THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

CREATE CHANGE

Digital Technology Options for Indonesia's and Australia's Beef and Cattle Sector

Indonesia-Australia Partnership on Food Security in the Red Meat and Cattle Sector

Contents

List of Tables

List of Figures

List of Boxes

List of Acronyms

Acronym	Definition
ACIAR	Australian Centre for International Agricultural Research
AIP-EID	Australia-Indonesia Partnership for Emerging Infectious Diseases
ASEAN	Association of Southeast Asian Nations
B2B	Business to Business
B2C	Business to Customer
BI	Indonesian Central Bank
COD	Cash on Deliver
CSIRO	The Australian Government's Commonwealth Scientific and Industrial Research Organisation
EDI	Electronic Data Interchange
E-HR	Electronic Human Resources
EID	Electronic Cattle Identification
EIS	Executive Information System
EY	Ernest & Young
eNVD	eNational Vendor Declaration
ERP	Enterprise Resource Planning system
ESCAS	Exporter Supply Chain Assurance System
FAQ	Frequently Asked Questions
FGD	Focus Group Discussion
GAPUSPINDO	Gabungan Pelaku Usaha Peternakan Sapi Potong Indonesia or The Indonesian Beef Cattle Businessmen's Association)
GDP	Gross Domestic Product
GPS	Global Positioning System
IA-CEPA	Indonesia-Australia Comprehensive Economic Partnership Agreement
IDR	Indonesian Rupiah
IoT	Internet of Things
ISO	International Organization for Standardization
IT	Information Technology
KADIN	Kamar Dagang dan Industri or Indonesia's Chamber of Commerce and Industry
MIS	Management Information System
MLA	Meat and Livestock Australia
MoA	Ministry of Agriculture
MRP	Material Resource Planning
MSA	Meat Standards Australia
NLIS	National Livestock Identification System
NTB	West Nusa Tenggara
OSS	Online Single Submission

RFID	Radio Frequency Identification
SME	Small and Medium-sized Enterprise
UQ	The University of Queensland
USD	United States Dollar
VAT	Value-Added Tax

Chapter 1
Executive Summary

1. Executive Summary

Indonesia has become the largest spender on Information Technology (IT) in Southeast Asia and the digital economy is expected to account for 61 per cent of the country's gross domestic product (GDP) by 2022 (Febrian & Genesia, 2020). As a result, the country has spearheaded efforts to establish itself as a digital hub in Asia. The improving infrastructure and connectivity in the country is now presenting many opportunities for businesses to adopt information technology to achieve efficiency dividends and ultimately an increase in profitability.

This study was an initiative under the Indonesia-Australia Partnership on Food Security in the Red Meat and Cattle Sector. The study aimed to identify and raise industry awareness of currently available and future technologies for production and marketing of cattle and beef that have potential to improve the efficiency and profitability of the beef industries in Indonesia and Australia. The Project was significantly affected by COVID-19 restrictions on travel, which severely impacted the ability to undertake face-to-face interviews with key stakeholders in both countries. Three sub-projects were therefore modified and undertaken:

- a **desktop review** of the technologies currently available and used, and of e-commerce developments around the world in agrifood chains generally, and in the Australia-Indonesia beef supply chain specifically (Section 4)
- a **technology audit of digital technologies** being used in the Indonesian beef supply chain (Section 5)
- an investigation of the role of **e-commerce** in cattle and beef marketing in Indonesia (Section 6).

1.1 Desktop review

Digital technologies in agrifood chains

First, the study summarised technologies common to agrifood supply chains, as well as those specific digital technologies used in the Australian beef supply chain (see Section 4, Table 2), from ear tags and herd management software at the production end to smart packaging and e-commerce in the retail section. Overall, the study found that the Australian beef supply chain currently uses various technologies extensively as a standard, with good digital information flow along the chain that enables traceability of product back to its source particularly through the application of the National Livestock Identification System (NLIS). While many Australian producers and processors, particularly the top end businesses, have invested in a range of technologies, there may be opportunities for smaller scale operations to improve the adoption of digital technologies.

In contrast, beyond the use of smart phones, very few stakeholders in the Indonesian beef supply chain currently have access to digital technologies or make use of them. While smallholder farmers were interested in technology options and have the connectivity to participate, they were reluctant to pay for technologies that do not provide immediate financial returns or are mandated by government. Several companies have developed systems to monitor animal movement, behaviour and health, but adoption rates are low. Some Indonesian feedlots use Radio Frequency Identification (RFID) and electronic cattle identification (EID) to comply with animal welfare standards imposed by Australian exporters. In most cases feed efficiency, cattle weights, and animal health information is still recorded manually. Consequently, while some traceability of product is possible in Indonesia, these manual records are subject to human handling errors and slow recall of information. There is an opportunity to automate information systems to improve efficiency and the traceability of beef products. While the study found no strong evidence of Indonesian consumer demand for beef traceability, as has been witnessed in Australia, the development of a traceability system remains a critical issue given the need to assure Halal compliance, which is of the utmost importance to Indonesian Muslim customers; and, to ensure that the marketed beef is not contaminated with other types of meat or unlawful/unwanted products.

