensive Reviews in Food Science and Food Safety* 13 (5):1104-1123. doi: 10.1111/1541-4337.12101.

Cicia, G. and Colantuoni, F., 2010. Willingness to pay for traceable meat attributes: a meta-analysis. International Journal on Food System Dynamics, 1(3), pp.252-263.

Ding, M., Jie, F., A. Parton, K. and J. Matanda, M. (2014), "Relationships between quality of information sharing and supply chain food quality in the Australian beef processing industry", *International Journal of Logistics Management,* Vol. 25 No. 1, pp. 85-108.

Elphick-Darling R and Gunasekera D (2017) *Study on the Application of Global Data Standards for APEC Supply Chain Connectivity*, Policy Support Unit, APEC.

Hobbs JE (2016), Effective use of Food Traceabiliy in Meat Supply Chains, Chapter 17 in *Food Traceability Techniques and Technologies,* Elsevier, pp 321-335.

Leong C, Viskin T, Stewart R, (2018) *Tracing the Supply Chain: How blockchain can enable traceability in the food industry*, Accenture.

Maman U, Mahbubi A, Jie F, (2018) "Halal risk mitigation in the Australian–Indonesian red meat supply chain", *Journal of Islamic Marketing*, Vol. 9 Issue: 1, pp.60-79.

Neo, P (2019) “Cocoa Connectivity: Cargill target further digital traceability advances for Indonesia”, *Food & Beverage Development & Technology – Asia Pacific.*

Nusran et al (2019) “Management of supply chain process for meat products”, *Indonesian Journal of Halal Research*, Vol 1, No 1, pp 18-25.

Ortega, D.L., Hong, S.J., Wang, H.H. and Wu, L., 2016. Emerging markets for imported beef in China: Results from a consumer choice experiment in Beijing. Meat science, 121, pp.317-323.

Permani, R, N. R. Setyoko, R. Trewin, and D. Vanzetti. 2016. "Indonesian Livestock Policy: Lessons for Self-Sufficiency." In *Crucial Agricultural Policy*, edited by R. Trewin. Singapore: World Scientific.

Purwandoko et al (2019), “Design Framework of a Traceability System for the Rice Agroindustry Supply Chain in West Java”, *Information* 2019, 10, 218.

Syahruddin N, Kalchschmidt M (2012) Traceability in the Cocoa Supply chain: An Indonesian Context, ACIAR, Australia.

Tenrisanna, V., 2015. Offal and beef demand in Indonesia and Australia's trade prospects (a case study of Makassar City) (Doctoral dissertation, University of Southern Queensland).Adam et al (2016) "Enhancing food safety, product quality and value-added in food supply chains using whole-chain traceability", *International Food and Agribusiness Review*, Special Edition Vol 19, Issue A, pp 191-214.

Toiba, H., Umberger, W.J. and Minot, N., 2012, July. EXPLORING INDONESIAN CONSUMERS'WILLINGNESS TO PAY FOR HIGH-VALUE AGRICULTURAL PRODUCTS. In *IV International Symposium on Improving the Performance of Supply Chains in the Transitional Economies 1006* (pp. 397-404).

Vanany et al (2016) "Developing electronic mango traceability in Indonesia", *Supply Chain Forum: An International Journal*, 17:1, 26-38.

Widyapratami H., Bagia B., (2018) "Achieving Palm Oil Traceability in Indonesia's Complex Supply Chain", *WRI Indonesia*, 6 March 2018.

Zhang, C., Bai, J. and Wahl, T.I., 2012. Consumers' willingness to pay for traceable pork, milk, and cooking oil in Nanjing, China. *Food Control*, *27*(1), pp.21-28.
USAID Oceans and Fisheries Partnership, (2019), "Indonesia continues progress in pursuit of end-to-end seafood traceability", published by SEAFDEC, 23 January 2019.

Zulfakar, M. H., Chan, C., Jie, F., & Sundram, V. P. K. (2019), "Halal accreditation and certification in a non-Muslim country setting: Insights from Australia halal meat supply chain" *International Journal of Supply Chain Management*, 8(1), 10-17.

7 Appendix

7.1 Australian Halal requirements and Law 33

	COMPLIANCE PARAMETERS FOR INDUSTRY		
	Export Registered Australian Standard Meat Establishments (Tier1) V: 1.0 12/07/2017		**LAW OF REPUBLIC OF INDONESIA NUMBER 33 YEAR 2014 CONCERNING HALAL PRODUCT ASSURANCE**
Overview Regulation	**Tier 1 arrangements were established to recognise that documented Australian Standard (AS) markets accept product prepared in accordance with the relevant AS and with oversight by a SRA (State Regulatory Authority). The SRA provides regulatory oversight, including audit systems, to these establishments to assess continued compliance.**		**Halal Product is a Product that has been declared halal (lawful) according to Islamic sharia.** **Halal Product Process hereinafter abbreviated as PPH is a series of activities to ensure the halalness of the Product including material procurement, process, storage, package, distribution, and presentation of the Product.** **BPJPH is organized with the objective of:** **The objective of the BPJPH is in providing convenience, security, safety, and certainty of the availability of Halal Product for the public in consuming and utilizing a Product as well as increasing the added value for Business Operators in producing and selling Halal Products.**
1	Tier 1 operations are registered under the Export Control Act 1982, and operate under an "Approved Arrangement" issued under Schedule 2 of the Export Control (Meat and Meat Products) Orders 2005 or the Export Control (Wild Game Meat and Wild Game Meat Products) Orders 2010.		Products that enter circulate, and traded in the territory of Indonesia must be certified halal.
2	Compliance with the Australian Standard for the Hygienic Production and Transportation of Meat and Meat Products for Human Consumption (AS 4696) or the Australian Standard for the Hygienic Production of Wild Game Meat for Human Consumption (AS 4464)		**AUDITS** Halal auditors authorised by the LPH (Halal Examination Agency) will have the right to audit at the manufacturers premises to ensure the halalness of the product. The BPJPH auditors must maintain the confidentiality of the ingredients and make-up of product at all times.

	Export Registered Australian Standard Meat Establishments (Tier1) V: 1.0 12/07/2017		**LAW OF REPUBLIC OF INDONESIA NUMBER 33 YEAR 2014 CONCERNING HALAL PRODUCT ASSURANCE**
3	Meat Transfer Certificate (MTC) must be obtained a transfer certificate in a form approved by the Secretary of the department.		5. Halal Auditor has the duty of: a. examining and assessing the materials used; b. examining and assessing the Product manufacturing process; c. examining and assessing the slaughtering system; d. inspecting the Product location; e. inspecting the equipment, production room, and storage; f. examining the Product distribution and presentation; g. examining the halal assurance system of Business Operator h. reporting the examination and/or testing result to LPH
4	Any product described as halal for export must be certified under the Australian Government Authorised Halal Program (AGAHP).		**MATERIAL AND PROCESS OF HALAL PRODUCT** The material used in PPH consists of raw material, process material, additional material, and auxiliary material (1) The material originated from animal that is forbidden as intended in Article 17, Law 33 (2) Including: a) Corpse; b) Blood; c) Pig; and/or animal that is slaughtered not in accordance with sharia. (3) Any material which originates from a forbidden animal.
5	SRA (State Regulatory Authority) and AS (Australian Standard) Combined Audit Satisfactory Completion		Animal that is used as Product material, must be slaughtered according to sharia and meet the principles of animal welfare as well as public veterinary health requirements.

	Export Registered Australian Standard Meat Establishments (Tier1) V: 1.0 12/07/2017		**LAW OF REPUBLIC OF INDONESIA NUMBER 33 YEAR 2014 CONCERNING HALAL PRODUCT ASSURANCE**
6	Export Registration Number received		**HALAL PRODUCT PROCESS** (4) Business Operators must separate the a) location, b) place, c) equipment for processing, d) storing, e) packaging, f) distributing, g) selling, and presenting of the PPH (Halal product process) from the location, place, equipment, for slaughtering, processing, storing, packaging, distributing, selling, and presenting **of non-halal Product**. (5) Location, place, and equipment of PPH as intended must be: a) maintained for its cleanness and hygiene; b) free of najis (List (defiled) c) free of non-halal Material. d) Indonesian Government Regulations yet to be defined The BPJPH (Halal product assessment Organizing Agency) will disqualify Australian processors (Businesses) from trade for a number of years for non-compliance a) written warning; b) administrative fines; or c) revocation of Halal Certificate.
7	Export Registration Certificate (Detailing a must have "Approved Arrangement") under Aus-Meat Standard that must be maintained to assert continuous accreditation.		Processors must have a Halal supervisor
8	HALAL product must comply with the AGAHP (Australian Government Authorised halal program)		Report and change of material composition or equipment to BPJPH

	Export Registered Australian Standard Meat Establishments (Tier1) V: 1.0 12/07/2017		**LAW OF REPUBLIC OF INDONESIA NUMBER 33 YEAR 2014 CONCERNING HALAL PRODUCT ASSURANCE**
9	Export Certifications required to ensure only eligible product for the market. • Export permit documents (through EXDOC) • Export Health Certificates (through EXDOC) • Government Halal Certificates.		Business Operators that obtain Halal Certificate must: a) must attach the Halal Label on the Product that receive Halal Certificate; b) maintain the halalness of the Product that has obtained Halal Certificate; c) separate the location, place and equipment for processing, storing, packaging, distributing, selling, and presenting between Halal and non-halal Product; d) renew the Halal Certificate if the validity period of the Halal Certificate has expired; and e) Report change of Material composition to BPJPH.
10	The department issues Meat Notices to inform establishments and staff of new requirements. When these notices apply to Tier 1 establishments this will be indicated in the scope statement of the Meat Notice and the establishment must amend its Approved Arrangement to reflect required changes		**HALAL SUPERVISOR** Halal Supervisor as intended in Article 24 has the task of: a) supervising PPH at the company; b) deciding corrective and preventive action; c) coordinating PPH; and d) assisting LPH Halal Auditor during examination Halal Supervisor must meet the requirements of: a) Muslim; and b) has a broad insight and understand sharia concerning halalness. Halal Supervisor is appointed by the head of the company and reported to BPJPH. Further provision regarding Halal Supervisor is regulated in the Ministerial Regulation.

	Export Registered Australian Standard Meat Establishments (Tier1) V: 1.0 12/07/2017		**LAW OF REPUBLIC OF INDONESIA NUMBER 33 YEAR 2014 CONCERNING HALAL PRODUCT ASSURANCE**
11	Establishments need to be able to demonstrate how they ensure that meat produced in accordance with the AS guideline is exported only to the markets that accept product produced according to the AS standard and approved counties AS Appendix C: Market Access (including identification, physical segregation and inventory control		**PROCEDURE TO OBTAIN HALAL CERTIFICATE** (1) Halal Certificate Application is submitted by Business Operators in writing (2) to BPJPH. 2) Halal Certificate Application must be equipped with document of: a) Business Operator details; b) Product name and type; c) Product registration and Material used; and d) Product manufacturing process. Further provision regarding submission procedure of Halal Certificate application is regulated in the Ministerial Regulation.
12	If the incoming product is required to comply with any additional importing country requirements, this shall be indicated on the incoming Meat Transfer Certificate and compliance must be demonstrated in the amendment of the "Approved Arrangement".		**EXAMINATION AND TESTING** Examination and/or testing of a Product's halalness as is performed by the Halal Auditor. Examination of the Product is performed on business location during the production process. In case during the Product examination there is a Material in which the halalness is doubtful, testing in a laboratory shall be conducted. In performing the examination on the business location the Business Operator must provide information to the Halal Auditor.
13	Where incoming meat for further processing before export is identified with the 'Australia Approved' mark, then the finished product produced from this meat must also be identified with the 'Australia Approved' mark .		**ISSUANCE OF HALAL CERTIFICATE** In case the Halal Fatwa (defined Halal or Haram process status) determined the Product being applied for by the Business Operator as halal, BPJPH shall issue the Halal Certificate. In case the Halal Fatwa Assembly, declared the Product not halal, BPJPH will return the Halal Certificate application to the Business Operator along with the reason. The cost of the Halal Certificate is charged to Business Operators that submit the Halal Certificate application.

	Export Registered Australian Standard Meat Establishments (Tier1) V: 1.0 12/07/2017		**LAW OF REPUBLIC OF INDONESIA NUMBER 33 YEAR 2014 CONCERNING HALAL PRODUCT ASSURANCE**
14	Establishments are required to segregate of meat that is ineligible for export (e.g. from establishments not registered for export) and ensure implementation of controls implemented to prevent its entry into the export chain (must be able to demonstrate this for audit)		**LABEL PLACEMENT** BPJPH determine the shape of Halal Stamp/Label which is nationally applicable. Business Operators that have obtained Halal Certificate must include the Halal Label on: a) Product packaging; b) specific part of the Product; and/or c) specific place of the Product. Label must be easy to see and read as well as not easily erased, detached, or damaged.
15	Participation by the management of the establishment in the initial and regular audits once the establishment is export registered.		**RENEWAL OF HALAL CERTIFICATE** The Halal Certificate is valid for 4 (four) years form issued by BPJPH, except when there is a change in the Material composition (e.g. recipe) The Halal Certificate must be extended by Business Operators by applying for renewal of Halal Certificate no later than 3 (three) months prior to the expiry date of the Halal Certificate. Further provision concerning renewal of Halal Certificate, may be found in the Ministerial Regulation?

	Export Registered Australian Standard Meat Establishments (Tier1) V: 1.0 12/07/2017		**LAW OF REPUBLIC OF INDONESIA NUMBER 33 YEAR 2014 CONCERNING HALAL PRODUCT ASSURANCE**
16	**AUDIT REQUIREMENTS Documents Compliance:** EX26 - Application for Registration Form - Completed EX92 - Authorization to Manufacture Official Marks and Marking Devices form; a controlled departmental form that provides legal approval for an establishment to request manufacture of Official Marks/Marking Devices from an approved manufacturer. Meat Transfer Certificate (MTC) MTC Authorised Signatory - Approval is obtained through being nominated in the Approved Arrangement. Notice of Intention (NOI)/Export permit - the NOI or the Export Permit is the permit signed by an RFP Validator as listed in the list of persons who 'manage and control' an establishment that accompanies the goods to Customs and allowing them to clear Request For Permit (RFP) - All information is supplied electronically to the department RFP Validator - Approval is obtained through the Application for Registration (EX26) and having the necessary amendments to the Approved Arrangement.		
17	**Inventory: Records must include** kill sheets, slaughter floor scale summaries, boning room summary, batch sheets for meat products establishments showing yields, load out invoices or waybills.		
18	For Export all inventory must be identifiable, kept separate to product not eligible for that market, and specifically show how it is identified in the inventory system e.g. Indonesians ULAMA Certificate Displayed		

	Export Registered Australian Standard Meat Establishments (Tier1) V: 1.0 12/07/2017		**LAW OF REPUBLIC OF INDONESIA NUMBER 33 YEAR 2014 CONCERNING HALAL PRODUCT ASSURANCE**
19	**Transport** Export eligible product must always travel between export-registered establishments, endorsed by MTC, is not required to be sealed. Non-conformance reporting system must be in place at all establishments detailing the investigation of the problem, actual or recommended disposition of the product, what will be done to minimise the risk of similar occurrences in the future. Where investigations reveal that there may have been possible criminal activity such as interference with the goods, or substitution, then the state or territory authority must be informed.		
20	**Transport of Product between Local Establishments** **-** A separate certificate must be obtained for each transfer between registered establishments - where product is continually transferred to another registered establishment that shares a physical boundary with the consigning establishment, - one MTC per day is permitted - each load must be covered by a way bill that adequately covers the requirements for consignment description - way bills are cross referenced to the MTC		

	Export Registered Australian Standard Meat Establishments (Tier1) V: 1.0 12/07/2017		**LAW OF REPUBLIC OF INDONESIA NUMBER 33 YEAR 2014 CONCERNING HALAL PRODUCT ASSURANCE**
21	**Consignment Description** - A full and accurate description of all goods Slaughter dates Processing dates Product type must have a separate entry addressing all the criteria Specific product types, differentiated on the basis of slaughter establishment slaughter date, processing date, unique trade description (e.g. bull, cow, ox, Grain fed, striploin etc.), Marked for market eligibility, Halal - Separate sheets may be attached to the Export Meat Transfer Certificate, instead of completing the details in the space provided One each to be attached to the duplicate and triplicate of the certificate. - In such an event the Export Meat Transfer Certificate must be endorsed with the words 'see attached' and each separate sheet must be endorsed with the words 'see MTC No.¾ ' then signed by the owner / agent. - The waybills must indicate how many there are that are attached (i.e. 1 of 2, 2 of 2) - The number of carcasses; or number of packages and total weight(kgs) for each product type must be stated in numerals and words. - The 'Description of Consignment' entry must be ruled off immediately below the last entry.		

	Export Registered Australian Standard Meat Establishments (Tier1) V: 1.0 12/07/2017		**LAW OF REPUBLIC OF INDONESIA NUMBER 33 YEAR 2014 CONCERNING HALAL PRODUCT ASSURANCE**
22	**Specific Market Eligibility** - The specific market eligibility of the product must be marked in the space provided on the form for the product covered by the MTC e.g. or 'This product is suitable for Halal'.		
23	**Journey Details** - In the 'vehicle No.' space, the vehicle registration number, container number, or railway wagon number, sea-vessel name, voyage number or flight number must be stated as appropriate. - For articulated road transports the registration number of the trailer must be stated. All boxes must be filled in.		
24	**Owner Agent Declaration** - The authorised company official must insert his / her signature, printed surname and initials in block letters and date in the space provided. - Any alterations to the details completed by the owner / agent must be neatly ruled out and initialed by the owner / agent who originally signed the certificate (no white-out permitted).		

	Export Registered Australian Standard Meat Establishments (Tier1) V: 1.0 12/07/2017		**LAW OF REPUBLIC OF INDONESIA NUMBER 33 YEAR 2014 CONCERNING HALAL PRODUCT ASSURANCE**
26	**Distribution** The completed certificates must be distributed as follows: - Original and Duplicate to the Receiving Agent at the receiving establishment (with one copy of attachment). - Quadruplicate to be filed with the reconciliation sheet at the consigning establishment by the company (with copy of attachment). - Endorsed duplicate to be returned to consigning establishment, within 21 days, for reconciliation and filing. - Endorsed original to be filed at receiving establishment (with copy of attachment). "All documents are to be stored on plant for three years and then destroyed."		
27	**Export of export eligible product – Export documentation "EXDOC system"** - The system accepts details of proposed exports from exporters. - Links details with the results of inspection of product, and where product is eligible, issues export permits, health certificates, certificates as to condition and phytosanitary certificates to enable export. - Requests for Permits (RFPs) are generated electronically using the EXDOC system. They are only required where product is exported directly from the establishment - The Department's EXDOC system will automatically generate an export certificate when information received is validated. - EXDOC will also issue the appropriate health certificate with applicable endorsements for countries that will accept product produced under the Australian Standard		

	Export Registered Australian Standard Meat Establishments (Tier1) V: 1.0 12/07/2017		**LAW OF REPUBLIC OF INDONESIA NUMBER 33 YEAR 2014 CONCERNING HALAL PRODUCT ASSURANCE**
31	**Official Marks and Controlled Documents -** - The 'Australia Approved' stamp [Clauses 13.12 and 13.13 of the Export Control (Prescribed Goods General) Order 2005] is to be used on product produced under this arrangement. - Stamps are ordered from an approved stamp manufacturer using an EX92 Authorization to Manufacture Official Marks and Marking Devices form. - The establishment completes the form in accordance with their approved arrangement, and provided to the FOM (Field Operations Manager) for approval. - If approved, the FOM signs the form and returns to establishment management. The establishment then submits the EX92 to the manufacturer. - Meat Transfer Certificates and Halal Certificates are ordered from the contracted service provider (Establishments to contact their respective FOM for details). - Record to be kept of authorised signatory/is responsible for the security, use of, and reconciliation of official stamps. This could be in the form of a daily issue book showing the authorised signatory issuing the stamp to the person in the section for the application of the stamp.		

	Export Registered Australian Standard Meat Establishments (Tier1) V: 1.0 12/07/2017		**LAW OF REPUBLIC OF INDONESIA NUMBER 33 YEAR 2014 CONCERNING HALAL PRODUCT ASSURANCE**
32	**Security Seals - Containers** **-** Procedures must be included in the AA to address ordering, security and reconciliation of official container seals. Official seals may only be ordered by a person listed in the registration who manages or controls the day to day operations. - The container bolt security seals and tamper evident strap seals are the prescribed official marks for sealing containers of meat that are exported. - An official seal is used to seal the container prior to export (bolt seals for shipping containers, and tamper evident strap seals or bolt seals for air freight containers). - An authorised signatory is responsible for the security of security seals. - An RFP validator must routinely reconcile (at a minimum weekly), the use of these seals with the number left in store. - All damaged or broken security seals must be kept for the state or territory authority audit to verify the control of seals		

	Export Registered Australian Standard Meat Establishments (Tier1) V: 1.0 12/07/2017		**LAW OF REPUBLIC OF INDONESIA NUMBER 33 YEAR 2014 CONCERNING HALAL PRODUCT ASSURANCE**
33	**Halal program (mandatory for establishments producing halal product for export) SUMMARY** - Procedures should comply with the Australian Government Authorised Halal Program : a) Humane stunning and slaughter: for guidance see the National Animal Welfare Standards for Livestock Processing Establishments Preparing Meat for Human Consumption available from the Australian Meat Industry Council (AMIC) website. b) Identification of the Approved Islamic Organisation (AIO) c) Provision of registered Muslim slaughter men. d) Identification and segregation of halal and non-halal products. e) Monitoring of the slaughter process and segregation throughout the whole production process. f) Corrective Action to be taken when elements of the program are not followed. g) Ordering, security, daily control (signed log-in/out) and reconciliation of the 'Halal' stamp (metal, rubber, computerised and/or pre-printed). The same controls apply to the official halal stamp as apply to other departmental Official Marks. h) Halal Certificates - ordering, security, issuing and reconciliation of the 'Halal' certificate only by an Authorised Signatory of the establishment.		

8 Appendix 2: Service provider catalogue

1. Oritain

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://oritain.com/

Oritain offers chemical (trace element and/or isotopes) definition of product that allows product to be traced to their source. Oritain measures the natural intrinsic properties of a product to verify where it has come from. The 'origin fingerprint' of a product cannot be replicated. Oritain can test meat from any point of the supply chain to ensure it is true to its claimed origin.

Once the chemical fingerprint is established, the customer company engages in advertising to ensure that potential fraudsters are aware of the protection now being given, a logo can be placed on the product, and surveys are conducted to verify that substitution is not occurring. Oritain customers include Silver Fern Farms, A2 milk company, Welsh lamb, GE Healthcare (animal sera).

MLA currently has an MDC project with Oritain that aims to collect beef and lamb/sheep samples from across the country to produce a chemical 'fingerprint' of Australian product.

Head office: 167 High Street, Dunedin, NZ
Australian office: Lvl 40, Northpoint Tower, 100 Miller St, North Sydney
Contact: Sandon Adamssadams@oritain.com

2. Source Certain

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://www.sourcecertain.com/

Source Certain offer the TSW Trace™ which is a robust, definitive, tested and validated scientific method for establishing provenance of an item. TSW TraceTM brings together over 30 years of research and application across various disciplines. The method is delivered by the TSW Analytical Pty Ltd Forensic Science Services.

This technology is applied across a vast number of areas including: gold, diamonds, precious and conflict metals, scenes of crime investigations, physical evidence, drugs and pharmaceuticals, food and fibre and artwork and antiquities. Once profiled, regular audits and random sampling – via the collection and analysis of Verification Samples – will verify whether future production output matches the established chemical profile. Verification can occur anywhere along the chain, depending on your unique requirement.

Clients receive regular reports on the status of their supply chain and are alerted rapidly when there is an issue.

Head Office Location: 2/27 Clark Court, Bibra Lake WA
Contact: Cameron Scadding Cameron.scadding@sourcecertain.com

3. SICPA

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://www.sicpa.com/

SICPA is a Swiss company with a core business in printing inks and anti-counterfeit measures for banknotes, passports and similar documents. They have printers that can be controlled and interrogated remotely. They are extending this capability to supply chains through labels that can be read (QR codes) and are linked to a database. SICPA are contracting to the Dubai Municipality for a halal track and trace system.

Head office: Lausanne, Switzerland
Australian office: Cambellfield, Australia
Contact: David Siahann david.siahaan@sicpa.com.au

4. DSS

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

http://www.dsssecure.com/

DSS has a range of anti-counterfeit label technologies, including the labels themselves, mobile phone scanners, and databases that help to prevent product diversion, theft, counterfeit etc. The DSS system provides the opportunity for anti-counterfeit labels to be scanned into a database, and for the database owner to track location of scanning, to ensure that product is only scanned once, and in the expected location. The customer can also scan the label and obtain information about the product.

Head office: Rochester, New York
Contact: Jody Janson ir@dsssecure.com

5. DNV GL

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

www.dnvgl.com

DNV-GL is essentially a certification body (>150 years), but they are adding food supply chain – particularly blockchain and temperature monitoring - to their offering. They are working in China. DNV's digital assurance solution is known as 'My Story™'. Some experience in wine and seafood.

Head office: Veritasveien 1 1363 Høvik Norway
Australian office: 401 Docklands Drive, Docklands Suite 25, Level 8 Melbourne
124 Walker Street Level 7 North Sydney
324 Queen Street Suite 22, Level 18 Brisbane
Contact: Ingunn Midttun Godal Ingunn.Midttun.Godal@dnvgl.com

6. Bureau Veritas

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

http://origin.bureauveritas.com/

Auditing / verification services combined with blockchain through business to business to consumer supply chains. Work through DTS Food Assurance in Australia. Have completed some meat industry trials.

Head office: Le Triangle de l'Arche - CS 90096 92937 Paris la Défense Cedex – France
Contact: foodservices@bureauveritas.com , Antoine GIROS antoine.giros@bureauveritas.com Clara MOSTACCHI clara.mostacchi@bureauveritas.com

7. IBM Food Trust

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://www.ibm.com/blockchain/solutions/food-trust

IBM Is offering blockchain and combining it with IoT – using a number of partners with the application and the technology knowledge. IBM are working with a number of food manufacturers and retailers, notably Walmart to build blockchain.

Contact: Laurent Lambert laurent.lambert@ibm.com

8. TE Food

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://ico.tefoodint.com/

A labelling system for through chain tagging and tracing. Working in 21 provinces in Vietnam, including with retailers such as AEON. Working in Hungary and South Africa. Used in pork supply chains in Vietnam.

Head office: Albstadt, Germany

9. Transparency One

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://www.transparency-one.com/

Blockchain and information systems company aiming to work along the entire supply chain. Clients include Carrefour and Mars. Working with SGS to provide 'on the ground' support and auditing. Developing some domestic systems with the Chinese government.

Head office: Boston, US
Contact: Craig Miller Craig.Miller@sgs.com

10. EcoMark GmbH

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

www.eco-mark.de

Using a CO2 laser an image is burnt onto a surface (i.e. kiwifruit – approx. 12-point font with ~0.4mm line width). Burns the same image onto every piece of fruit.

Head office: Neuwied, Germany

11. Objective

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

www.objt.com

Software system for tracking and tracing of product through supply chains. Currently only working in Europe.

Head office: Wichelen, Belgium

12. CSB Systems AG

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

www.csb.com

IT systems for traceability and production information in many industries, including meat processing. In competition with the specialised meat system vendors. Simplot is a customer.

Head office: ?
Contact: info@csb.com

13. SafeTraces

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

http://www.safetraces.com/

The use of DNA markers to specifically identify product. It could be used for a brand, or a quality grade, a batch of product etc. Analysis on the supply chain can be conducted using fairly simple laboratory (and maybe even field) tests. Examples of their product use has been in apples where the marker was included in the wax at a cost of USD 2.00 per tonne.

Head office: San Francisco Bay Area
Contact: anthony@safetraces.com

14.Shping

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

shping.com

Originally known as AuthenticateIt, they commenced building a platform for determining the authenticity of goods in 2012 and have now expanded to include consumer-facing aspects. Shping provide (blockchain) software and integration with various hardware. Shping together with Peloris has developed a service called Trust Lane specifically for exporters of food products. Have worked to with Bindaree Beef to develop supply chain protection in the Chinese market. Have also worked with Norco milk for fresh liquid milk shipping into China – including temperature monitoring.

Head office: Level 2, 10 Queens Road, Melbourne
Contact: Joel Stevenson joel@shping.com

15.PWC Food Trust Platform

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://www.pwc.com.au/

PwC offers a means of addressing supplier risks, traceability, regulatory change, food fraud, resource scarcity and crisis management. PwC's 'Food Trust Platform' will adapt existing technology from the pharmaceutical industry and integrate with best-practice 'block-chain' technology. The 'Food Trust' platform technology will enable this two-way communication through innovative devices and systems. These devices and systems may interact with the packaged and non-packaged food environment, communicate useful information about the product to the consumer, and allow for the consumer to communicate back to the red meat supplier to allow the industry to gain experience with meat supply chains consumer insight to improve the product or educate the consumer about the product as well as handling, preparation and cooking methods.

Head office: multiple Australian locations
Contact: Joanna White joanna.white@pwc.com

16.Trust Codes

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://www.trust.codes/

Trust Codes can integrate printing and application of Codes (labels) with production, and use blockchain to provide transparency to consumers.

Head office: 11 Dockside Lane, Auckland Central, New Zealand
Contact: Sam Hardy sam.hardy@trust.codes

17.Laava.ID

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://www.laava.id

Laava.ID is a technology start up in collaboration with CSIRO. Their technology – labelling blockchain connected "fingerprint" that allows anyone to check the authenticity of anything. Mobile phone will prove provenance of product and evidence of substitution. Integrate to database or blockchain- "field to fork". Unhackable- cannot be copied.

Head office: ?
Contact: Tony Surtees tony@laava.id

18. IdentiGEN

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://www.identigen.com/Home/DnaTraceBack

DNA Traceability System. Their proprietary DNA TraceBack® traceability system, provides food retailers, processors and producers with the capability to identify and trace the source of protein products throughout the entire supply chain.

Head office: IdentiGEN Ltd. Block 2, Blackrock Business Park, Carysfort Avenue, Co. Dublin, A94 H2X4, Ireland

19. Neogen

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://www.neogen.com/en/

Neogen are producers of diagnostic test kits for meat speciation (among other diagnosable concerns). They are an American company with global presence.

Head office: 620 Lesher Place, Lansing, MI 48912 USA
Contact: corporate@neogen.com

20. Weatherbys

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://weatherbysscientific.com/

DNA testing, genomics and bioinformatics services. Irish company, working with Australian livestock via a project between University of Adelaide and the Federal Government. Species Composition Analysis - Composition Screening for Equine (Horses), Porcine (Pigs), Bovine (Cattle), Ovine (Sheep) and Galline (Chicken).

Head Office: Weatherbys Scientific Unit F1, M7 Business Park, Newhall, Naas Co. Kildare Ireland W91 VX86
Australian office: Weatherbys Scientific Australia PTY Ltd, Room G26, Hickinbotham Building, The University of Adelaide Roseworthy Campus, Roseworthy, South Australia 5371
Contact: moreinfo@weatherbys.ie

21. UCOT

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://www.ucot.world/

"A Blockchain powered smart IOT ecosystem" 5G technology claiming to support a myriad of Internet of Things devices, all on their Blockchain.

Head office: Level 1, 23 O'Connell Street, Sydney, NSW 2000
Contact: Mike Verhoeven mike.verhoeven@ucot.world

22. ThinFilm

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://www.thinfilmnfc.com/

Near field communication labelling. Real time tracking of anomalies in the supply chain based on scan frequency and location. One tap authentication for supply chain partners through to end consumer. ThinFilm have presented at the MLA "Smart Packaging" workshop in March 2019.

Head office: 2581 Junction Avenue San Jose, CA 95134, USA
Contact: Dan Wilmott Dan.Wilmott@thinfilmnfc.com

23. FreshSupply Co

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://www.freshsupplyco.com/

Blockchain specifically designed for the agricultural sector, Australian company. Heavy focus on smart contracting and incentivising every stop in the supply chain in order to ensure quality information.

Head office: Brisbane Australia
Contact: David Inderias david@freshsupplyco.com

24. Aglive

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://aglive.com/

Aglive has a livestock traceability system that provides evidence-based tracking & authentication-enabled technology, allowing food to be tracked along its journey through the food production supply chain. Aglive's IntegriPro livestock traceability system provides seamless mob and individual EID movements between PICs and fully customisable livestock farm inventory management system, perfect for larger farms looking for more from their software. Available for smartphone, tablet and PC.

Head office: 18-20 Riversdale Rd Newtown, Victoria, Australia, 3220
Contact: Paul Ryan paul@aglive.com

25. ConSenSys

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

www.consensys.net

ConsenSys is a global blockchain technology company building the infrastructure, applications, and practices that enable a decentralized world experience with meat supply chains. ConSenSys are a blockchain provider and have a simple to use blockchain.

Head office: ?
Contact: Claudio Lisco Claudio.lisco@consensys.net

26. Evigence

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

http://www.safetraces.com/

"Our state of the art laboratory is equipped to design and calibrate smart label solutions to meet your needs. If you have an application that requires dynamic indicator labels that are readable by either eye or machine (or both), please contact us."

Head office: 4473 Willow Road, Suite 260, Pleasanton, CA 94588
Contact: Yoav Levy info@evigence.com

27. HarvestMark

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

www.harvestmark.com

HarvestMark is a traceability solution that links the first and last mile of the supply chain — from seed to store to kitchen. Now you can capture feedback from shoppers, and build brand loyalty. Join the thousands of farms that use HarvestMark traceability.

Head office: 510 DeGuigne Drive, Sunnyvale, CA 94085, USA
Contact: Todd Berg tberg@yottamark.com

28. Origin Trail

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

www.origintrail.io

OriginTrail protocol brings trusted data sharing to global supply chains by utilizing blockchain technology. The OriginTrail Decentralized Network (ODN) is built for data integrity and validation in inter-organizational environments, based on globally recognized standards and powerful graph data structures. With existing use cases across different industries, OriginTrail is a foundation for the next generation of business applications.

Head office: Ljubljana, Slovenia
Contact: office@origin-trail.com

29. Agrigate

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://www.agrigateaustralia.com.au

Agrigate's patented smart supply chain will introduce a commercial way to mitigate the growing counterfeit industry by providing an end to end traceability system of the beef. It will provide real-time reporting on proof of provenance and the biometric information on the quality of the beef, and any instances of degradation to all stakeholders on a block-chain based platform. This will provide all parties with irrefutable evidence that the beef remains of premium quality and has not been counterfeited. Our beef will be transported with an augmented reality packaging which will have a unique code that customers can scan from their mobile phones which will allow them to see the full journey of the beef.

Australian office: 12 Kett St, Kambah ACT 2902
Contact: Manu Sridhar manu@beyondbusiness.com.au

30. Data61

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

www.data61.csiro.au

Data science, engineering and design are at the core of what we do. As your applied R&D partner, we offer advisory services, deep research to inform decision making, proof of concepts, product and platform development and breakthrough technologies that can transform existing industries and seed new ones.

Contact: Ben Sorensen Ben.Sorensen@data61.csiro.au

31. Lumachain

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://lumachain.io/

Our platform tracks and traces the origin, location and condition of individual items in a supply chain, in real time, from farm to fork. It allows enterprises to reduce waste, increase efficiency, and grow revenues and margins. And it allows consumers to know, with absolute certainty, the provenance, condition and quality of what they buy, and that it has been ethically and sustainably sourced.

- Algorithms connect broken links in the supply chain and allow partners to conduct business in a secure ecosystem
- Smart-tags, IoT & sensors allow individual items to be tracked, including history, location and conditions
- Blockchain creates secure and indisputable information that can be shared across the supply chain ecosystem
- AI provides data insights to improve performance and product/marketing decisions
- Smart devices allow the product's quality, origin and history to be verified by end-consumers

Clients include CSIRO, Microsoft and JBS.