A review of the companies in Indonesia dealing in technology revealed that there are at least 26 digital platform companies involved in the Indonesian beef and cattle industry. They are mainly involved in marketing (including e-commerce companies), followed by investment companies that attract capital including crowdfunding from the community. Other functions include information systems, monitoring animal health, and for education.

Online beef marketing

The review of the literature on online marketing suggests that the Indonesian e-commerce market was thriving even before the COVID-19 pandemic. In 2018, McKinsey reported that Indonesia's e-commerce market was projected to grow by eight times between 2017 and 2022. In terms of payments, digital wallets are the fastest-growing payment method, expected to expand at a compound annual growth rate of 47 per cent per annum to 2021. GoPay has the biggest market share in e-wallets (60%) followed by OVO (28%), Dana (8%) and LinkAja (4%). Moreover, with 160 million Indonesians being social media users in 2020, it is key to promotional activities (e.g. through the power of influencers) and interaction between sellers and buyers. YouTube, Facebook, Instagram, and WhatsApp are the most popular social media channels in Indonesia, while WhatsApp and Instagram are the most popular platforms for selling goods online.

The study found that e-commerce is being successfully used in both Australia and Indonesia, connecting beef producers and retailers with consumers. In Indonesia, the young, active smartphone-user customer base, and the additional pressure put on consumers by the COVID-19 pandemic, means that having a strong e-commerce presence is no longer just another option as a marketing channel for beef processors and retailers – it is now a necessity to remain competitive. Meanwhile, in Australia e-commerce development has been centred on responsible consumption and customer-focused convenience including through various 'click and collect' innovations.

We predict that we will see more businesses adopting the so-called 'omni-channel strategy', which integrates the various business models e.g. online and offline, B2C (business to customer) and B2B (business to business). The study also identified several deficiencies in online beef marketing in Indonesia, including logistical issues and the lack of information about Halal certification. For Australia, there are opportunities for Australian producers and processors, particularly small-scale producers, to use online marketing of beef and beef products directly to both domestic and international consumers.

Digital technology audit

A digital technology audit across the Indonesian beef supply chain identified the technologies that are currently used and how they are being used, as well as technologies that might potentially be used in the future. Three focus group discussions (FGDs) for producers and 11 interviews, which included feedlots, cattle importers, processors, off-takers, information and technology (IT) providers and central, provincial, and district government officials, were conducted.

Overall, the digital technology audit suggests there are variations in the adoption rates of digital technologies across cattle and beef chain segments, and across regions in Indonesia. There is evidence of technology adoption including RFIDs for cattle identification and traceability, Enterprise Resource Planning systems (ERPs), and government information management systems among large feedlots in the country. However, connectivity to allow some of these devices to function is still an issue in rural areas, which puts smallholder farmers at a disadvantage. The study also found some development of traceability systems in several districts.

Producers: Three FGDs conducted in West Sumbawa, Sumbawa, and Dompu districts of NTB (*Nusa Tenggara Barat*) suggested that smallholder farmers had never heard of the use of digital technologies in cattle production and marketing. They could see the potential use of RFID/GPS technologies to monitor or track free grazing cattle – and they have the connectivity capacity to participate – but they were reluctant to pay for technologies that do not provide immediate financial returns or are mandated by government.

Feedlots are starting to use digital technology (RFIDs) for electronic cattle identification (EID), mainly to comply with animal welfare standards imposed by Australian exporters. They have RFID readers to record each animal's EID after arrival at the international port, at the feedlot, and at the abattoirs to ensure the traceability of the beef. One company interviewed already uses QR codes to allow consumers to identify the beef product's history using an Android phone App. Purchase and sale data

are managed electronically in the company's main computer (using an enterprise resource planning or ERP system) to monitor cash flow; however, feed efficiency, cattle growth and health data are still managed manually by trained officers. There is no electronic transfer of data from the digital cattle weighing scale into the company databases; it is still recorded manually and printed to then be entered into the company's main computer. The use of digital technology in feedlots is constrained by a lack of awareness among the other supply chain partners. For example, cattle traders still use cash transactions when buying cattle from the feedlot.

Processors/abattoirs/importers: There are at least four abattoirs that supply premium cut beef in Indonesia and two of them were interviewed. They are among the largest and most modern abattoirs in Indonesia and are Halal certified. Both companies are currently partly digitalised. They use automated cattle restraining and pneumatic stunning, and carcasses are lifted using hydraulic hoists. However, slaughter and skin removal are still carried out manually due to Halal requirements. Their employees are skilled, trained, and certified so that they can butcher standard primal cuts. Slaughtered cattle are identified by RFIDs (recording data such as country/region of origin, weight, etc.), and the primal cuts produced are identified using barcodes, which can be used to trace back to individual animals if there is a customer complaint. While the packaging of imported beef coming into Indonesia also has a barcode, it does not allow consumers to trace back the complete history of the beef because the importers do not have access to the historical data from the country of origin. This lack of traceability is not viewed as a major issue by consumers (including those at 5 star hotels) at this stage.

Offtakers/investment platforms: Offtakers usually have the capacity to aggregate livestock products and store them as frozen foods in the cold chain. One of the most significant uses of digital technology is to attract investment (crowdfunding). One company has attracted significant investment funds due to their ability to demonstrate the profitability of their business operations and ensure that investors receive regular updates on performance.

IT/hardware provider: One company interviewed has an IT system (based on a wearable device for livestock) that can be used to monitor animal movements, count animals, provide virtual fencing and record ambient temperature, animal health, and feeding behaviour. It is hoped that the IT system will be able to monitor feed conversion efficiency in individual animals based on feeding behaviour.

The Central Government (Ministry of Agriculture (MoA)): The MoA decree No. 16/2010 regulates the use of cattle identification systems for large ruminants in Indonesia that should be identified using a) ear tag or microchip; and/or b) Livestock Card (*Kartu Ternak*) and Farmers Card (*Kartu Peternak*). However, only a few districts in Indonesia have been applying the cattle identification system and none of them use microchips. The Indonesian government has also developed five digital platforms relevant to livestock producers. There are opportunities for the MoA to further utilise these websites to improve effectiveness and adoption rates of technology in the red meat and cattle sector.

Local governments: An interview with the provincial West Nusa Tenggara (NTB) Livestock Office confirmed that not all districts in Indonesia have applied the cattle identification system despite the mandate implied by the MoA decree No. 16/2010. In NTB, for example, only on Sumbawa Island is cattle identification required and none of the districts in Lombok have adopted the cattle identification system. Staff from Sumbawa district of NTB mentioned an application called siJINAK to track real time cattle population, cattle exports, slaughter, etc. This identification system will be based on RFID technology, which has recently been trialled. Next year they plan to expand the scheme with more readers and ear tags. The underlying database is now in the process of being finalised. In the long term, it will be used as the basis for a traceability system for beef produced in this district.

Beef consumer demand analysis: e-commerce focus

This part of the study investigated online beef marketing in Indonesia through interviews with six e-commerce companies and a consumer survey interviewing 30 respondents in the Greater Jakarta Region. Given the small sample size, findings from this activity may not be representative of consumer behaviour in Indonesia. However, various measures were adopted to ensure the usefulness of the results, including to survey e-commerce companies with different business models.

Business perspectives

- E-commerce platforms such as Tokopedia, Shoppee, Bukalapak, Lazada and Blibli are drawing the most consumer traffic in Indonesia. The pandemic has provided the incentive for e-commerce companies to focus on the B2C (business to consumer) segment. In March 2020, the Indonesian Central Bank (BI) reported a significant increase in total e-commerce transactions by 18.1 per cent to 98.3 million transactions; and, in the total transaction value by 9.9 per cent to USD $1.4 billion. A survey by RedSeer (2020) suggests that the COVID-19 pandemic is expected to add about 12 million new e-commerce users in Indonesia. Under normal circumstances that growth could have taken 1.5 to two years.
- Companies selling their products through a major digital marketplace benefit from wide-ranging features such as order status, order history, automatic verified payment, and live chat options.
- Most of the companies surveyed sourced beef directly from overseas or from Indonesian beef importers and their ability to reach end-customers seems to have significantly shortened the supply chain especially for customers residing in Greater Jakarta region. Frozen beef dominates the online beef sales. While all imported beef coming into Indonesia presumably has met Halal certification requirements whose information is not necessarily visible to online customers.
- Optimistic views on future e-commerce development were expressed by all companies interviewed. One proposed to leverage activity off the Indonesia-Australia Comprehensive Economic Partnership Agreement (IA-CEPA) to position Indonesia as a processing hub for Australian beef.
- Logistical challenges, customers' preference to see and touch products at retail outlets, and competition from other types of meat and sources of protein were significant challenges facing companies wanting to grow their e-commerce business. They cited regulatory challenges such as difficulty in obtaining legal status for small businesses, government regulations related to financial technology and taxation, and persistent issues relating to import policy.