Head office: Level 2, 17-19 Bridge St, Sydney 2000
Contact: Jamila Gordon jamila@lumachain.io

32. International Commodities House (ICH)

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

www.int-ch.com

ICH first commenced business as Alluvial Wealth Pty Ltd trading as International Bullion House initially offering gold coins/numismatics products and services. Over the last 4 years, ICH expanded its business to include Food, Bulk Fuel and Vehicle Servicing (including fuel cards) and updated its trading name to International Commodities House to better reflect its wider offering to businesses. Over the last year ICH has included blockchain and related technologies to its business model. We aim to provide a blockchain service for our existing customers and the wider market.

Australian office: 1/34 Barber Avenue, Eastlakes, NSW 2018
Contact: Ambrose Wong, Managing Director E: awong@int-ch.com M: 0401 348 324

33. Eurofins Food Testing

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

www.eurofins.com.au

Eurofins Food Testing Australia will be the first Australian laboratory to offer a complete range of GB methods for dairy powders. Located in a new premise in Melbourne, Eurofins Food Testing Australia continues Eurofins global commitment to the food industry by providing leadership and solutions to global food supply chains for local manufacturers.

With 400+ Eurofins sites around the world, each laboratory offers analytical services and customer support however some specialised services are centralised to our competence centres. Through excellent logistics and information technology, Eurofins Food Testing Australia can deliver a full range of expertise through any one of its laboratories

Australian Address: 6 Monterey Road Dandenong South Victoria 3175 Australia
Contact: Lachlan Govenlock – LachlanGovenlock@eurofins.com

34. Neogen

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://foodsafety.neogen.com/en/

Genotyping service provider. Neogen® offers food safety products, services and expertise to help ensure the safety and quality of food, nutraceuticals, and nutritional supplements. Neogen's food safety on-site tests are rapid, accurate and easy to use. For companies that prefer not to do their own on-site testing, Neogen also offers a rapid laboratory testing service at its locations in Lansing, Mich., and Ayr, Scotland. Neogen's comprehensive line of rapid food safety products includes: Sanitation verification, Indicator/spoilage organism tests, Mycotoxin tests, Food allergen tests, Pathogen tests, Culture Media, Sample testing services

Head office: 620 Lesher Place • Lansing, MI 48912 USA
Contact: foodsafety@neogen.com

35. Zoetis

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://www.zoetis.com/products-services/animal-genetics.aspx

Genotyping service provider. Zoetis has one of the broadest portfolios of animal genetics products and support services in the industry. Our advanced genetic solutions are tailored to provide accurate genetic predictions that can help livestock producers across species and regions increase the economic returns on their breeding programs.

Australian office: 5/10 Depot Street Banyo QLD 4014 Australia
Contact: genetics.au@zoetis.com

36. Intertek

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://www.intertek.com/

Genotyping service provider. Intertek offers global support to the food and healthcare industry, helping brands, retailers, manufacturers and suppliers provide safer products to the consumer. Our global specialists with local expertise work with you to guide you through the things that matter to your business. Our inclusive range of services means we specialise in supporting a wide variety of industries within the food sector, including Meat, Dairy, Honey and Hive, Seafood, Fruit and Vegetables, Convenience Foods, Hospitality and Retail to help you tackle the unique challenges you face.

Australian office: multiple testing sites across AU

37. Concierge Genomics

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://www.conciergegenetics.com.au/

Genotyping service provider. Concierge Genetics is applying genetic knowledge to breeding through its design service. If you want to know how DNA selection will benefit and prosper your businesses bottom line, we are here to help you. We offer laboratory services from development of trait associated markers through to high throughput genotyping selection and analytics for small and large breeding programs.

Australian Address: 5 Peel Street, Adelaide 5000
Contact: Info@conciergegenetics.com.au

38. SAI Global

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://www.saiglobal.com/en-au/assurance_solutions/

SAI Global can assist protect your organisation's brand through our unique SAIGOL™ web-based software solution, from supplier approval to product approval to managing complaints. Clients include McDonalds, Toyota, David Jones, Woolworths.

39. Inexto

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://inexto.com/

Our leading-edge solutions address business to business, business to consumer, and business to government interoperability; providing data security, as well as brand and trade protection, for our clients. More specifically, INEXTO's 100% digital and mobile application enabled platform delivers scalable solutions for secure serialization, track and trace, supply chain visibility, and both product recall, and authentication. INEXTO continues to innovate and develop a wide-range of products that enable us to provide comprehensive solutions and services (*In Extenso*), from manufacturing to the end-consumer.

Head office: Edouard Dapples 7 1006 Lausanne Switzerland
Contact: info@inexto.com

40.TE-food

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://www.te-food.com/

Basic steps of traceability:

- Companies in the supply chain need to identify their premises, lots, batches, and sometimes the retail products
- They need to log information about the events of these identifiers
- Identifications need to be connected throughout the supply chain to keep the integrity of the information

TE-FOOD provides solutions to all these activities from object identification and product serialization, to data capture through interfaces or our B2B mobile app, data storage on blockchain, data processing to follow custom protocols, and tools to present the food history to the consumers.

Head office: An der Technologiewerkstatt 1, 72461 Albstadt, Germany
Contact: info@te-food.com

41.Greenfence

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://greenfence.com/

The system provides 'groundbreaking new paradigm in knowledge and trust and the ability to verify any type of information across your enterprise and supply chain'. Such as:

- Reports, documents, certificates
- Equipment
- Products
- Labeling
- Inventory
- Chain of custody
- people

Contact: 1-800-266-1473

42.Biomerieux

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://www.biomerieux.com.au/

'In industrial applications, we contribute to preventing contamination risks in agri-food, pharmaceutical and cosmetic products. We also bring progress to laboratories: by increasing automation and improving data management, we are helping to reinforce the efficiency of healthcare structures, increase lab productivity, and reduce healthcare costs.'

Australian office: Unit 25 - Parkview Business Centre, 1 Maitland Place, Norwest NSW 2153
Contact: 1800 333 421

43. Where Four

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://wherefour.com/food-erp/

As a comprehensive traceability and production costing system, Wherefour provides you with constant real-time data on inventory levels, costs, production usage and accurate COGS numbers for your products. Get email alerts when your inventory runs below certain levels and see at a glance what you need to reorder, even when you're not in your facility. Other key food & beverage management software features:

- Pull ingredients and supplies via FIFO, FEFO, LIFO or per-batch needs.
- Manage and organize your master recipes and production instructions, including base products and variants.
- Purchase ingredients and supplies in bulk units of measurement and convert them to your recipe units.
- Determine which customers got which products (and which lot codes!) with one-click.
- No hardware or software to install and maintain.
- Print GS1-128, Code 128 or Code 93 barcodes for stock labels.
- Integrates with Quickbooks Online, Quickbooks Desktop, Sage Intacct and Zapier, giving you access to the most popular accounting packages and over 1,000 other popular accounting, POS and ecommerce platforms, including Xero**,** Square**,** Shopify, Google apps, Microsoft Office 365 and ShipStation.

Head office: 1390 N. McDowell Blvd. Suite G133 Petaluma, California 94954, USA.

44. BarTender by Seagull Scientific

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://www.seagullscientific.com/

'BarTender® barcode and label software is an integral component of the compliance, traceability and supply chain interoperability labeling strategies of food producers, processors, logistics providers and manufacturers around the world. Named a top technology for the food industry, BarTender® helps simplify the unique business-to-business interoperability and communication requirements of the food supply chain, offering ease of deployment and legendary technical support, all backed by industry expertise — we understand the regulatory and supply chain pressures the food industry faces.'

'BarTender makes the design and coding of RFID as simple as creating a standard barcode. And because BarTender can pull RFID, barcode and human readable data from a common data source,

and group associated labels in a single template, your label data accuracy and inventory visibility increases. The data in your labels can come from many places: ERP, WMS, production and pricing database files, clocks, weighing scales. BarTender's Intelligent Templates™ and Integration Builder platform make it easy to link your data — wherever it lives — to your label.'

Head office: 15325 SE 30th Place, Suite 100 Bellevue, WA 98007-6597 USA

45. Centricity

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

http://centricityglobal.com/homepage/

'Centricity offers a vertically-integrated suite of field data collection applications, professional services, and infrastructure building blocks (APIs and Frameworks) to Advance the Internet of Ag. Our proprietary Trust Mediation framework provides all stakeholders, from the Farm Forward, the ability to establish business rules regarding the use of their data. These rules ensure that only the right data is shared with the right people at the right time; this mitigates potential risks associated with exposure and secures intellectual property and privacy rights.'

Head office: Confluence Technology Center 285 Technology Center Way Wenatchee, WA 98801 USA

46. KPMG

Analysis for product authentication	Anti-counterfeit packaging	Anti-counterfeit labels	Labels for communication	Audit for integrity
Cloud / block chain exchange of data				

https://home.kpmg/au/en/home/services/blockchain-services.html

KPMG has launched a blockchain-based track and trace platform in Australia, China and Japan. Dubbed as KPMG Origins, the solution leverages blockchain, Internet of Things (IoT) sensors, as well as data and analytics tools to provide transparency and traceability for numerous industries.
The goal of the platform is to communicate product information across the supply chains and for the end-user. Organizations trialing KPMG's solution include CANEGROWERS, the body for Australian sugarcane growers, Australian food exporter SunRice, and vineyard Mitchell Wines.

KPMG has partnered with Blockchain in Transport Alliance (BiTA) to help develop standards for the transport industry. Last year, KPMG worked with Singapore Airlines to develop a digital wallet for the latter's blockchain loyalty program.

Multiple Australian offices: Level 16, Riparian Plaza, 71 Eagle Street Brisbane
Contact: +61 7 3233 3111

9 Appendix 3: AUS-MEAT requirements

Source: AUS-MEAT 2020

Establishment Listing Requirements
Refer Department of Agriculture - Elmer 3 Manual of Impor_ng Country Requirements (MICoR) and relevant Market Access Advices. Directorate General of Livestock Services (DGLS) requirements exist.

Product restrictions / Import permits
Meat Regulations control the import and distribution of meat, meat products and Co Products:

- Ministry of Agriculture Decree 58/2015 - refer MAA1581
- Confirm any import permit requirements with Importer
- Refer MICoR for full Details

Product preparation requirements
None known - verify any requirements with Importer

Product packaging requirements
None known - verify any requirements with Importer

Entry dates / Shelf Life Restrictions
Entry date requirements exist for frozen and chilled meat products:

- Frozen meat must arrive in Indonesia within 6 months of Date of Slaughter and be transported/stored at a maximum temperature of minus -18ºC
- Chilled meat must arrive in Indonesia within 3 months of Date of Slaughter and be transported/stored at a maximum temperature of 4ºC

Exporters / Packers should verify all labelling requirements and current meat regulations controlling import and distribution of Meat, Meat Products and Co products with their importer, refer MAA1581.

Expiry dates
None known - verify any requirements with Importer.

Religious slaughter requirements
Halal slaughter and certification is required.

Stamping requirements
None known - verify any requirements with Importer

Labelling information
Dual English / Bahasa labels must accompany all cartons of Meat, Meat Products and Co products exported to Indonesia. Information in English and Bahasa (on the primary label) must include:

- Country of Origin
- Country of Destination
- Establishment of Origin (Packing Est No.)
- Packed on Date / Slaughter Date
- Product Specification (Product Name)
- Net Weight
- Halal Stamp

- Indonesian port of entry ISO code
- Shipping marks must appear on all cartons of Meat, Meat Products and Co Products and include
- Packing Establishment No: and
- Indonesian Port of Entry ISO code

Exporters/packers will need to verify if use of common code cipher is acceptable.

Labelling guidance
Authorities in some countries require particular information to be shown. It is recommended that all labelled products include ALL the required labelling information on the 'principal display panel'. Below is a checklist that can be used when preparing labels, but independent verification is recommended to confirm labelling compliance.

Australian Labelling Requirements
- Country of Origin
- Full Generic Description
- Product Description
- AUS-MEAT Category
- Date of Production
- Net Weight
- Refrigeration statement
- AI Stamp
- Establishment Name & Address; or Company Name & Address (confirm with importer)
- Type of Packaging (where required)

Importing Country Requirements (verify with importer)
- Halal Certification
- Foreign Language requirements (comply with DGLS requirements)
- Country of Destination
- Slaughter date
- Establishment of Origin (Packing Est. No.)

Additional Labelling Requirements (to be considered)
- Consumer Labelling Information (nutrition information etc.)
- Date of Durability

10 Appendix 4: Preconditions for market access

Australian Government
Department of Agriculture

Indonesia

Indonesia

Hide details

1. PRECONDITIONS FOR MARKET ACCESS

1.1 Import Permit

IMPORT PERMIT

Exporters should ensure that their importer complies with any requirements to obtain a permit for imports into this country.

Updated: 27 Aug 2014

1.2 Establishment Listing

ESTABLISHMENT LISTING

Initial listing procedure for edible products	Required?
Export registration	Yes
Indonesian listing	Yes
ATM listing audit	Yes
Indonesian inspection for listing	Yes
Indonesian listing approval	Yes

*Area Technical Manager

Establishments participating in the listing approval process will be subject to 'Government Regulation Number 35 year 2016 on Types and Tariff of Non-Tax State Revenue' and 'Regulation of the Minister of Finance Number 65/PMK.02/2015 year 2015'. These regulations require establishments to settle with Directorate General of Livestock Animal Health Services (DGLAHS), fees incurred in the processing of listing applications, auditing and establishment approvals.
The department understands that payment is required at two stages in the listing application process. First, prior to completion of the desk audit of application documentation; and second, on receipt of advice of successful desk audit and prior to on-site audit of the establishment by DGLAHS.
Current advice from DGLAHS does not stipulate any further details of the implementation of this regulation, such as how the payment can be made. The department is working closely with Indonesia to clarify the payment process with Indonesian authorities.
In the interim, the department advises working with an Indonesian commercial agent to process the fee payment.
It remains essential that establishments work with the department to submit listing applications and arrange audits

Slaughter, boning, processing

The steps to achieve Indonesian approval for slaughter, boning or processing cattle, sheep or goats for Indonesia include:

- Establishment to incorporate the Australian Government Authorised Halal Program in its Approved Arrangement.
- Establishment to complete and submit Directorate General of Livestock Animal Health Services (DGLAHS) application Form 1 for slaughter premises and Form 2 for halal practices in conjunction with, and verified by, the ATM and relevant Indoneisa recognised Australian Approved Islamic Organisation. The completed forms must be submitted to the Department of Agriculture head office.
- Inspection of establishment by DGLAHS.

In preparing and submitting applications, establishments should take into consideration the general guidelines of Indonesia's Halal Assurance System (HAS).
Production for Indonesia may only commence when DGLAHS grants approval for export to Indonesia.

Buffalo

Halal slaughtered buffalo meat and meat products are accepted from Australian meat establishments with existing approval to export beef to Indonesia. Establishments are required to have export registration for 'Indonesia-buffalo' in addition to their existing 'Indonesia' registration on the department's export registration (ER) database.

Casings and cold storage establishments

Casings and cold storage establishments that handle product destined for Indonesia need not be listed for Indonesia; however, they must have the Australian Government Authorised Halal Program incorporated in their Approved Arrangement.

Updated: 26 Sep 2018

1.3 Access For Edible Products And Edible Byproducts

ACCESS FOR EDIBLE PRODUCTS AND EDIBLE BYPRODUCTS

Animal species or product	Access?

Cattle	Yes
Sheep	Yes
Goats	Yes
Pigs	Yes
Poultry	No agreed certification
Horse	No agreed certification
Buffalo	Yes
Farmed deer	No agreed certification
Farmed rabbit	No agreed certification
Ostrich, emu	No agreed certification
Kangaroo	No agreed certification
Other wild game	No agreed certification
Casings	Yes
Edible tallow	No agreed certification
Gelatine and collagen	Yes

Updated: 28 Mar 2018

1.4 Access For Inedible Products And Inedible Byproducts

ACCESS FOR INEDIBLE PRODUCTS AND INEDIBLE BYPRODUCTS

Product	Access?
Green runners	No agreed certification
Wool	Yes
Skins	Yes
Hides	Yes
Trophies	No agreed certification
Rendered products for animal feed	Suspended by Indonesia
Technical products and pharmaceutical material	No agreed certification
Raw petmeat	Yes
Processed petfood	Yes

Updated: 26 Sep 2018

1.5 Prohibited Products

Meat that has been processed in a third country, other than meat sourced from Indonesian-approved New Zealand export establishments, is prohibited.
Offals are prohibited, except the following cattle and buffalo offals:

- hearts
- livers
- lips
- tails
- feet
- tongues
- tendons

Note that cheek meat, head meat, thin and thick skirt are classified by Indonesia as 'secondary cuts' or 'boneless meat' and are eligible for import into Indonesia.
Animal byproduct meals containing any material sourced from pigs are prohibited.

Updated: 28 Mar 2018

1.6 Australian Animal Products That Do Not Meet Importing Country Official Requirements

AUSTRALIAN PRODUCTS THAT DO NOT MEET IMPORTING COUNTRY OFFICIAL REQUIREMENTS

Apart from prohibited products, there are no known Australian animal products that do not meet Indonesian official requirements.

Updated: 27 Aug 2014

1.7 Premises And Equipment

PREMISES AND EQUIPMENT

This country has no known specific requirements for premises and equipment, that differ from relevant Australian Standards.

Updated: 27 Aug 2014

Updated: 26 Sep 2018

2. OPERATIONAL REQUIREMENTS

2.1 General Operational Requirements

GENERAL OPERATIONAL REQUIREMENTS

This country has no known specific requirements for general operations that differ from the relevant Australian standards.

Updated: 27 Aug 2014

2.2 Religious Slaughter

RELIGIOUS SLAUGHTER

The slaughter establishment must comply with all requirements of the Australian Government Authorised Halal Program.
Imports of beef, sheep and goat meat and meat products into Indonesia require a halal certificate in addition to an AQIS health certificate. Halal certificates for beef, sheep and goat meat may only be issued by an Islamic organisation that has an Approved Arrangement with AQIS.
Indonesia will only approve Islamic organisations based in the same state as the slaughter establishment.
Indonesian-approved Islamic organisations must recognise the halal certificate provided by other Indonesian-approved Islamic organisations without the need to audit the Islamic organisation.