Consumer perspectives

- Consumers showed a strong preference for local beef, but those with experience of online beef purchases were more accepting of imported beef. Wet markets remain the most popular outlet for beef purchases across consumers from different age groups, while online channels are more popular among young respondents.
- While the share of end-customers purchasing beef through digital marketplaces remains small, respondents cited convenience, quality, and promotion as their main reasons for online beef purchases. The majority of respondents (73%) who never purchase beef online are likely to use online channels for beef purchases in the future.
- Both cash payments and digital wallets are popular payment methods among online customers.
- Quality-related and logistical issues such as expensive delivery fees, late delivery and damaged packaging, were the main concerns listed by purchasers.
- Product description, information about Halal certification, and price were substantially more important than other attributes while user reviews, delivery tracking updates, and wish lists topped the chart as the most important features for customers' decision making.

1.2 Recommendations

The development of an electronic cattle identification system

The development of traceability systems in Indonesia remains limited. While there is no strong evidence of consumer demand for traceability information of a product's farm or country of origin, or certification about other attributes or production systems (e.g. grass-fed, organic, etc.), Indonesian consumers are concerned about Halal compliance and may benefit from assurances regarding product contamination (e.g. with other types of meat, pesticide residue, etc.). Given the still-limited private investment in this area, the role of the Indonesian government is crucial. The recommendations are provided below.

- **Provide better accessibility to Electronic Cattle Identification (EID) ear tags and readers to producers:** The Indonesian government should assess the possibility of making digital technologies for electronic cattle identification such as RFID/GPS ear tags and readers more widely available by supporting their acquisition.
- **Develop a data management system maintained by the Ministry of Agriculture for EID records:** A systematic approach to how this data is collected, stored, and then accessed needs to be implemented and it is best that this is undertaken by the government, so that no vested interests take control. A good example is Australia's NLIS database, which holds the data of cattle in Australia and is maintained and managed by Meat and Livestock Australia (MLA's Data Management Group). Platforms such as iSIKHNAS and siJINAK should also be reviewed to assess whether they can serve as a basis for the desired data management system.
- **Provide education and training about technologies available:** A concerted education program needs to be put in place by the Indonesian government in partnerships with industry associations, universities and vocational education centres, research organisations, extension officers, farmer organisations, and other stakeholders, including in Australia (e.g. ACIAR, Australian Centre for International Agricultural Research), about technologies available throughout the chain, preferably using existing materials/platforms (e.g. a structured training program rolled out as part of the MoA's iSIKHNAS).
- **Identify investment opportunities:** Efforts by the government alone are not sufficient for achieving the optimal technology development. The technology gaps between Indonesian and Australian beef industries and opportunities presented by the IA-CEPA imply the need to identify further investment opportunities for both Australian and Indonesian investors in the technology sectors in both countries including to develop internationally comparable traceability systems in Indonesia. Central to this identification of investment opportunities are cost consideration and governance issues, which warrants a future study.

E-commerce development

Focusing on the Indonesian retail sector, the e-commerce analysis suggests that beef producers and retailers wanting to enhance their online presence are recommended below.

- **Undertake research into the suitability of e-commerce platforms:** E-commerce platforms offer different services, business models and target markets, hence the importance for beef producers and retailers to research the suitability of those platforms for their individual business requirements. For new entrants, penetrating the digital market through major digital marketplaces such as Tokopedia and Bukalapak could be an expedited solution, while existing online businesses can consider upgrading options e.g. becoming an accredited store, adopting click and collect strategies.
- **Address current deficiencies in online beef marketing strategies:** Beef producers and retailers should address existing deficiencies including logistical issues, to display Halal certificates, provide varied payment methods including cash on delivery, ensure appropriate functioning of e-commerce features (e.g. user reviews, delivery tracking status) and provide full product information, as well as facilitating offline-to-online transition for many customers.
- **Develop cold chains:** Cold chain solutions involve not only the use of technologies but also improved regulatory frameworks. Interviews with Indonesian e-commerce companies suggested that refrigerated vehicles for the last stage are often absent i.e. delivery to customers. Given cost consideration and road conditions, affordable solutions may include the use of refrigerated motorbike boxes and insulated packs.