Cold stores

Cold stores must have the Australian Government Authorised Halal Program incorporated into their Approved arrangement.

Pork

Pork may be processed at the same establishment that processes halal meat and meat products; however, in the halal procedures section of their Approved Arrangement, the establishment must ensure complete segregation of halal product from non-halal product, including meat, personnel, equipment and transport.

Updated: 27 Aug 2014

2.3 Microbial And Residue Sampling And Maximum Acceptable Limits

MICROBIAL AND RESIDUE SAMPLING, AND MAXIMUM ACCEPTABLE LIMITS

Indonesia has no known specific requirements for microbial sampling in addition to Australian national programs such as the *E. coli* and *Salmonella* Monitoring Program (ESAM).

National Residue Survey

Historically Indonesia has accepted the National Residue Surveyas adequate assurance that Australian meat and meat products are unlikely to contain violative residues of agricultural and veterinary chemicals, and environmental contaminants. However, Indonesia has a list of specific residue requirements in Indonesian language and exporters are encouraged to engage with their imports to ensure that product is compliant.

Updated: 05 Feb 2018

Updated: 05 Feb 2018

3. SLAUGHTER AND PROCESSING

SOURCING AND RECEIVAL OF SLAUGHTER LIVESTOCK

This country has no known specific requirements for sourcing and receival of slaughter livestock, that differ from relevant Australian Standards.

Updated: 27 Aug 2014

3.2 Antemortem Inspection, Slaughter And Postmortem Inspection

ANTEMORTEM INSPECTION, SLAUGHTER AND POSTMORTEM INSPECTION

This country has no known specific requirements for antemortem inspection, slaughter and postmortem inspection that differ from relevant Australian Standards.
This country accepts imports from establishments that are state-regulated and export-registered.
This country also accepts imports from establishments in which AQIS provides veterinary supervision of antemortem and postmortem inspection.

Updated: 27 Aug 2014

3.3 Boning

BONING

Updated: 27 Aug 2014

3.4 Wrapping And Packaging

WRAPPING AND PACKAGING

This country has no known specific requirements for wrapping and packaging, that differ from relevant Australian Standards.

Updated: 27 Aug 2014

3.5 Refrigeration, Transfer And Loadout

REFIGERATION, TRANSFER AND LOADOUT

This country has no known specific requirements for refrigeration, transfer and loadout, that differ from relevant Australian Standards.

Updated: 27 Aug 2014

Updated: 27 Aug 2014

4. PRODUCTION OF EDIBLE PRODUCTS

4.1 Meat And Edible Offal

SHIPMENT WITHIN 6 MONTHS OF THE TIME OF SLAUGHTER

Meat, meat products and edible offal must arrive in Indonesia within 6 months of the date of slaughter of the animals from which the product was derived.

Updated: 30 May 2019

4.2 Meat Products

MEAT PRODUCTS

Apart from using meat from religious slaughter, Indonesia has no known specific requirements for production of meat products, that differ from relevant Australian Standards.

Updated: 02 Apr 2015

4.3 Casings

CASINGS

Raw material must be sourced from establishments listed for Indonesia, and must be processed in an export-registered establishment with an Approved Arrangement that incorporates the Australian Government Authorised Halal Program.

Updated: 27 Aug 2014

4.4 Rendered Edible Animal Fats And Oils, Including Tallow

RENDERED EDIBLE ANIMAL FATS AND OILS, INCLUDING TALLOW

There is no agreed certification for import of rendered edible animal fats and oils, including tallow, into this country.

Updated: 27 Aug 2014

GELATINE AND COLLAGEN

This country has no known specific requirements for edible gelatine and collagen, that differ from relevant Australian Standards.

Updated: 27 Aug 2014

Updated: 30 May 2019

5. PRODUCTION OF INEDIBLE PRODUCTS

5.1 Green Runners

GREEN RUNNERS

There is no agreed certification for import of green runners into this country.

Updated: 27 Aug 2014

5.2 Wool, Skins, Hides And Trophies

WOOL, SKINS, HIDES AND TROPHIES

Indonesia has no known specific requirements for production of wool, skins and hides.
There is no agreed certification for import of trophies into Indonesia.

Updated: 27 Aug 2014

5.3 Raw Petmeat And Processed Petfood

RAW PETMEAT AND PROCESSED PETFOOD

Indonesia has no known specific requirements for production of raw petmeat, that differ from the Standard for the Hygienic Production of Pet Meat, nor specific requirements for processed petfood.
There is no agreed certification for import of processed petfood into Indonesia.

Updated: 27 Aug 2014

5.4 Technical Products And Pharmaceutical Material

TECHNICAL PRODUCTS AND PHARMACEUTICAL MATERIAL

There is no agreed certification for import of technical products and pharmaceutical material into this country.

Updated: 27 Aug 2014

5.5 Rendered Products

RENDERED PRODUCTS

Indonesia has suspended trade in Australian rendered products for animal feed.
Updated: 26 Sep 2018

Updated: 26 Sep 2018

6. LABELLING, TRADE DESCRIPTION, USE-BY DATE, AND SHIPPING MARKS PORT MARKS

6.1 Labelling And Trade Description

DUAL-LANGUAGE LABELS

A dual English/Bahasa label must be attached to all cartons of meat and meat products imported into Indonesia.
Information in English and Bahasa must include:

- country of origin
- country of destination
- establishment of origin (pack establishment number)
- slaughter and or production date
- product specification
- net weight
- halal stamp
- Indonesian port-of-entry ISO code.

Primary label

All bilingual information must be provided on the primary label rather than on a secondary label on the carton end panel.

Date format

Indonesia does not stipulate a date format; dd/mm/yyyy or yyyy/mm/dd are both acceptable.

Translation

The ‘Country of Origin’, ‘Country of Destination’, ‘Establishment of Origin’, ‘Slaughter/Production date’ and ‘Net weight’ will appear the same if written in English or Bahasa. For example, ‘Australia’ and ‘25 kg = 55.1 lbs’ are identical in English and Bahasa. AQIS strongly advises exporters that prior to the shipment departing Australia, they ensure that their importers have confirmed with DGLS that their dual English/Bahasa labels comply with DGLS requirements.

Updated: 21 Aug 2014

MEAT MEAL, BONE MEAL, POULTRY AND FEATHER MEAL

Product must be labelled with the following text:

The products are not fit for human consumption and do not contain swine products and are only for poultry, swine and aquaculture feed purposes.
Labelling of bulk product must be either:

- on the tailgate board of the container

or

- on the accompanying documents.

Updated: 21 Aug 2014

6.2 Use-By Date Andor Shelf Life Restrictions

USE-BY DATE AND/OR SHELF LIFE RESTRICTIONS

Indonesia has no known specific requirements for use-by dates and/or shelf life restrictions. However, note that Indonesia has requirements concerning the interval between slaughter and the date of arrival in Indonesia.

Updated: 30 May 2019

6.3 Shipping Marks Port Marks

SHIPPING MARKS (PORT MARKS)

Shipping marks must appear on both the health certificate and all cartons of meat, meat products and edible offal, and include:

- packing establishment number
- Indonesian port-of-entry ISO code.

Updated: 27 Aug 2014

Updated: 02 Apr 2015

7. DOCUMENTATION REQUIREMENTS FOR EDIBLE PRODUCTS

7.1 Meat, Meat Products And Edible Offal

HALAL CERTIFICATION

All exports of beef, buffalo, sheep, and goat meat and meat products and offal to Indonesia must be accompanied by an official halal certificate that shows the halal stamp.
Official halal certificates must be endorsed, dated and signed by an AQIS officer:
I further certify that the meat originated from ..... (name and registered number of abattoir(s)).

Updated: 08 Mar 2018

For beef, buffalo and sheep meat, meat products and edible offal, use Z709 with endorsement 3656.

Additional endorsement 3656

I hereby declare that the goods described above have not originated from animals from properties in Australia quarantined due to a case of anthrax.

Attached documentation

- Z709.pdf.PDF (PDF 11.7 KB)

Updated: 08 Mar 2018

PORK MEAT, PORK MEAT PRODUCTS AND EDIBLE OFFAL

For pork meat, pork meat products and edible offal, use Z941 with endorsement 3656.

Additional endorsement 3656

I hereby declare that the goods described above have not originated from animals from properties in Australia quarantined due to a case of anthrax.

Attached documentation

- Z941.pdf.PDF (PDF 11.9 KB)

Updated: 02 Apr 2015

MEAT AND MEAT PRODUCTS USING MEAT SOURCED FROM NEW ZEALAND

For meat and meat products using meat sourced from New Zealand, use Z919 with endorsement 3656.
Meat must be sourced from an Indonesian-approved NZ export establishment.
The exporter must provide a declaration confirming that the New Zealand farm from which animals were sourced has not been quarantined because of anthrax.

Additional endorsement 3656

I hereby declare that the goods described above have not originated from animals from properties in Australia quarantined due to a case of anthrax.

Attached documentation

- Z919.pdf.PDF (PDF 13.2 KB)

Updated: 02 Apr 2015

7.2 Game Meat And Meat Products

GAME MEAT AND MEAT PRODUCTS

There is no agreed certification for import of game meat and game meat products into this country.

Updated: 27 Aug 2014

7.3 Casings

CASINGS

For casings, use Z709 with endorsement 3656.

Additional endorsement 3656
I hereby declare that the goods described above have not originated from animals from properties in Australia quarantined due to a case of anthrax.
Attached documentation

- Z709.pdf.PDF (PDF 11.7 KB)

Updated: 02 Apr 2015

7.4 Rendered Edible Animal Fats And Oils Including Tallow

RENDERED EDIBLE ANIMAL FATS AND OILS, INCLUDING TALLOW

There is no agreed certification for import of rendered edible animal fats and oils, including tallow, into this country.

Updated: 27 Aug 2014

7.5 Gelatine And Collagen

GELATINE AND COLLAGEN

Exports of beef gelatine have gained access to Indonesia under an EX188B (unendorsed certificate) or EX188M (endorsed certificate).
Exporters and AQIS documentation staff should contact DAFF head office for certification requirements and establishment auditing requirements for export of edible gelatine to Indonesia.
This is not agreed certification, and exporters should be aware that DAFF may not be able to intervene in the event of a detained consignment.

Gelatine is a non-prescribed good and therefore not covered by the Australian Government Authorised Halal Program. If an exporter requires a halal certificate, they may approach an individual Islamic Organisation to request a halal certificate on a commercial basis.

Attached documentation

- EX188B.pdf (PDF 11.5 KB)
- EX188M.pdf (PDF 208.6 KB)

Updated: 02 Apr 2015

7.6 Ships Stores

SHIPS STORES

AQIS will issue a Z516 for export of ships stores to this country.

Updated: 02 Apr 2015

7.7 Carry-On Packs, Personal Consignments And Trade Samples

CARRY-ON PACKS, PERSONAL CONSIGNMENTS AND TRADE SAMPLES

There is no agreed certification for import of carry-on packs, personal consignments and trade samples into this country. Anyone who wishes to import these goods into this country should contact the competent authority to determine import and certification requirements.

Updated: 27 Aug 2014

Updated: 08 Mar 2018

8. DOCUMENTATION REQUIREMENTS FOR INEDIBLE PRODUCTS

8.1 Green Runners

GREEN RUNNERS

There is no agreed certification for import of green runners into this country.

Updated: 27 Aug 2014

8.2 Wool, Skins, Hides And Trophies

WOOL, SKINS AND HIDES

For wool, skins and hides, use E153 (manual) or Z450 (EXDOC).

E153 (manual) certificate as to condition contains the following attestations:
I ..... of ..... do hereby solemnly and sincerely declare that I have read this form and that the information contained in this certificate is correct in every detail and that the goods described above were derived from animals of Australian origin and the products were treated solely within Australia.
[Declaration by exporter]
I, the undersigned, a duly qualified Veterinary Surgeon in the employ of the Government of the Commonwealth of Australia, have no reason to doubt the truth of this declaration, and certify that Foot and Mouth Disease and Rinderpest do not exist in Australia, and further that Anthrax is not prevalent in the district of origin of the above-mentioned products.
[Declaration by Government Veterinarian]
Z450 (EXDOC) certificate as to condition contains the following attestations:
It has been declared to me, a duly qualified veterinary surgeon in the employ of the Government of the Commonwealth of Australia and I have no reason to doubt the products described above were derived from animals of Australian origin or which have been raised in Australia for more than three months and the products were treated solely within Australia. I further certify that foot and mouth disease and rinderpest do not exist in Australia, and that anthrax is not prevalent in the district of origin of the above-mentioned products.

Updated: 20 Dec 2014

8.3 Raw Petmeat And Processed Petfood

RAW PETMEAT

For raw petmeat, use E242A (EXDOC only).

Any poultry material must be derived from birds which were slaughtered on or after 28 April 2015.

Indonesia requires the certificate to be printed on security paper.
Embedded endorsement
E242A (EXDOC) certificate as to condition contains the following attestations:
It has been declared to me, a duly qualified veterinary surgeon in the employ of the Government of the Commonwealth of Australia and I have no reason to doubt the products described above were derived from animals of Australian origin and the products were treated solely within Australia. I further certify that foot-and-mouth disease and rinderpest do not exist in Australia.

Updated: 14 May 2015

PROCESSED PETFOOD

For processed petfood, use E242A (EXDOC only).
Any poultry material must be derived from birds which were slaughtered on or after 28 April 2015.
Indonesia requires the certificate to be printed on security paper.
Embedded endorsement
E242A (EXDOC) certificate as to condition contains the following attestations:

It has been declared to me, a duly qualified veterinary surgeon in the employ of the Government of the Commonwealth of Australia and I have no reason to doubt the products described above were derived from animals of Australian origin and the products were treated solely within Australia. I further certify that foot-and-mouth disease and rinderpest do not exist in Australia.

Updated: 14 May 2015

8.4 Technical Products And Pharmaceutical Material

TECHNICAL PRODUCTS AND PHARMACEUTICAL MATERIAL

There is no agreed certification for import of technical products and pharmaceutical material into this country.

Updated: 27 Aug 2014

8.5 Rendered Products

MEAT AND BONE MEAL, POULTRY MEAL AND FEATHER MEAL (NOT CONTAINING PIG)
Certification for these products is currently not issued pending official negotiations.

Updated: 26 Sep 2018

Updated: 26 Sep 2018

9. SHIPPING AND AIRFREIGHT REQUIREMENTS

Shipping And Airfreight Requirements

DIRECT SHIPPING OF ANIMAL BYPRODUCT MEALS

Animal byproduct meals must be shipped directly from Australia to Indonesia, or via an intermediate port approved by the Directorate General of Livestock Animal Health Services (DGLAHS).

Updated: 13 Feb 2018

Updated: 13 Feb 2018

10. PORT-OF-ENTRY INSPECTION AND TESTING

Port-Of-Entry Inspection And Testing

PORT-OF-ENTRY INSPECTION AND TESTING

The Department has no specific knowledge of port of entry inspection and testing for imports of meat products and inedible products into the country.

Updated: 15 Jul 2015

Updated: 15 Jul 2015

11. GLOSSARY

Glossary

GLOSSARY

Cheek meat, head meat, thin and thick skirt are classified by Indonesia as ‘secondary cuts’ or ‘boneless meat’.

Updated: 15 Jul 2015

Updated: 15 Jul 2015

11 Appendix 5: Smart packaging technologies

Source: University of Melbourne (2019)

Number: 1

What: Blockchain currency

- **Terms:** Cryptocurrency is a digital currency that functions as a medium of exchange, utilizing the process of cryptography enables users to transact securely using these digital coins. Cryptocurrencies operate on a distributed ledger called a blockchain. Units of a cryptocurrency are tracked through a process known as mining,
- **Terms:** A blockchain is a public ledger of all cryptocurrency transactions. Each group of transactions are referred to as a block, with each block then being combined chronologically into a chain. Information that exists on the blockchain is shared and public, therefore, every node connected to the network, possesses a copy of the blockchain. Each node will be able to have access to all transactions that have or ever will take place on the blockchain. The distributed nature of blockchain technology also means that the database cannot be controlled by a single entity, nor can it easily be hacked as there is not one single point of failure. Unauthorized changes to the blockchain would be unlikely, as overriding the network would require a tremendous amount of computing power.

- **What is VeChain (VEN)?**
  VeChain is a blockchain-enabled platform that is designed to enhance supply chain management processes. By utilizing tamper-proof and distributed ledger technology, VeChain provides retailers and consumers with the ability to determine the quality and authenticity of products that are bought. From product source materials, to servicing history, spare part replacements, every single piece of information about the supply chain movement of a product can be recorded and verified to bring about a supply chain management ecosystem that is secure for all participants.

- **Future:** There is no doubt that blockchain technology can be an important innovation to supply chain management. With a growing list of business partnerships and technological developments, VeChain is positioning itself to be THE disruptive, and innovative force that reshapes the way we think about supply chain management.

Number: 1

What: VeChain

Blockchain Currency

- **How:** A secure supply chain management ecosystem via the method of asset digitization. It enables manufacturers to assign products with unique identities to the platform. Allowing manufacturers, supply chain partners and consumers, to track the movement of products through their supply chain. Making use of its VeChain Identity (VID) technology, to mark and track a product. VIDs are produced using a SHA256 hash function, it generates a random hash value that corresponds to a VID. The VID can then be written into a NFC tag, QR code, or RFID tag, to be used for each product. This method allows for the tagged product and all corresponding information, such as the supply chain activities of the product, to be translated from the real business world into the platform.
  How: Security is maintained on the platform by the use of network nodes. These network nodes can be controlled by businesses and organizations that are directly participating in the ecosystem. Network nodes may provide services such as: quality inspection, wallet services, and may even act as a private key management service provider. The platform will also make use of its own native token asset known as the VeChain tokens (VEN). These tokens will be used as GAS that is needed for smart contract execution. As well as this, VENs will also be used as an incentive mechanism, in that they will be awarded to network nodes that help facilitate the ecosystem via their operation.

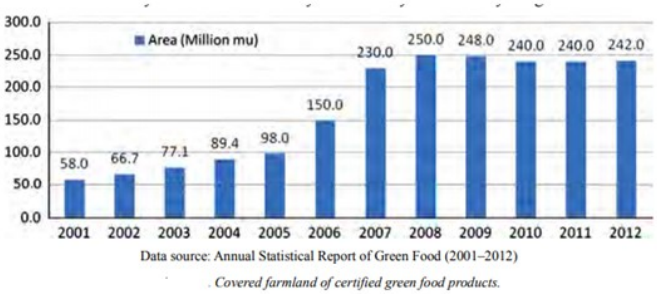
- **Current Partners:** Babyghost, Healthcare Co Ltd, MadeForGoods, BitOcean, Hyperledger, Microsoft, China Unicorn, Jiangsu Printed Electronics Co Ltd, PwC, Directed Imported Goods, Kuehne & Nagel, Renault, DNV GL, Xiamen Innov Information Technology Co Ltd

Number: 2

What: Green Food Logo

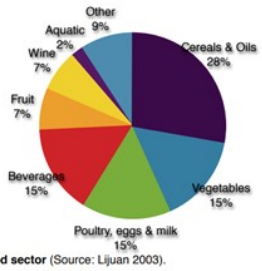
- **What:** "Green Food" is a Chinese food production innovation, and has been described as "one of the most successful eco-labelling programs in the world". Green Food provides a "middle way" between chemical and organic farming. China's development of the Green Food concept resolves issues with both chemical and organic agriculture - for the former by offering reduced pesticide use, and for the latter by providing a stepped pathway for conversion from chemical to organic agriculture while simultaneously providing a Green Food price premium. After 25 years Green Food is well known to Chinese consumers, and is readily available for retail purchase in China. There are two tiers A and AA

- **Can we use it?** In 2006 The CGFDC accredited the Canadian production of 600,000 tonnes per annum of barley to carry the Green Food label. With barley yield in Canada reportedly 2.9 tonnes per hectare this suggests that theGreen Food certified area in Canada is at least 200,000 hectares. Canada's total barley planting is 3.6 million hectares, so the new Green Food certification accounted for 5.6% of Canadian barley production.



Data source: Annual Statistical Report of Green Food (2001–2012)

Covered farmland of certified green food products.



Green Foods by food sector (Source: Lijuan 2003).

Number: 2

What: Green Food Logo

- **History:** Green Food in China dates from 1990. In that year China's Ministry of Agriculture created the Green Food program. Under their control, the China Green Food Development Centre (CGFDC) was founded in 1992, to be "responsible for national development and management of Green Food". The CGFDC owns the Green Food logo, develops and maintains the Green Food standard, coordinates inspections and monitoring, is responsible for certification, and draws income for certification fees.
  Signalling the future direction for Green Food, in 1993, the CGFDC joined the International Federation of Organic Agriculture Movements (IFOAM), based in Bonn, Germany. The CGFDC subsequently split Green Food certification into the two grades, Grade A and Grade AA, in the late 1990s. Green Food certification serves as a reassurance to both domestic consumers, and to international food manufacturers sourcing ingredients in China.

- A (which allows some use of synthetic agricultural chemicals), This is what is domestically known as **'organic'** China
- AA (which is more stringent, allowing less chemical use) This is the **international standard for 'Certified Organic'.**

- **Label:** Food certified under Green Food is labeled with the Green Food-logo both in Chinese and English. It also carries a twelve digit LB-number which makes it traceable and able to verify its authenticity

Green Food logo	Organic & Organic In-Conversion logos
绿色食品 GreenFood	

What: Integrated Printed Electronic System with Rewritable Memory

Number: 3

- **Benefit:** A smart label with memory that strengthens packaging authentication. Printed electronics is a low-cost anti-counterfeiting format for packaging (including refillable formats). The film adds low-cost intelligence to objects or packaging by printing thin circuitry on a flexible substrate.
- **How's it different from RFID / other smart labels?** Traditional anti-counterfeiting methods such as invisible ink, holograms and RFID tags can be easily copied/hacked and are often expensive to implement. By integrating this technology with advanced security printing and digital cryptography, the solutions are inexpensive and difficult to counterfeit as every stamp is uniquely encrypted and can only be created by authorized personnel. In addition, key features will work offline. The data is rewritable and can identify if a medication refill has been authorized, shipping tax has been paid, whether a package passed through an authorized distributor. Using a smartphone reader, printed memory tax stamps can be used for track and trace package location, authentication and verification of a product's information.

Picture:

What: Integrated Printed Electronic System with Rewritable Memory

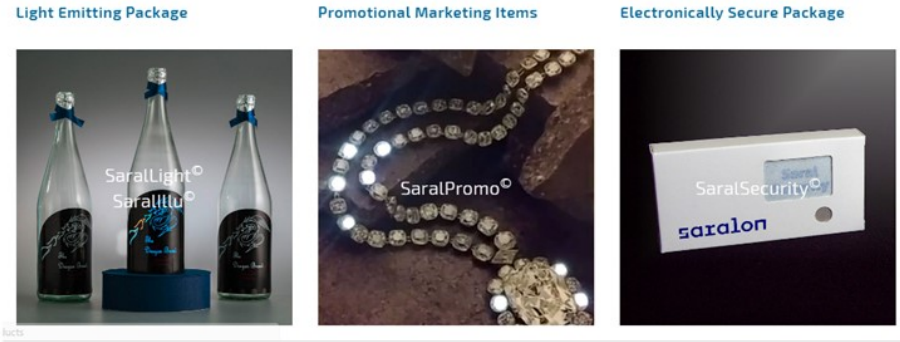
Number: 3

- **What:** Manufactured through a printing process and add low-cost intelligence to objects or packaging by printing thin circuitry on a flexible substrate. The non-volatile memory is delivered in small flexible labels. The labels can be placed on products at any stage of the manufacturing or supply-chain process. Labels can store up to up to 36 bits of information, which enables 68 billion distinct data combinations. Everything from lot codes and serial numbers to expiration dates and geographic IDs can be stored on the labels, and the data is preserved until overwritten within a 10-year span.
- **Commercial Examples:** Xerox Printed Memory in partnership with Thinfilm,

What: Saralon Printed electronics for packaging

Number: 4

- **Benefit:** Innovative Inks are produced by Saralon for creating desired electronic features. Inks are printed one-over-another to produce different electronic devices by using a conventional printing machine in ambient conditions. The printed electronic device is integrated into a package by using conventional technologies. An end-user can interact with the electronics integrated into the package. Electronics on a package make the package more attractive, highly secure and customer interactive. It can also connect a package to the Internet of Things (IoT).
- **Application:** The functional inks for printed battery and printed illuminated displays make a package capable of emitting light. The package can be a paper, cardboard or plastic box, bottle label or even a glass bottle. Or use functional inks for printed battery, printed electrochromic display, printed diode and printed sensors enhance the anti-counterfeiting measures of a package. The package can be a cardboard box, a glass vial, a blister, a sleeve or a tag.



What: Inks (fluorescent)

Number: 5

- **Benefit:** Fluorescence-based oxygen sensors are well suited to be integrated into meat packages since they should remain in operation and be reliable through the supply chain until the point of opening.
- **What:** Special dye molecules display excited states and emit radiation at specific wavelength (fluorescence or phosphorescence) when they absorb light. Quenching of this excited luminescent dye can occur during collision with oxygen molecules. Due to this energy transfer mechanism, luminescence intensity is decreased over time, the degree of quenching is proportional to the concentration of oxygen within the system. Fluorescence-based oxygen sensor consists of a fluorescent or phosphorescent dye which is immobilized in a solid polymer matrix. A dye-polymer coating is applied as a thin film on a device such as an optical fiber

Picture:

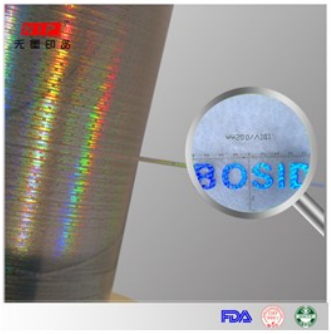
Number: 6

What: Optical variable device Printing;

- **What:** An optical variable device (OVD) is an iridescent image that exhibits various optical effects such as movement or color changes. They can't be photocopied, scanned, accurately replicated or reproduced. Often used as a security device and anti-counterfeiting measure on money, credit cards and government-issued identification cards. They can be created through a combination of printing and embossing.

  OVDs are based on diffractive optical structures. This gives cards the appearance of having different patterns, colors, and designs depending on the amount of light striking the OVD and the angle the OVD is viewed at. Holograms are a type of OVD.

Picture:



Product differentiation. Holographic foil helps Colgate Palmolive create shelf impact for its products and instant recognition t

Number: 7

What: RDIF/NFC

- **RFID WHAT:** Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically stored information. Information flow is one way
- **PASSIVE HF RFID:** powered by the electromagnetic energy transmitted from the RFID reader. Reader range from near, up to 25 meters
- **Active RFID:** own power source. Broadcast range up to 300 meters

- **NFC What:** Growing out of RFID, NFC is method of wireless data transfer for near field communication, that detects and then enables technology in close proximity to communicate without the need for an internet connection. It's easy, fast and works automagically. Powered by the electromagnetic energy transmitted from the RFID reader.

- NFC has three modes of operation: the peer-to-peer mode that lets two smartphones swap data, a read/write mode in which one active device picks up info from a passive one, and card emulation, in which an NFC device such as a smartphone can be used like a contactless credit card.

Number: 8

What: QR codes

- **What:** A QR (Quick Response) Code is a two-dimensional barcode consisting of a black and white pixel pattern which allows to encode up to a few hundred characters. Smartphones and tablets are able to recognize and decode them quickly.

- Can direct to:
  - a web address
  - store vCard details
  - Google Maps info
  - Youtube video links
  - Download Apps
  - Spotify playlists
  - Information
  - Augmented Reality Videos
  - Serialisation = Product Validation

Picture:

Number: 9

What: Tamper proof / evident

- **What:** Anti-tamper devices have one or more components: tamper resistance, tamper detection, tamper response, and tamper evidence. Resistance to tampering can be built in or added to packaging. Examples include:
  - Extra layers of packaging (no single layer or component is "tamper-proof")
  - Packaging that requires tools to enter
  - Extra-strong and secure packaging
  - Packages that cannot be resealed
  - Tamper-evident seals, security tapes, and features

- **Why:** Tamper-evident packaging provides many benefits to businesses in almost every industry. The most evident benefit is security. If you are in the pharmaceutical industry, tamper-evident packaging as well as tamper-resistant packaging are in almost every case a requirement. In other industry it provides security throughout the product's lifecycle including after purchase by a consumer.

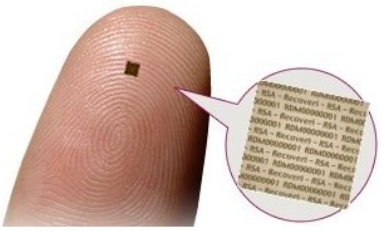
Picture:

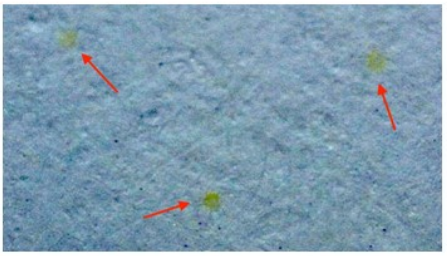
Number: 10

What: Microdot printing

- **What:** A microdot is text or an image substantially reduced in size onto a small disc to prevent detection by unintended recipients. Microdots are normally circular and around one millimetre in diameter but can be made into different shapes and sizes and made from various materials such as polyester or metal. The name comes from the fact that the microdots have often been about the size and shape of a typographical dot, such as a period. Microdots are, fundamentally, a steganographic approach to message protection.
- Printer steganography is a type of steganography – "hiding data within data" where tiny yellow dots are added to each page. The dots are barely visible and contain encoded printer serial numbers and timestamps. Unlike many forms of steganography, the hidden information is not intended to be available from a computer file, but to allow serial number and time of printing to be determined by close examination of a printout.

Picture:



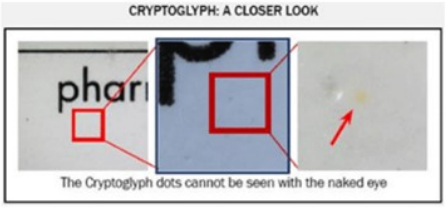


Number: 11

What: Cryptoglyph

- **What:** Cryptoglyph (Crypto = encryption, glyph = marks), which combines two elements: Printing of invisible micro-points over the entire surface of the primary or secondary packaging, such as the blister foil for foods and pharmaceuticals. As these dots are invisible and spread on the whole surface of the packaging, it is impossible to replicate or to erase them. The invisible micro-points contain encrypted information, which can only be deciphered by using the encryption key. The micro-points are integrated in the package design before printing and are invisible to the naked eye and difficult to distinguish, even with a magnifying glass, as the dots are confused with the imperfections found in all printed material structures and thus effectively camouflaged.
- The Cryptoglyph detection process can be performed using a smartphone or scanner. To avoid having the encryption key made available in the field, a digital image of the packaging is sent to a processing system located in a secured area, via mobile data transmission networks. Once analyzed in this safe and secured area, the result is sent back to the field controller. This two-way communication process ensures the full security of the encryption system and allows instant consolidation of the field track and trace verification tests.

Picture:



Number: 12

What: Taggants

Picture:

- **What:** Taggants are uniquely encoded materials or chemistries that are virtually impossible to duplicate. A taggant is like a fingerprint—a unique signature of identity to which customers assign meaning. Taggants can be overt or covert and are used for a wide variety of applications. They serve four main purposes, Proof of ownership, anti counterfeiting, tracking and monitoring
- **How: Physical**, eg mircodots, **Spectroscopic**, eg dyes that fluoresce in different regions of the visible spectrum. **Chemical**, similar to optical but using trace minerals as the marker. DNA, based on DNA oligonucleotide fingerprints, could be natural, synthetic or a combination
- **Summary:**

Coding Type	Advantages	Disadvantages
Physical	Simplistic analysis Inexpensive	Limited coding capacity Less covert
Spectroscopic	Simplistic analysis Inexpensive	Subject to counterfeiting Limited coding capacity
Chemical	Analysis sensitivity More covert	Prone to misidentification Incomplete recovery
DNA	High coding capacity Low toxicity	Expensive analysis Possible degradation

Number: 13

What: Taggant MicroDOT

Picture:

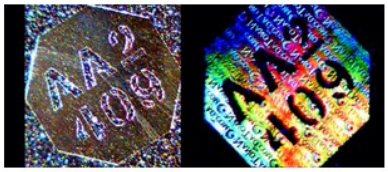
- **Use:** Identification
- **MicroDOT:** MicroDOTS are tiny metallic particles that are chemically etched with a unique identification code. All MicroDOTS within an individual kit have the same unique code; each kit has a different unique code. They are nearly invisible to the naked eye and can be read with any simple hand-held magnifier of 60x or higher
- **Why:** The unique code is registered against the owner of the kit. The code provides a direct link between the owner of the kit and the assets to which they are applied. When applied to items of value, they are used to provide irrefutable proof of ownership via the unique code. MicroDOT partners with luxury brands to develop innovative overt and covert security systems for their individual protection needs.

Number: 14

What: Taggant Nanotags

- **Use:** Identification
- **Nanotag:** NanoTags are octagonal pieces of microscopic nickel – 6 to 10 microns thin and ranging from 0.3mm to 0.5mm wide. An individual NanoTag features a micro-image of a personalised brand, created to order. This is a hologram-like nano image displaying changes of colour under different viewing angles. Technically not a hologram, it is known as a Modulated Diffraction Grating (MDG). A real hologram viewed under a microscope becomes a meaningless grey mass of micro-particles, but by contrast, a NanoTag reveals the branding in fine detail and brilliant colour
- A Security Identification Code (SIC) is etched physically through the body of the nickel tag. The same SIC is repeated through the thousands of NanoTags contained in each personalised set or batch of NanoTag products, mixed with special proprietary adhesives or embedded into the body of plastics. Once the mixture of tags and adhesive/plastic becomes dry and solid, the NanoTags become fully resistant to water, most chemicals and environments. NanoTag supersedes competing microdot technology which is based on a plastic substrate

Picture:

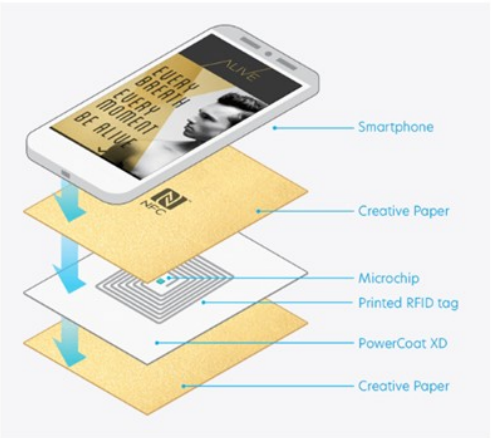


Number: 15

What: Powercoat by Arjowiggins

- **Benefit:** PowerCoat® is a unique, flexible paper formulation that allows the printing of complex electronic circuitry directly onto paper, ushering in the next generation of smart products for many industries.
- **How:** A sheet of PowerCoat comprises 3 layers of paper: two layers of our conventional creative papers encasing a layer paper with pre-printed RFID circuitry and a silicon chip. The 3 sheets are then laminated to create a sheet of "connected" PowerCoat Alive. The result is an NFC-ready paper that can be programmed to trigger a multitude of functions on any NFC-enabled device.
- By enabling smart functionality that consumers can interact with and offering a more immersive brand experience. Eg scanning to receive the latest instore promotions. Or added functionality eg point of sale packaging with integrated LEDs that light up or food packaging that can communicate the freshness of its contents to your phone. Detailed analytics, allow you to track the success of your campaigns in real-time.