- **Monitor evolving regulatory frameworks:** The Indonesian government continues to update or enhance regulations related to the e-commerce market and supporting systems such as digital payments. Beef retailers and producers are therefore recommended to get a regular update on these changes. Foreign businesses may therefore see a partnership with local companies (e.g. Indonesian importers, distributors, e-commerce companies) as critical. The Indonesian government may have particular rules about payment systems, taxation, and business registration including risk category that may affect their ability to conduct on-line business. This risk-based business registration further highlights the importance of technology adoption to improve traceability, efficiency and food safety in the beef and cattle supply chain, and therefore, manage business risks.

The production sector could also benefit from greater adoption of e-commerce. There is emerging evidence of using e-commerce to procure production inputs (such as farm tools and concentrate) among Indonesian farmers and this should continue. Furthermore, Australian cattle producers and Indonesian feedlots and importers should also assess a possibility of using Australia's online auction systems (such as AuctionsPlus), which would allow Indonesian importers to buy cattle directly from Australia. However, the development of an effective system is complex and includes consideration of such issues as animal welfare, exporting and importation procedures, and impacts on supply chain efficiency, and so, future study into this area is recommended.

Support for small businesses should also be improved. This may include support for Indonesian small businesses to obtain appropriate legal status, which is a prerequisite for their business expansion, and assistance for Australian small-scale producers to utilise online marketing of beef and beef products directly to both domestic and international consumers.

Chapter 1
Ringkasan Eksekutif

1. Ringkasan Eksekutif

Indonesia merupakan salah satu negara yang pengeluaran dana untuk teknologi informasi terbesar di di Asia Tenggara dan ekonomi digital diperkirakan akan menyumbang 61% dari Pendapatan Domestik Bruto (PDB) pada tahun 2022 (Febrian & Genesia, 2020). Sebagai implikasi, Indonesia telah melakukan berbagai upaya untuk menjadikan negara ini sebagai pusat (*hub*) digital di Asia. Perbaikan infrastruktur dan konektivitas di Indonesia saat ini membuka banyak peluang bagi para pelaku bisnis untuk mengadopsi teknologi informasi dalam rangka meningkatkan efisiensi dan keuntungan.

Studi ini merupakan sebuah inisiatif dari kemitraan Pemerintah Indonesia dan Australia terkait *food security* di sektor sapi dan komoditas daging merah yang bertujuan untuk mengidentifikasi dan meningkatkan kesadaran para pelaku usaha terkait ketersediaan teknologi pada saat ini dan di masa datang dalam bidang produksi dan pemasaran untuk meningkatkan efisiensi dan keuntungan di industri sapi dan daging sapi di Indonesia dan Australia. Adanya wabah COVID-19 terutama terkait dengan implementasi pembatasan sosial di kedua negara tentu saja berdampak pada kemampuan tim peneliti dalam pengumpulan data terutama dalam melaksanakan wawancara tatap muka dengan para pelaku kunci di industri daging sapi baik di Indonesia maupun di Australia. Untuk mengatasi keterbatasan tersebut, tim peneliti melakukan modifikasi melalui tiga pendekatan berikut.

1. **Literatur Review** terhadap teknologi yang tersedia saat ini, teknologi yang telah digunakan dan perkembangan e-commerce di dunia pada rantai pasok produk pertanian secara umum, dan secara khusus fokus kepada rantai pasok daging sapi Australia-Indonesia (Bagian 4),
2. **Audit teknologi digital** yang digunakan pada rantai pasok daging sapi di Indonesia (Bagian 5), dan
3. Investigasi terkait peran **e-commerce** dalam pemasaran sapi hidup dan daging sapi di Indonesia (Bagian 6).

1.3 Literatur Review

Teknologi digital pada rantai nilai produk pangan

Pertama, studi ini merangkum berbagai teknologi yang umum digunakan di rantai pasok di sektor pangan dan pertanian serta teknologi digital yang digunakan di rantai pasok daging di Australia (Tabel 2) mulai dari tanda telinga (*ear tags*) dan *software* manajemen peternakan (*herd management software*) di segmen produksi hingga kemasan cerdas (*smart packaging*) dan e-commerce di bagian ritel. Secara garis besar, penelitian ini menemukan bahwa saat ini para pelaku di rantai pasok daging sapi di Australia telah menggunakan berbagai teknologi sebagai praktek standar dengan aliran informasi digital yang baik, yang memungkinkan keterlacakan (*traceability*) produk hingga ke asalnya terutama melalui penggunaan aplikasi 'Sistem Identifikasi Ternak Nasional' (National Livestock Identification System / NLIS). Sebagian besar produsen dan pengolah daging di Australia khususnya yang berskala besar telah berinvestasi di berbagai teknologi, namun demikian masih terbuka peluang bagi pelaku bisnis skala kecil untuk meningkatkan adopsi teknologi digital.