Picture:



What: Multi-layer material from agricultural by-products

Number: 16

- **What:** A compostable multi-layer material made from agricultural and forestry by-products is under development as an alternative to oil-based plastics. Researchers from Finland are developing a solution that has a number of applications for food packaging including meat. The material looks and performs like plastic but is made from cellulose-based raw materials, which, of course, are renewable, recyclable and biodegradable. Can also be made from by-products such as rice straw, sugar cane, textile waste and agricultural residues. The material exhibits good gas, grease, mineral oil and moisture barrier properties. It's is comprised of two complementary wood cellulose. The first is a fibrous cellulose(HefCel) combined with a plastic type cellulose (MMCC). VTT has combined them into a compostable three-layer film that has overcome the moisture sensitivity typically associated with fibrous cellulose films

Picture:

What: Compostable meat pack

Number: 17

- **What:** ProMessa BV (main butcher for supermarket chains in Holland) has recently launched a fully biodegradable meat packaging solution. In collaboration with Reine, Germany based compostable packaging specialists Bio4pack. The organic meat assortment is fully certified compostable and can be thrown away by the consumer with their waste. The whole of the pack is biodegradable including the absorption pad, foil and labels. The meat trays are made of completely renewable Poly Lactic Acid (PLA), which is made from the vegetable raw materials dextrose and lactic acid. Bio4Pack pack for fresh meat, meets food safety and pack functionality requirements, as well as being fully compostable. It complies with the requirements of the EN13432 compostable certification standards. The material is naturally hard but is quite brittle. An additive has been used to give the tray the necessary strength.

Picture:

What: Zubex biodegradable film

Number: 18

- **What:** Monterrey, Mexico based Zubex has developed a biodegradable film suitable that is claimed to be 100% degradable. The film is suitable for meat and cheese products and the degrading process takes just over two years – about 26 months – in a landfill. The co-extruded material is made from a range of polymers including PE and polyamide. Two options are available – a meat casing film as well as shrinkable bags. Mexican brand owner Qualtia Alimentos has been one of the first companies to use the casing for their premium meat brand Zwan. Disposable covers for these products has always been an environmental issue so the Zubex solution helps to reduce the waste waste generated by provide degradability properties. The material is able to maintain its properties throughout the supply chain journey. Once it has been discarded in landfill it is slowly converted into CO2 or methane gas.

Picture:

What: Nanoscale clay tubes

Number: 19

- **What:** Scientists at Sabanci University in Turkey have developed a new material that promises to protect food through a new process that helps to reduce bacteria growth as well as over-ripening. The initiative incorporates nanoscale clay tubes, which are hollow tubes made from clay. These prevent oxygen from permeating the film, while also stops water vapour and other gases from escaping. Current cling film products suffer from contamination from bacteria and permeability to water vapour and oxygen. They also accumulate ethylene, which is released naturally by the food. The nanoscale stops ethylene from building up by absorbing it. Carvacrol oil is added which helps to kill off microbes. In tests, the new film improved the shelf-life of wrapped tomatoes, bananas and chicken compared with normal polyethylene and further development work is ongoing. Significant testing still needs to take place before this initiative can be commercialized

Picture:

What: Plant-based material for Australian beef pack

Number: 20

Picture:

- **What:** Wesfarmer owned Australian grocery store chain Coles Supermarkets has begun to sell its lean beef mince own label brand in a new plant-based packaging material. The use of a bio-material from Plantic Technologies combines PET with a bio-based ultra-high barrier material, which increases the shelf-life of the product. The multi-layered film consists of the plant-based Plantic HP (High Performance), which provides oxygen and gas barrier, whilst the PET layer delivers the necessary moisture and water vapour barrier. The Plantic material is soluble and biodegrades in the recycling process, whilst the PET layer is recovered and recycled. Plantic requires about half the energy to produce than traditional fossil fuel plastics.

What: Edible packaging made from milk protein

Number: 21

Picture:

- **What:** Washington DC based American Chemical Society has recently announced the progress of a food packaging development made from milk protein. The material is edible and is being seen as a potential long term replacement for plastic film that is used for products such as cheese and meat. The protein-based pack is biodegradable as well as being edible. It is also claimed that it has the potential to keep its contents fresher than plastic. The film's protein is casein and bonds tightly, so much so that the packaging could improve oxygen barrier properties 500 times more than conventional plastic packaging. The researchers are currently testing applications for products in single-serve, edible food wrappers. The film apparently has little taste although flavours as well as vitamins could be added if required

Number: 22

What: Compostable pack, biobased foam product

Picture:

- **What:** Global chemical giants Basf is busy expanding its range of foam products with the introduction of a compostable foam called ecovio EA. The main areas of use for ecovio is usually plastic films such as organic waste bags and for agricultural products. ecovio is primarily biobased and can be used as a compostable packaging solution as a paper-coating, for shrink films, for injection moulding products and in this case foam packaging. The foam's properties make it particularly ideal for transport packaging where a high level of impact resistance is important. ecovio EA is the first expandable, closed-cell foam material which is biobased and certified compostable.ecovio EA is being seen as suitable as a reusable container for fruit / vegetables, fish and meat products

Number: 23

What: Expandable foam meat packaging

Picture:

- **What:** Erze Ambalaj is one of Turkey's largest food packaging companies and is Turkey's largest Expanded polystyrene (EPS) packaging business. It has partnered with Dutch biochemistry business Parx Plastics to create a new version of expandable foam packaging that improves food safety by reducing salmonella and listeria in meat packaging. The antimicrobial packaging solution not only reduces contamination but also helps to prolong product shelf life. This is achieved through bio-mimicry where a trace element is added to the packaging to prevent bacteria from proliferating. Over a 24 hour period, the packaging development reduces bacteria on food products by as much as 97%.

Number: 24

What: Irreversible heat-activated ink

- **What:** Thermochromic ink experts Chromatic Technologies Inc. (CTI) have announced a breakthrough innovation with the introduction of a new solution to identify evidence of tampering. Tamper Alert is an irreversible, heat-activated ink technology with potential applications in industrial products, pharmaceuticals, food and electronics prone to theft and counterfeiting. The ink is irreversible and is used to show a product has been tampered with or has undergone temperature changes that will impact on the quality of the product. CTI has developed a narrow activation window where the alert transitions from colourless to full colour within a range of just 10° C. This compares with traditional irreversible technologies that require a much higher transition window of up to 50° C. CTI have perfected an ink that changes only the one-way. Tamper Alert is available only in water-based applications.

Picture:

Number: 25

What: Twist and lock pack

- **What:** Wisconsin based Plastic Ingenuity have been on the innovation trail again with the introduction of an easy-to-use twist-and-lock pack that also has a unique, tamper-evident security tab. The twist and- lock function is situated between the lid and base and the user pushes the lid down and twists to lock it in place. The process of unlocking is also straight forward. They twist it back and then lift it off. When the pack is opened for the first time, the snap breaks indicating that it may have been tampered with.

Picture:

Number: 26

What: Hologram cap

- **What:** German packaging business KISICO has nearly 70 years of experience in developing and producing caps and closures for many different fields of application. They have tapped into this experience with the development of a hologram topped cap they have called the HologramCap. Breakthroughs in nanotechnology has allowed the business to create the innovation, which has many applications for anti-counterfeiting and brand enhancement opportunities. The hologram is fully integrated in the production process of the cap. This means that no additives, inks or labels are required to deliver the effect. The technology can be applied to any existing cap and the hologram design can be personalised to meet the needs of the brand owner. The solution will be of interest to the pharmaceutical industry as well as other high value products. The HologramCap uses technology developed by Swiss brand protection business Morphotonix.

Picture:

Number: 27

What: Fluorescent ink

- **What:** Plastic packaging specialists Spectra Packaging have announced the development of a covert print technique to combat the threat of counterfeiting. The business' new ink has an illuminate fluorescent print that is invisible to the naked eye. It is only revealed when exposed to ultra violet light. As well as this fluorescent ink the business has also created a product called Chameleon, a print finish that changes colour depending on the angle viewed. This acts not only as an additional brand feature to deter counterfeiters, but also as an engaging pack enhancement in its own right.

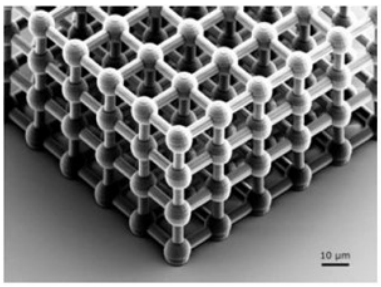
Picture:

Number: 28

What: 3D micro-printing

- **What:** Researchers from optics business Zeiss have worked alongside Karlsruhe Institute of Technology (KIT) in Germany to develop an anti-counterfeit technology using 3D micro-printed structures. The development could result in the replacement of conventional 2D holograms microstructures. The new security feature has been created using a technique called multistep 3D optical laser lithography using a device developed by KIT company Nanoscribe. The use of 3D-printed fluorescent microstructures helps to improve counterfeit protection. This security feature is complex to manufacture making it very difficult to copy. The microstructures take the form of a unique pattern combination made with an acrylate structure and fluorescent quantum dots. These can only be seen using specialised equipment. The new security features have a side length of about 100 µm (micrometre) and are barely visible with the naked eye. The plan is to embed the technology in foil to operate as security tags for branded items.

Picture:

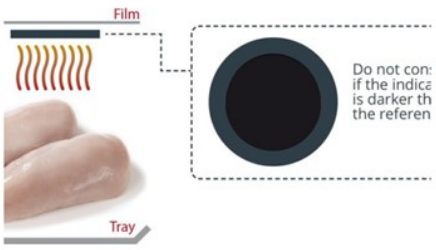


Number: 29

What: Visual indicator label

- **What:** A new label patented by Chimigraf aims to improve chicken produce freshness visual communication. The smart technology Freshcode label is a unique visual indicator, that displays the freshness of chicken breasts. Freshcode has been developed in collaboration with Valencia, Spain based ITENE. It The centre of the Freshcode label is impregnated with an intelligent ink, which captures the emission of volatile gases released as chicken that has been treated with modified atmosphere packaging (MAP) begins to spoil. The intelligent ink gradually changes colour to indicate the level of freshness and the product is no longer suitable for consumption when the label turns fully black. This is a rich area of development: Colour-changing label to help indicate food freshness, Self-adhesive device changes colour to show food freshness, Colour changing packaging indicates if product is fit for consumption and Label changes colour to inform on shelf-life length.

Picture:



Number: 30

What: 360 degree view

- **What:** Chicago-based start-up company PRE Brands has created new packaging to help consumers make their choice of meat from the range. The business' insight that shoppers want to see their cut of meat in full before they buy it has lead to the introduction of a patent pending pack format that delivers a 360-degree view of the contents. The easy-open vacuum pack is attached to a paperboard backer and shoppers can rotate the pouch to see all sides of the meat. A perforated tear line makes it easy to separate the film pack from the backer. PRE Brands worked with the packaging design firm Ciulla for the design

Picture:

Number: 31

What: Three layer film with sensors

- **What:** ASINCAR is a non profit organisation founded by a group of meat industry companies in Asturias, Spain. The organisation was created to represent and support the agri-food industry as well as progress innovative packaging solutions. The group is developing an intelligent pack solution that will allow real-time reporting of the quality of fresh beef as well as predict its remaining shelf life via pack sensors and an external reader. A prototype has been developed and consists of three specific sensors within a three layer film. As meat deteriorates it releases volatile organic compounds (VOx). The sensors are able to detect and quantify the amount of VOx that is being emitted. The innovation will give information about potential breaks in refrigeration to individuals in the supply chain as well as consumers and is an alternative and perhaps more accurate way of assessing the shelf-life of meat compared with the sell-by/eat-by pack markings.

Picture:

What: Time-Temperature Indicators

32*

to monitor the Supply Chain, Inform Customers

Benefit:

- A label that facilitates cold chain monitoring that informs retailers and consumers if a frozen food is still safe to eat. This is an indicator and not in direct contact with the food (smart not active)
- An accumulative temperature indicator, mimics rate of food decay.

Commercial Example:

OnVu™ TTI.

- Based on photochromic spiropyran based inks.
- Label activation is a 4s UV light exposure.
- The rate of photochromic colour change from blue to pale is dependent on the temperature.
- Smart label placed upon food packaging to monitor the cold chain for chilled and deep-frozen food, making the current state of the product visible–the label changes colour depending on temperature. The darker its colour, the better the cold chain has been maintained.
- Acting as a reference, the outer portion of the thermometer is a lighter shade of blue. The cold chain monitor works simply: as long as the centre is darker than or the same as the reference colour, then there has not been any significant interruption in the cold chain, and the best before date shown on the packaging remains valid.
- As time goes by and/or if the cold chain is broken, the colour pales.
- Patent: WO/2006/048412

What: Time-Temperature Indicators

33*

to monitor the Supply Chain, Inform customers

Benefit:

- A label that facilitates cold chain monitoring that informs retailers and consumers if a frozen food is still safe to eat. This is an indicator and not in direct contact with the food (smart not active)
- An accumulative temperature indicator, mimics rate of food decay.

Commercial Example:

Tempix Indicator Labels

Smart label placed upon food packaging to monitor the cold chain for chilled and deep-frozen food, making the current state of the product visible– The line is black and continuous through proper transport.

- If the temperature during transport is breached the line is missing or broken
- The barcode is also partly erased to make it un-scannable
- Not a gradual colour loss
- Irreversible indicator (smart not active)
- www.tempix.se

Number: 34*

What: Time-Temperature Indicators

to monitor the Supply Chain, Inform customers

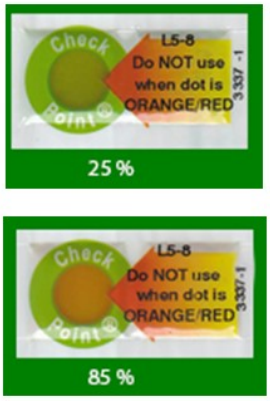
Benefit:

- A label that facilitates cold chain monitoring that informs retailers and consumers if a frozen food is still safe to eat. This is an indicator and not in direct contact with the food (smart not active)
- An accumulative temperature indicator, mimics rate of food decay.

Commercial Example:

Vitsab TTI Label

- The smart label is activated by producer by pressure to break the seal between the enzyme and the substrate.
- The food degrades at the same rate as the enzyme reacting in the indicator which varies depending on transport temperature and time since activation
- A **gradual** colour loss
- Irreversible indicator (smart not active)
- www.Vitsab.com/en/tti-label/



Vitsab TTI Label

Number: 35*

What: Time-Temperature Indicators

to monitor the supply chain, Wicking Styles

Commercial Examples:

- WarmMark is a wick based temperature indicator which when heated **above** a trigger temperature the red dye moves along a matrix. The warmer the temperature the faster the dye travels to indicate brief, moderate and prolonged exposure. These are irreversible indicators and are not used in contact with food. Designed to go on the outside of a box/package. "Place the indicator inside the insulated shipper as close to the product being monitored as possible"
- Cold Mark is a single use, irreversible color change when an item goes **below** the predetermined threshold.
- Monitor Mark(TM) by 3M. Triggered by melting of coloured fatty esters

Features:

- Not for consumers
- Typically used for shipments not individual items

Applicability to Meat

- This type is an irreversible wicking style with relative temperature history of supply chain.
- A relevant for indicator on meat packaging

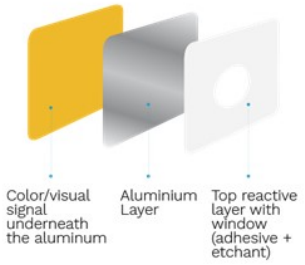
What: Time-Temperature Indicators

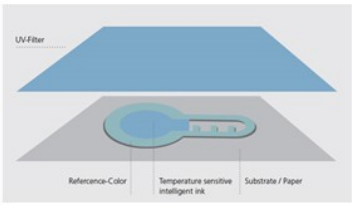
36

to monitor the supply chain and to inform consumer

Commercial Examples:

- Freshpoint Holdings markets labels that change colour over a period dependent on the temperature of the supply chain.
- They indicate to the consumer the freshness of the product.
- Aluminium etchants dissolve an aluminium layer exposing the colour behind
- UV Inks are photoinitiated and then gradually fade (same method as OnVu)
- BestBy is activated by removing a separating layer between cellophane and resealing. The colour fades based on time-temperature.





Features:

- Easy to apply as labels to packaging

Applicability to Meat

- This type is an irreversible indicator (smart not active)
- Relevant indicator for meat packaging

Reference:

http://freshpoint-tti.com/time-temperature-indicators/

"TTI Device", US 2017/0045485 A1

https://www.youtube.com/watch?v=d_l4ywu4Vwo

What: Temperature Sensitive Labels Leuco Dyes (CTI)

37

Commercial Examples

Coors Beer, Coca Cola, Tim Tam's

Patent Examples

"Small scale microencapsulated pigments", EP 2970677 A2

Cautions

- Ink companies aware of potential adverse public opinion due to formaldehydes, phenolics used in Leuco Dyes
- Applications have mainly been on metal glass or thick plastic (PP), however Tim Tam's use thin packaging with sandwich layers of plastic.

COURTESY: CHROMATIC TECHNOLOGIES INC.

Applicability to Meat

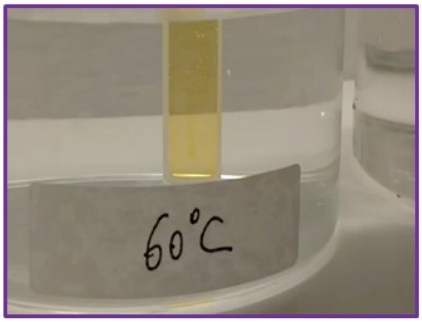
- Consumption: Is temperature a desired consumption criteria for meat (reversible)
- Counterfeiting: Indicator of authentic product.
- This type is reversible so applications for supply chain are not met. May not be as useful for meat packaging.