Kondisi sebaliknya terjadi di Indonesia, dimana hanya sedikit pelaku di sepanjang rantai pasok daging sapi yang telah memiliki akses atau memanfaatkan teknologi digital lainnya selain penggunaan telepon pintar (*smartphone*). Di satu sisi petani kecil sebenarnya tertarik dengan berbagai opsi teknologi yang ada dan memiliki akses untuk berpartisipasi dalam penggunaan teknologi tersebut, namun mereka enggan membayar untuk teknologi yang tidak memberikan keuntungan finansial langsung atau jika teknologi tersebut tidak dianjurkan oleh pemerintah. Beberapa perusahaan telah mengembangkan sistem untuk memantau pergerakan, perilaku dan kesehatan hewan, namun demikian tingkat adopsi terhadap teknologi tersebut masih rendah. Beberapa perusahaan penggemukan sapi di Indonesia telah menggunakan teknologi RFID untuk memenuhi standar kesejahteraan hewan yang diberlakukan oleh eksportir dari Australia. Pada kebanyakan kasus efisiensi pakan, bobot sapi dan informasi kesehatan hewan masih dicatat secara manual. Sebagai akibatnya, meskipun *traceability* dimungkinkan di Indonesia, pencatatan secara manual tersebut sangat rentan karena dapat menyebabkan terjadinya kesalahan manusia (*human error*) dalam penanganan dan menyebabkan akses pelacakan informasi berjalan lambat. Terdapat peluang untuk melakukan sistem informasi secara otomatis dalam rangka meningkatkan efisiensi dan keterlacakan produk daging sapi. Walaupun penelitian ini belum menemukan bukti pendukung yang kuat terkait preferensi konsumen Indonesia terkait isu *traceability* produk daging seperti halnya yang terjadi di Australia, pengembangan sistem *traceability* tetap merupakan isu yang penting terutama terkait jaminan kehalalan produk yang menjadi perhatian banyak konsumen muslim di Indonesia.

Traceability juga diperlukan untuk menjamin agar produk daging sapi yang dibeli tidak tercampur atau terkontaminasi dengan produk daging lain atau produk yang tidak halal atau produk yang tidak diinginkan lainnya.

Berdasarkan hasil tinjauan terhadap perusahaan-perusahaan di Indonesia yang bergerak di bidang teknologi digital menunjukan bahwa terdapat setidaknya 26 perusahaan platform digital yang terlibat dalam industi sapi dan daging sapi di Indonesia. Sebagian besar perusahaan-perusahaan tersebut terlihat dalam pemasaran (termasuk e-commerce) diikuti oleh perusahaan yang bergerak di bidang pendanaan untuk investasi (*crowdfunding*). Teknologi lainnya meliputi sistem informasi, pemantauan kesehatan hewan, dan untuk pendidikan.

Pemasaran daging sapi secara online

Berdasarkan tinjauan literatur, pasar e-commerce di Indonesia sudah berkembang bahkan sebelum pandemi COVID-19. Pada tahun 2018, McKinsey melaporkan bahwa pasar e-commerce Indonesia diproyeksikan bertumbuh delapan kali lipat antara 2017 dan 2022. Dompet digital adalah metode pembayaran yang memiliki pertumbuhan paling cepat dan diperkirakan akan terus tumbuh mencapai 47% per tahun di tahun 2021 (JP Morgan 2019). Di antara dompet digital tersebut, GoPay memiliki pangsa pasar terbesar (60%) diikuti oleh OVO (28%), Dana (8%) dan LinkAja (4%). Mengingat 160 juta penduduk Indonesia adalah pengguna media sosial, peran media sosial menjadi kunci dalam aktivitas promosi (misalnya dengan menggunakan *influencers*), dan interaksi antara penjual dan pembeli. Youtube, Facebook dan Instagram adalah platform sosial media yang paling popular di Indonesia. Sementara Whatsapp dan Instagram adalam platform yang paling popular untuk menjual produk secara online.

Ke depan diperkirakan banyak para pelaku usaha akan yang mengadopsi apa yang disebut dengan 'strategi omni-channel' yang mengintegrasikan berbagai model bisnis, misalnya *online* dan *offline,* B2C (bisnis ke konsumen) dan B2B (bisnis ke bisnis) dan lain-lain. Penelitian ini juga mengidentifikasi sejumlah kesenjangan yang masih terjadi dalam pemasaran daging sapi online di Indonesia terutama masalah logistik dan kurangnya informasi tentang sertifikasi Halal. Untuk Australia sendiri terdapat beberapa peluang bagi produsen dan pengolah khususnya bagi pelaku bisnis skala kecil untuk memasarkan produk sapi dan turunannya secara online baik di pasar dalam negeri maupun luar negeri.