What: Temperature Sensitive Labels Leuco Dyes (CTI)

38

Commercial Examples

- No commercial examples using simpler reversible non-toxic components on the market



UniMelb Prototype

- Uses less toxic precursors and materials than typical Leuco dyes.
- Prototype to prepare a gel, and a thick film.
- Requiring a stationary phase (polymer matrix for fabrication).
- Reversible and irreversible colour change observed

Applicability to Meat

- Supply Chain: Indicator of temperature breach (irreversible) as with OnVu label
- Consumption: Is temperature a desired consumption criteria for meat (reversible)
- Counterfeiting: Indicator of authentic product.

Cold | Hot | Cold (After 5 cycles)

What: Time-Temperature Data Loggers

to monitor the Supply Chain using NFC

39

Benefit:

- This type of label records temperature data throughout a supply chain and transfer the information using Near Field Communication (NFC) to a smartphone via an App.

Commercial Examples:

Flexstr8

- The label is set using an iPhone or Android setting temp. intervals
- Labels by Felxstr8 can printed using a modified Epson printer and encodes the labels at 30 $mm.sec^{-1}$.
- Label is adhered to package, container

Avery Dennison TT Sensor Plus

- Near Field Communications, Battery, Temperature Sensor
- The size of a credit card.
- Can be adhered to a package
- Has a unique ID number.
- TT Sensor Plus App on Smart Phone.

Applicability to Meat

- This is designed for producers, suppliers and retailers.
- Applicable to meat but not for individual lpackaging

What: Pressure Sensitive Labels

40

for novelty, anti-counterfeiting and shock indicators (high pressure)

Applications:

- The most common form is used in high pressure indicators to show possible damage to goods.
- A label that shows package tamper evidence, authenticity or novelty requires much lower pressure triggers.

Commercial Example:

- Shock Labels (Shockwatch): Triggered at different G-forces. Rated based on grams.

Applicability to Meat

- Believed not to be relevant for meat as food pressure/crushing not a major issue
- Pressure for tamper-evidence or authenticity is discussed later

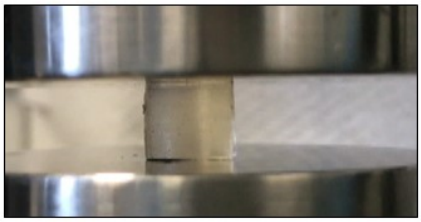
What: Pressure Sensitive Labels

41

for novelty and anti-counterfeiting

Commercial Examples

- High pressure shock markers (previous slide).
- Golf club ink markers for high pressure history.
- No low pressure human triggered indicators.
- No pressure triggered tamper evident closure indicators



UniMelb Prototype

- Early stage development of low pressure colour changing dye-polymer system.
- Existing pressure remains high.
- Targets aimed to trigger: a) below 0.5 MPa or equivalent to a thumb print, or b) below 2 MPa to trigger a thin film or closure being "torn"; c) incorporated into a film which changes color upon excess expansion under meat degredation.

Applicability to Meat

- Anti-counterfeiting: Colour triggering as proof of authenticity
- Novelty to customers
- Intelligent packaging to consumer demonstrating excess degradation.

What: Bioactive Sensors

42

Freshness indicators based on protein food decay

Benefit

- This label known as Mimica Touch (previously known as Bump Mark) which becomes bumpy as the gelatin (protein) breaks down.
- The degradation of the gelatin is said to correspond to the condition of the food contents.

Commercial Example:

- Mimica Touch (patent pending)

Options:

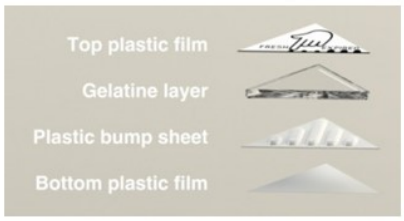
- One simple chemical component (hydrogels: gelatin, agar, carrageen, pectin, konjac, synthetic collagen…)
- Applied external to food a gelatine film
- Permeable top layer exposed to air

Applicability to Meat

- Relevant to meat or any protein based food.
- Simple and effective
- Informs consumer
- May not be cost effective

http://fifty.brunel.ac.uk/discovery-trail/47-a-refreshing-best-before-label/

US 2017/0082589 A1; EP 3151681 A1; Inventor: Pakstaite Solveiga; Owner (US): Mimica Lab Ltd.



What: DNA Tracing of Beef

43

for anti-counterfeiting

Commercial Examples:

- Canadian DNA Traceback is an example of DNA tracking which allows to track the beef form regional farms to the store. www.dnatraceback.ca
- Cattle are reared on approved feed yards and raised to exacting standards. In Canada, cattle are identified by an RFID ear tag and unique ID number which links to the animal's production history.
- Cattle are DNA sampled at harvest, linking genetic information with the animal's production history. Once the beef has been processed, samples are routinely taken from finished products, their DNA code read and matched with DNA from the original animal. This level of precise monitoring verifies the exact origin of your beef and confirms individual meat products are sourced from approved cattle.
- DNA TraceBack enables grocers to tell the story of their meat products with greater precision and accuracy. It connects the beef in store with producers and helps ensure you get the quality eating experience you pay for.
- Patented by Micro Beef Tech. Canada, CA 2660859 A1

What: Confinement odour packaging

44*

For consumer and safety concerns

Background:

This well documented technique either involves absorption of the moisture generated from the meat packaging or the use of sachets or films containing zeolites, cyclodextrins, or other small compound absorbing materials. These are separate to antioxidant, antimicrobials in that they absorb small compounds that result in odour

Commercial Products:

Many commercial examples are in use including MoistCatch; Biomaster; Food-Touch; Sanic Films; Febreze, SANICO

Technologies: Interleavers (layers for absorbtion), antifungal coatings, scavenger films, antimicrobial substances trays and films.

Applicability to Meat

A clear correlation to beef with pads, sachets and packaging films all valid approaches to confine odours.

What: Ethanol Sensing RFID Label

45*

to indicate spoilage

A major cause of fresh fruit spoilage is the release of ethanol. This technology monitors and indicates the freshness of the fresh fruit pieces.

Commercial Examples:

- VTT SusFoflex 2015.

Features:

- A label that changes colour upon excess ethanol vapour in the product headspace. The system contains an RFID tag that transmits the freshness information of the food to a retailer or consumer.
- VTT has also developed O_2, H_2S, ketone and aldehyde detection systems.

Applicability to Meat

Outgases relevant to meat could potentially be developed depending on the technology.

What: Freshness indicators

46*

to indicate shelf life

This example is a label that is activated by the consumer when opening a product package. This then leads to a time delayed colour changing of a label indicating Fresh / Still Fresh / Past Best.

Commercial Examples:

- Novas® Insignia Tech. 2017.

Features:

This is a TTI based on activation time by the consumers and not necessarily the history of the product. It is however applicable to meat products in any form as long as the rate of colour change matches the rate of decay (loss of freshness) of the meat product. This product is useful in reminding a consumer the length of time a product has been opened. Would the simple sniff-look-touch test also achieve this.

Applicability to Meat:

Directly related to the meat industry and could be used for other food products.

What: Electronic Noses

47

to indicate volatile gas/odours

This handheld device detects volatile compounds/gases exuding from the product,

Commercial Example:

- FOODsniffer 2016

Features:

- A spectroscopic chip identifying harmful substances (mycotoxins, allergens and pesticides) in fresh produce at the point-of-need. FOODSNIFFER is field deployable and the result of the integration of three major innovations: silicon photonics, wafer-scale microfluidics and filtration systems, low-power reader controlled by a smartphone.
- Marketed to end-users: consumers, chefs.
- Gives a digital color indication of the freshness of the meat depending on concentrations of the raw meat gas levels.

Patented: WO2015/150880 A1

Applicability to Meat

Specifically designed for raw meat.

Cost $199 per unit.

Number: 48*

What: Antimicrobial Packaging

Extending the shelf-life of food products

Benefit:

Extending the shelf-life of food allows for the reduction in waste, reduced transport and production costs, increased consumer confidence, sustained aesthetic appearance and appeal.

Background:

- A range of antimicrobial packaging films are on the market using difference modes of actions.
- Agion, Biomaster, Ionpure, Surfacine and Irgaguard are all commercial silver glass/zeolite based antimicrobial packaging's.
- Nisaplin® and Novasin® use Nisin a broad spectrum polycyclic antibacterial peptide sourced from a bacterium which inhibits bacterial growth.
- Microban uses Triclosan which the FDA has recently banned in soaps and detergents (still legal in Aus).
- Extracts from natural plant sources, eg cloves, garlic, cinnamon, thyme, horseradish have also been reported.

Applicability to Meat:

All of these products are applicable to meat products and demonstrate longer shelf-lifes.

What: Antimicrobial Packaging

49

Cyclodextrin facilitated slow release of antioxidant/antimicrobial compounds

Background

One area of research being developed is the use of cyclodextrins (CDs). These have been used commercially in Febreeze air fresheners to capture small molecule 'smells'. There have been many recent publications that use cyclodextrin incorporated into packaging that release small antioxidant molecules into the headspace of food packaging.

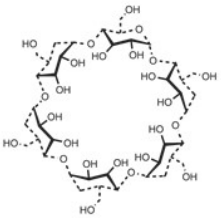
Examples include the release of essential oils from star-anise (anethole), oregano (carvacrol), tocopherol (Vit-E), thyme (Thymol). These are typically incorporated into cellulose, LLDPE, gelatin films and showed extension of shelf-life and gradual release over days of the antioxidant/antimicrobials.

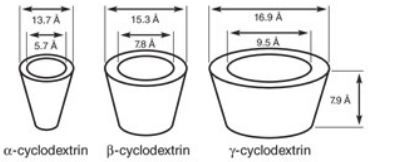
Benefits:

Cyclodextrins have world food approvals, and the studies reported, cover typically food safe, biocompostable, natural polymers.

The essential oils have also been widely used in the food industry.

Commercial applications in food packaging films are unknown at this stage.





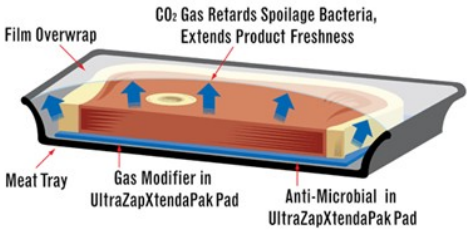
What: Carbon Dioxide Emitters

50*

Extending shelf-life of meat

Background

These decrease microorganism growth and spoilage, reduce the metabolic rate of microbes, preserve food quality and prevent swelling of the packaging. Moisture in the headspace or meat drip reacts with the pads or films producing CO_2.



Benefits:

- Increase the shelf-life of product
- Used in ground coffee, snack foods, nuts, bakery products, dried meat, fresh meats, fish products.
- Low tech., low cost.
- Active technology

CO_2® Fresh Pads

Commercial Examples:

Ageless G; CO2 Fresh Pads, Freshilizer C[1], Freshlock, Freshpax, Ovtene, Standa, Superfresh, UltraZap, Verifraise, Vitalon, FreshCase are all commercial examples,

Mode: typically using chemical reactions to release carbon dioxide when reacted with moisture from the meat.

Chemicals: sodium nitrite, sodium ascorbate /bicarbonate, citric acid, sorbic acid, calcium carbonate

What: Antioxidant Packaging

Number: 51*

Extending the shelf-life of food products

Benefit:
Extending the shelf-life of food allows for the reduction in waste, reduced transport and production costs, increased consumer confidence, sustained aesthetic appearance and appeal. Antioxidants may be synthetic or naturally derived to prevent off-flavour and improve colour

Background:
Many published examples use various antioxidant additives to polymer films for the scavenging of oxygen and radical oxygen species, which lead to lipid oxidation of protein based foods.

Literature since 2015:
Many recent examples typically report the use of essential oils, natural clays and additives, along with biodegradable polymers for extending the shelf life of food. A commercial Example is ATOX

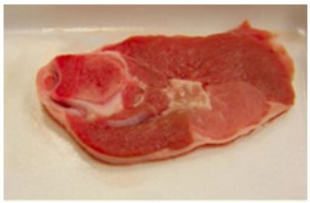
Patents:
A general patent by Intern. Consolidated Business Gp. Covered the use of food packaging comprising a polymeric material and a natural antioxidant. WO 2017/049364 A1

Other Patent Owners (2949 patents): Univ Santiago Chile (WO2016/082053 A1); Guangxi Point Map Pack. (CN105083750 A); Huang Zongkao (CN106553399 A); Kim Jin Woong (KR20160087180 A); Henan Newland Pharm. (CN104691937 A; CN103773002 A); Univ Zhejiang Ocean (CN 104974385A); J-Chemical Corp. (US9056711 B2)

Commercial Example: Addivant's Weston 705, liquid phosphite antioxidant liquid solution for packaging inclusion (EP 2057222 B1).

Relevance to Meat Industry: Very relevant

Control



ATOX 102 AV

Modified atmosphere for lamb meat stored for 11 days at 1 °C

What: Self-Cooling Food Packaging

Number: 53

Benefit:

A concept that has been around for a number of years but has never really taken off. Most embodiments use metal cans (canisters) containing endothermic heat absorbers. The most common application is for the consumer to cool the food (beer, soda etc.) prior to consumption. More examples of self-heating flexible packaging exist such as Scaldopack

Commercial Examples:

InstaCool Can (Tempra Tech.), Chill Can (Joseph Comp.); Scaldopack (heating),

Patents:

The latest concept patent reported package pouches containing ammonium nitrate, sodium acetate and urea, with the cooling occurring once one of the pouches is manually ruptured. KR 20110002522 A

Source: bestinpackaging.com/2012/12/17/the-self-cooling-technology-anf-the-future-part-3/

Relevance to Meat Industry:

Cooling of meat would be most likely needed during supply chain. There is no real need for consumers to chill temporarily meat prior to consumption or cooking. A self-initiating cooling pouch/container may have more applications, but the cooling would need to cover the time of a temperature event and only occur once during supply.

What: Vacuum Packaging

52*

Extending the shelf-life of meat

Background:

Vacuum packaged meat products is commonplace and leads to extended shelf-life, dramatic product presentation and can be combined with other techniques such as MAP.

Commercial:

- Crovac® Darfresh®, Sealed Air
- Mondini Trave combines the clear thin film top layer and a tray-like bottom layer.
- Improvements using nitrite crystals impregnated in PVC films lead to extended colour and shelf-life.

Benefits:

- Reduces cross contamination
- Faster processing speeds
- Zero film scrap
- Double shelf-life compared to mother bag packaging
- Prevents juices from leaking through seal

Applicability to Meat:

- Directly related to meat industry

Current Technologies used for meat packaging

1. CTI: High Pressure Verification Technology demonstrates High Pressure Pasteurization (HPP) and can differentiate by color intensity, the exposure of <20k, 20k, 30k and >40k psi. CTI are the original manufacturers of Leuco dye thermochromic systems.

2. Freshness Label designed by To-Genkyo changes color based on ammonium release from a beef product. The hour-glass design 'fills' as the product releases gas. It is unclear if this is a design only or has been developed fully to proof of concept. Another Freshness indicator is produced by Vitsab with a green/yellow/red indicator panel

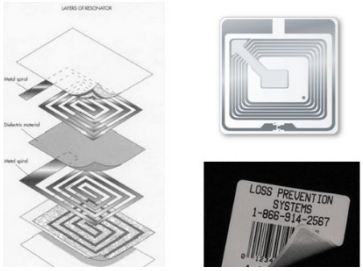
Vitsab®
The sign of freshness

3. Commercially available Freshness indicator is the Insignia Labelling. Sainsbury's used Insignia Labels on their processed pork slices. Insignia Technologies Ltd. uses intelligent plastics and inks to produce simple, cost-effective colour-changing labels for application to packaging. The key component is Insignia's patented intelligent pigments, which change colour in response to changing levels of CO_2 or temperature. Insignia has the ability to develop colour changing labels which respond instantly or over a pre-calibrated time period. The chemical formulation of the pigments can be changed to produce a wide variety of indicators with different sensing properties. Examples include a freshness indicator with a guide for use based in the number of days it has been activated (A)

A second commercial example (B), designed for MAP, uses a single yellow-blue indicator label to demonstrate film leakage, which would be applied to the film upon packaging of the meat. The previous two examples are activated once applied to the packaging at the processing level.

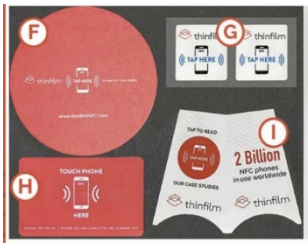
A third type uses the same labels but **consumer triggers** to demonstrate time exposure once opened. The example used is for mayonnaise, which when the lid Is opened the tag covering the indicator is displaced and label activation occurs.

4. Checkpoint RF Labels (EAS Tags & Labels - 4010, 4210) is an example of a microwave safe RF tag that can be scanned to verify authenticity. Inside each Electronic article surveillance is a technology that prevents shoplifting commonly used in retail stores with an alarm that sounds if detected upon leaving the store. Checkpoint **Radio Frequency** (RF) label or hard tag is a resonator, a device that picks up the transmitted signal and repeats it. The Checkpoint antennas or gates also contains a receiver that is programmed to recognize whether it is detecting the target signal during the time gaps between the pulses being broadcast by the gates. This signal is generally at 8.2 MHz, but it can be anywhere from 8.0 to 9.5 MHz depending on the needs of the retailer. Sensing a signal during these intervals indicates the presence of a signal being resonated (rebroadcast) by a security label or tag in the detection zone. When this occurs, the Checkpoint System sounds an alarm; in most Checkpoint systems, the alarm sound is accompanied by flashing lights.



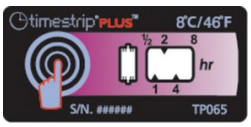
5. Sanitrace is an example of an **QR Code** tracking system. It is used to track the product and consumers can receive a notification text if the beef is recalled.

6. Thin Film Electronics ASA offer a range of near Field Communication devices. These can be used for tracking, weblinks to tell the brand story, brand protection, use-by-date checking, e-commerce for reordering and links to customer loyalty programs. Marketing packages offer a range of design and ideas for marketing from drink coasters to tap here labels, tear resistant tags and basic NFC tags for applying to plastic or paper for proof of concept marketing.