Audit teknologi digital

Audit teknologi digital pada rantai pasok sapi dan daging sapi di Indonesia dilakukan dalam penelitian ini untuk menentukan teknologi apa yang digunakan saat ini dan bagaimana teknologi tersebut digunakan serta teknologi apa yang berpotensi untuk digunakan di masa depan. Sebanyak 11 wawancara dan tiga *focus group discussions* (FGD) dilakukan terhadap para pelaku di sepanjang rantai pasok sapi dan daging sapi termasuk *feedlot*, importir daging sapi, pengolah, *off-taker*, penyedia teknologi informasi, pemerintah pusat dan pemerintah daerah.

Secara umum, audit teknologi digital menunjukan keragaman dalam tingkat adopsi teknologi digital antar segmen di rantai pasok, dan antar wilayah. Studi ini menemukan adopsi teknologi yang lebih tinggi oleh perusahaan penggemukan sapi (*feedlots*) berskala besar terutama penggunaan teknologi RFID untuk identifikasi ternak dan pelacakan, *Enterprise Resource Planning* (ERP) dan sistem manajemen informasi yang dibangun oleh pemerintah. Namun demikian, penggunaan teknologi tersebut masih menjadi masalah terutama di daerah pedesaan sehingga tidak bisa digunakan oleh peternak kecil. Penelitian ini juga menemukan perkembangan sistem *traceability* di berbagai daerah.

Produsen – Tiga FGD dilaksanakan di Kabupaten Sumbawa Barat, Sumbawa dan Dompu di NTB menunjukkan bahwa peternak kecil belum menggunakan teknologi digital dalam produksi dan pemasaran sapi. Para peserta FGD tersebut melihat potensi pemanfaatan teknologi RFID/GPS untuk memonitor ternak sapi dan memiliki akses terhadap jaringan internet untuk berpartisipasi, akan tetapi mereka ragu untuk membayar biaya penerapan teknologi tersebut terutama karena teknologi tersebut tidak memberikan manfaat finansial secara langsung atau tidak/belum diamanatkan oleh pemerintah.

Usaha penggemukan sapi potong (feedlots) – *Feedlot* sudah mulai menerapkan teknologi digital RFID untuk identifikasi ekektronik (EID) dengan tujuan utama untuk mematuhi standar kesejahteraan hewan yang diterapkan oleh eksportir sapi Australia. Mereka memiliki pembaca RFID untuk merekam data EID individual ternak pada saat tiba dari Australia, di *feedlot* dan di RPH untuk memastikan keterlacakan dari daging sapi. Satu perusahaan yang diinterview sudah menggunakan QR code yang memungkinkan konsumen untuk mengakses riwayat daging sapi yang dibeli menggunakan aplikasi Android. Meskipun data pembelian dan penjualan dikelola secara elektronik di dalam perusahaan (menggunakan ERP) sehingga *cash flow* dapat dimonitor dengan mudah, data efisiensi penggunaan pakan dan pertumbuhan sapi masih dikumpulkan dan dikelola secara manual oleh petugas yang terlatih. Tidak ada transfer data elektronik dari timbangan sapi elektronik ke database perusahaan –

data masih dikumpulkan dan dicetak sebelum dimasukkan ke dalam komputer utama perusahaan. Penggunaan teknologi digital di perusahaan *feedlot* terkendala oleh rendahnya kesadaran pelaku rantai pasok yang lain, misalnya pedagang sapi masih menggunakan dana tunai dalam melakukan pembelian sapi dari *feedlot*.

Pengolah (processors)/rumah pemotongan hewan (RPH)/importir - Ada sedikitnya empat RPH modern yang menyediakan daging sapi dengan potongan premium di Indonesia dan dua diantaranya diwawancara dalam penelitian ini. Perusahaan tersebut merupakan perusahaan terbesar dan modern di Indonesia dan sudah mengantongi sertifikat Halal. Kedua perusahaan tersebut juga sudah menerapkan teknologi digital secara parcial, menggunakan alat untuk merebahkan sapi secara otomatis dan menggunakan alat pemingsanan (*stunning*), dan karkas diangkat menggunakan hidraulik. Akan tetapi, pemotongan dan pengulitan masih dikerjakan secara manual untuk mematuhi prosedur pemotongan Halal. Petugas mereka sudah terampil, terlatih dan tersertifikasi sehingga dapat melakukan pemisahan bagian daging primal (*primal cuts*) sesuai standar. Sapi yang dipotong memiliki RFID (yang memuat data negara/wilayah asal ternak, berat badan, dan lain-lain) dan potongan premium yang dihasilkan diidentifikasi menggunakan barcode sesuai data yang ada di RFID sehingga dapat digunakan ketika ada konsumen yang melakukan komplain. Meskipun kemasan daging impor yang masuk ke Indonesia juga memiliki barcode, konsumen tidak dapat melacak riwayat daging sapi tersebut secara utuh karena importir tidak memiliki akses terhadap data historis dari negara asal. Kurangnya ketertelusuran ini tidak dipandang sebagai masalah utama oleh konsumen (termasuk hotel bintang 5).