7. **Data Loggers** which track humidity and temperature during a Supply Chain are commonly used. These are however expensive at between US$30 for a 60 day logger (PAKREC022) to a larger re-useable version (SHOREC001) at US$65. Emerson has a range of examples including bulky USB linked loggers (A), thinner NFC data loggers (B) which can be either single or multiple use however all of these are added to larger containers to track the time-temperature of a bulk delivery and not individual items.

8. **Time Temperature Indicators.** Many examples of wicking or capillary movement of inks along a scale are available which indicate whether the supply chain has exceeded optimal conditions. These show a total representative condition however are relatively inexpensive. Tempix is a good example which can be applied as a label directly to packaging, while Timestrip (US$1.60ea for 500) and Cryopak (US$9 ea. for 100) and WarmMark by 3M examples are bulky and more likely to be packed with larger quantities of product. These all need to be activated at the packaging stage

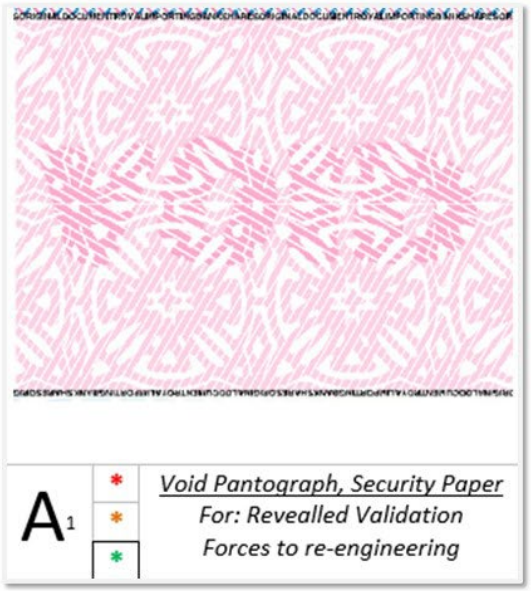


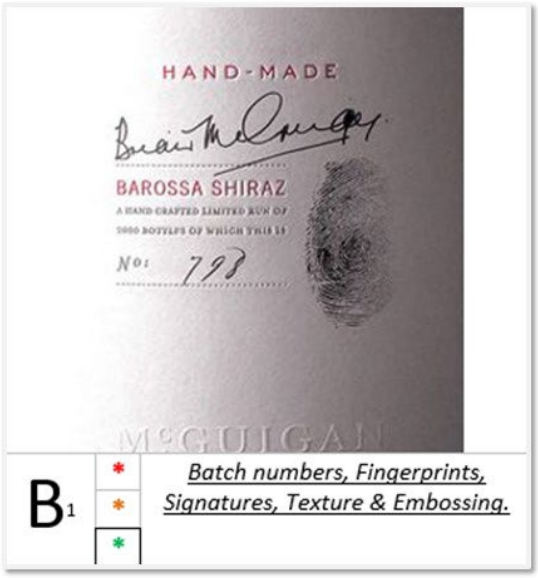
9. **Thermometer Labelling.** These label devices change colour with temperature and are simple thermometer replacements. Examples are 3Ms TLCSENN199 ($1.15ea.)

10. Other examples include: O2xyDot and Ripesense Sensors which are ethylene scavengers and not suitable for meat; Mitsubishi's Moisture and Oxygen Scavengers; Antimicrobials by Agion and Biocompostable Packaging by Bio4Pack

12 Appendix 6: Anti-counterfeit technologies

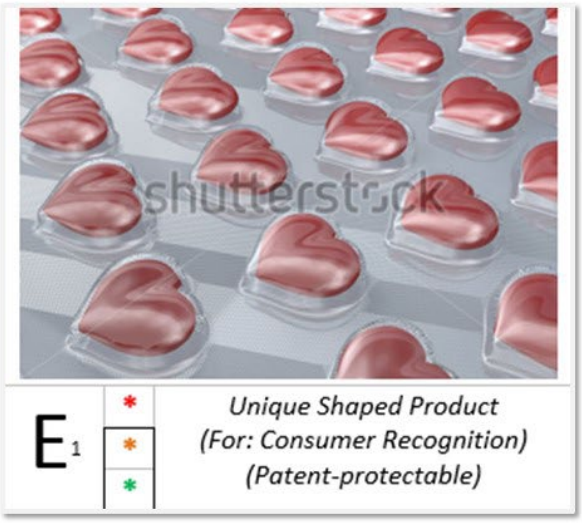
Source: University of Melbourne (2019)



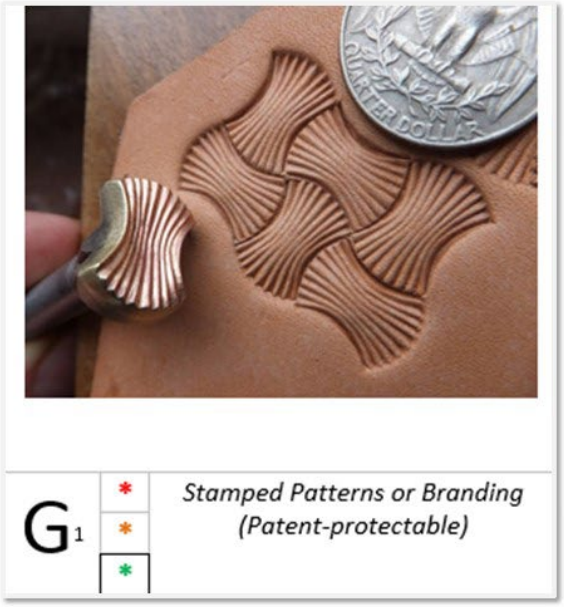


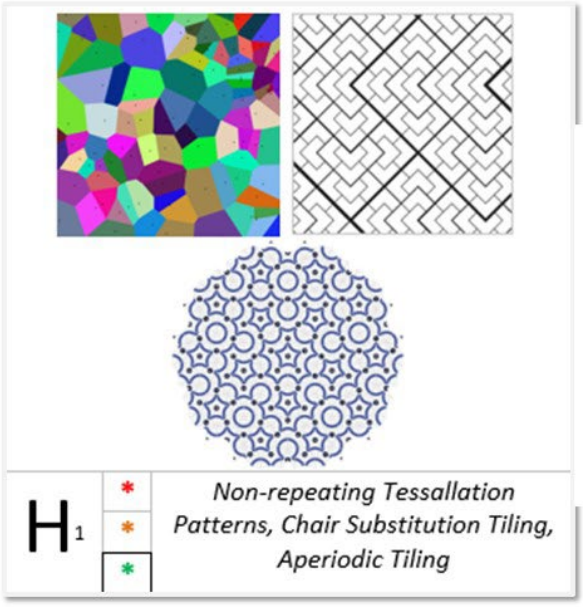
C1 — Recongisable Unique Packaging (For: Consumers Validation Fights: Re-engineering)

D1 — Destructive Packaging (For: Consumers Validation Fights: Reuse)

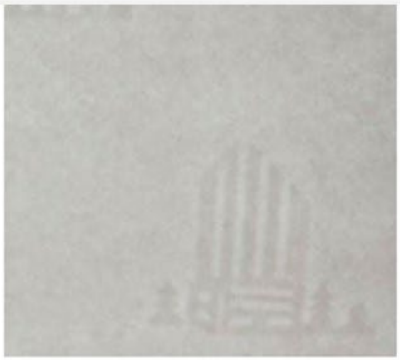

shutterstock
E1
Unique Shaped Product
(For: Consumer Recognition)
(Patent-protectable)


Cadbury
F1
Mould-In Branding
(For: Consumer Recognition)
(Patent-protectable)


G1
Stamped Patterns or Branding
(Patent-protectable)


H1
Non-repeating Tessallation
Patterns, Chair Substitution Tiling,
Aperiodic Tiling

I_1	*	One Product with Varied Packaging Sleeves (For: Consumer Options Creates: Complexity)
	*	
	*	



J_1	*	Watermarks / Reflective White Ink (For: Consumer Validation) (Creates: Hidden Elements)
	*	
	*	

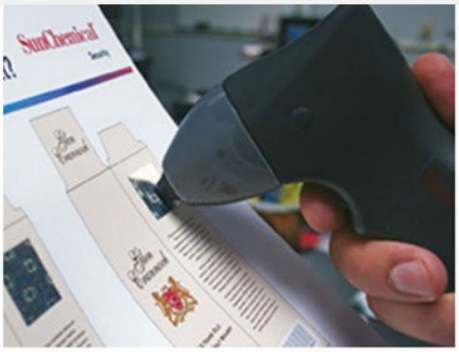
K1

Miroprint
(For: Consumer/Business Validation)
(Against: Hard to forge)

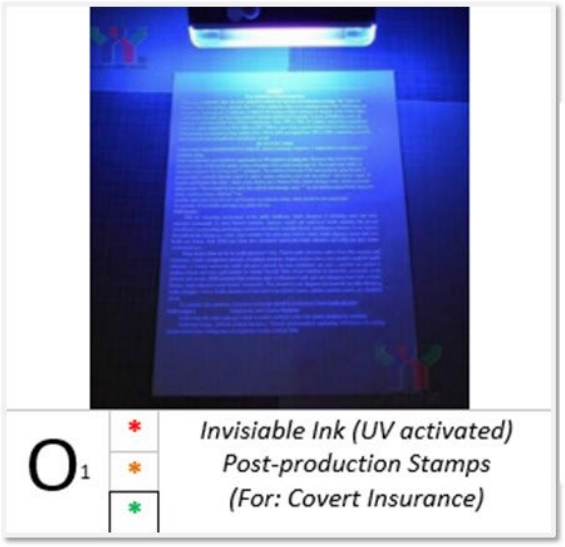
L1

Thicker Inks - Printed Textures
(For: Consumer Validation)
(Against: Hard to Forge)

M1 — OVI (Optically Varaible Inks)
(For. Showing a large colour shift for validation)



N1 — Covert Taggent Inks and Readers
(For: Product Tracking and Validation)
(Protects Supply Chain)



O_1

Invisiable Ink (UV activated)
Post-production Stamps
(For: Covert Insurance)

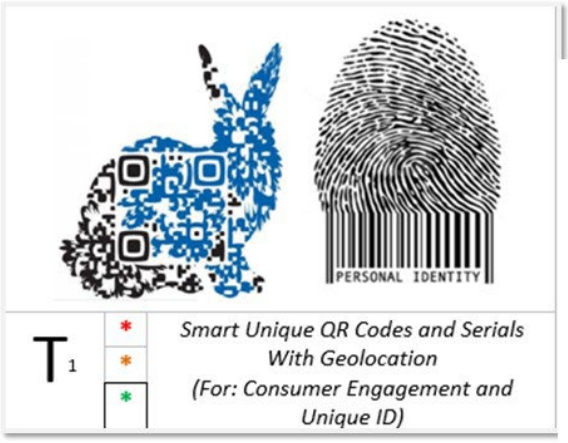
P_1

Visible and Invisible Fibers
(For: Consumer Detection)
(For: Covert Insurance)


Q1
Thermochromic Inks
(For: Brand Building
Against: Fast fraud)


NESCAFÉ
SEAL
of AUTHENTICITY
NESCAFÉ
CLASSIC
R1
3D reflective holographic lens image
using transfer technology on laminate
(For: Consumer Trust and Layered
Complixity)


Colgate
EXTRA WHITENING
SENSODYNE
S1
Branded Holographic Stickers / Foils or Codes
(For: Consumer Validation and Trust)


PERSONAL IDENTITY
T1
Smart Unique QR Codes and Serials With Geolocation
(For: Consumer Engagement and Unique ID)

U_1

Covert Ultra High Frequency RFID Chips
(For: streamline supply chains without direct scanning)

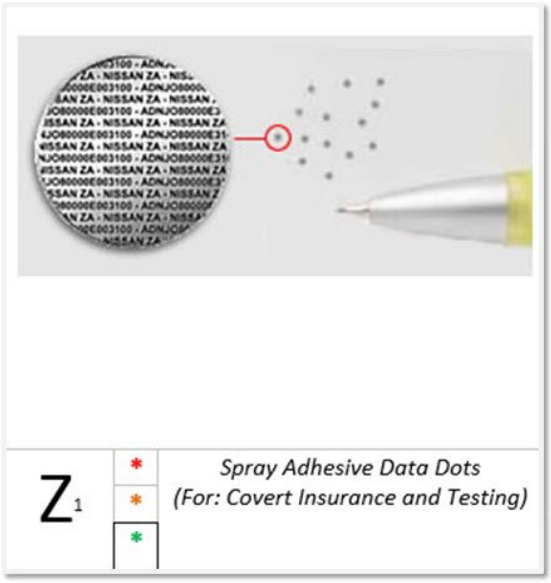
V_1

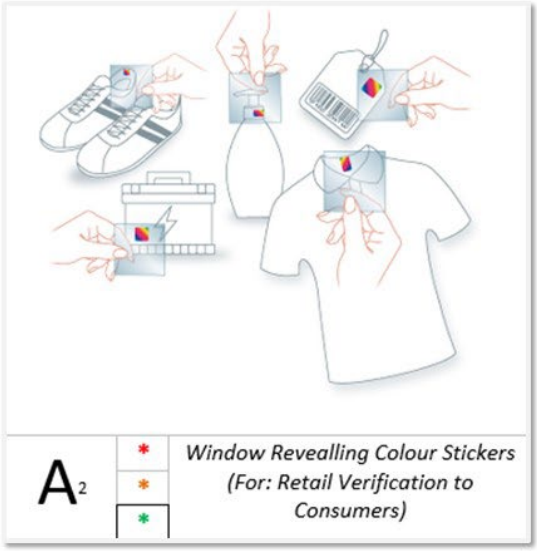
NFC Programmed Chip OR Sticker
Multi-use Scan, Can detect and report number of scans
(For: Consumer/Business Interaction)


W1
Printed Memory, Sensing, Wireless Labels
(For: Manufacturing and Supply Chain Tracking and Insurance)

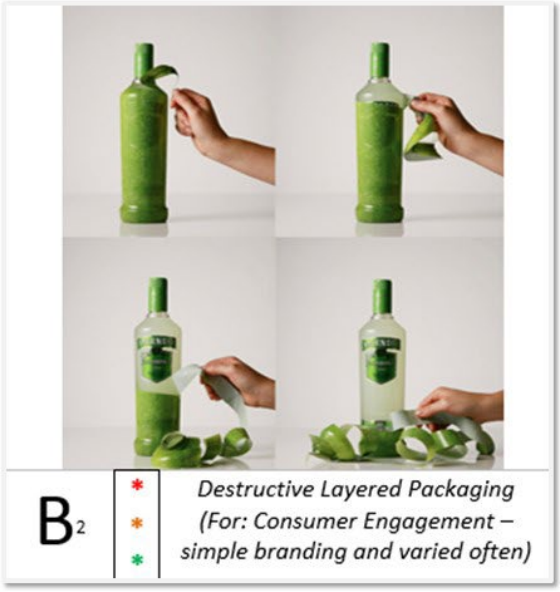

Eleaf
Security Code
S/N: 695691641573
X1
Destructive Scratch Layer, Reveal Unique Code.
Scan QR and Enter in Code and Serial to verify product and get rewards
(For: Consumer Validation)


AQUA D'OR
CONNECTS THE NEW #PURE
LIMITED EDITION WITH MYPACK® !
CPH
DK
CPH
CPH
DK
DK
Y1
Photorecognition Technology
(For: Consumer Engagement and Ease of Purchase)
(For: accuracy to get results)


Z1
Spray Adhesive Data Dots
(For: Covert Insurance and Testing)



A_2 — *Window Revealling Colour Stickers (For: Retail Verification to Consumers)*



B_2 — *Destructive Layered Packaging (For: Consumer Engagement – simple branding and varied often)*

C_2 * * *

Authenticity Apps for Consumers (For: Validation of Product & Consumer Tracking)

D_2 * * *

Simple Electronics/Lighting (For: Consumer Engagement) (For: Complexity)

13 Appendix 7 Terms of reference specifications

Background
MLA has previously received an Australian Government grant via the Indonesia-Australia Red Meat and Cattle Partnership. The purpose of the grant was to undertake a scoping study to strengthen Indonesian red meat supply chain traceability systems.

As a part of the first stage, MLA engaged Deakin University's Centre for Supply Chain and Logistics to complete an Australia Indonesia Value Chain Mapping report (Appendix A) utilising a genuine Australian supply chain and an Indonesia based meat importer. This report discovered a number of challenges and opportunities in the traceability of exports of Australian product to Indonesia.

This tender document relates to the second phase of the scoping study, where MLA is seeking to initiate a trial based on the successful tender/s to identify and plan additional work that can be undertaken to improve consumer confidence and awareness of Australian red meat in Indonesia.

Project description
The focus export market for this trial is Indonesia.

This project seeks effective technology/ies that can:

- test the use of authenticity/traceability systems or products and follow the path of beef from Australia to Indonesia end-to-end
- Provide an effective "marker" to packaging/product that provides customers and consumers with confidence that the branded product they are purchasing and consuming is, in fact, the genuine product.
- This marker and/or the system that supports the marker has the ability to transfer relevant company data that ensures the product's integrity and other company specific information important to customers.

Technologies will be trialled across one to two separate and diverse supply chains currently exporting into Indonesia.

Achieving all of the project objectives may not be possible with currently available technologies. Multiple technology providers may need to submit a combined proposal to best meet the project objectives.

Requirements for the tender
Questions we want to answer:

- * What products/technologies are available?
- * How can the system be promoted in a meaningful way to customers?
- * What information is provided to supply chain participants and how is that provided?
- * How may the operation of the supply chain be verified?
- * What is the balance of cost and benefits between supply chain participants? Where is the value? Who pays for this? How can this help our system to become more efficient?
- * How does this proposal address considerations raised by the Deakin University Australia Indonesia Value Chain Mapping report (Appendix A)?

Budget
It is anticipated that this project would be funded through the MLA Donor Company (MDC; https://www.mla.com.au/about-mla/what-we-do/mla-donor-company/). The MLA Donor Company will contribute 50% of the project value while the Technology Provider (tenderer) would contribute

the other 50% plus the MDC's administration fees. The Supply Chain partner would provide their value chain for use of this project.

The overall budget is therefore variable dependent on the solutions proposed