***Offtaker*/platform investasi** – *Offtaker* umumnya memiliki kapasitas untuk mengumpulkan produk ternak dan menyimpannya sebagai pangan beku dalam sistem rantai dingin mereka. Penggunaan teknologi digital yang paling signifikan pada sektor ini adalah untuk menarik investasi (*crowdfunding*). Satu perusahaan yang diwawancara telah berhasil mengumpulkan dana dalam jumlah yang cukup besar karena kemampuannya untuk menunjukkan profitabilitas perusahaan dan menjamin investor mendapat informasi terkini secara reguler tentang kinerja perusahaan.

Penyedia IT/perangkat keras (*hardware)* – Satu perusahaan penyedia teknologi memiliki sistem informasi (perangkat berbasis *Internet of Things* (IoT) yang disematkan pada leher sapi) yang dapat digunakan untuk memonitor pergerakan ternak, menghitung jumlah ternak, membuat pagar virtual, mencatat temperatur lingkungan dan informasi kesehatan ternak serta pemberian pakan. Diharapkan sistem informasi ini dapat memonitor efisiensi penggunaan pakan pada individu ternak berdasarkan perilaku pemberian pakan.

Pemerintah Pusat – Peraturan menteri pertanian no 16/2010 telah mengatur penggunaan identifikasi ternak ruminansia besar di Indonesia. Dalam peraturan tersebuti disebutkan bahwa semua ruminansia besar harus diidentifikasikan menggunakan a) *ear tag* atau *micro chip* dan/atau b) kartu ternak dan kartu pemilik ternak. Akan tetapi hanya sebagian kecil kabupaten di Indonesia menerapkan sistim identifikasi ternak ini dan tidak ada satupun yang menggunakan *micro chip*. Pemerintah Indonesia juga sudah mengembangkan setidaknya lima *platform* digital yang relevan untuk peternak. Terdapat peluang untuk untuk memperbaiki efektivitas dan tingkat adopsi teknologi tersebut.

Pemerintah daerah – Hasil interview dengan Dinas Peternakan dan Kesehatan Hewan di NTB (Nusa Tenggara Barat) mengkonfirmasi bahwa tidak semua kabupaten/kota di Indonesia menerapkan sistem identifikasi ternak walaupun sudah dimandatkan oleh Kementan Nomor 16 Tahun 2010. Di NTB misalnya, hanya kabupaten di Pulau Sumbawa yang menerapkan sistem identifikasi ternak dan tidak ada kabupaten/kota di Pulau Lombok menerapkan sistem identifikasi ternak. Salah satu staf Dinas Peternakan dan Kesehatan Hewan Kabupaten Sumbawa menyebutkan penggunaan sistem informasi yang disebut siJINAK yang digunakan untuk melakukan pelacakan secara real time terhadap data populasi ternak sapi, pemotongan sapi, pengiriman sapi antar pulau, dan lainnya. Sistem identifikasi ternak yang sedang dikembangkan berbasis teknologi RFID saat ini sudah diuji coba. Pada tahun 2021 direncanakan untuk m menambah jumlah *reader* RFID dan *ear tag*. Untuk jangka panjang, siJINAK akan digunakan sebagai basis untuk sistem traceability daging sapi asal Kabupaten Sumbawa.

Analisis permintaan konsumer untuk daging sapi: Fokus e-commerce

Investigasi terkait isu-isu dalam pemasaran daging sapi secara online dilakukan melalui wawancara terhadap enam perusahaan e-commerce dan 30 konsumen (responden) di wilayah Jabodetabek. Mengingat terbatasnya jumlah responden pada penelitian ini, hasil analisis ini sebaiknya tidak dijustifikasi untuk menggambarkan perilaku konsumen di seluruh Indonesia. Namun demikian, beberapa hal telah dilakukan oleh tim peneliti untuk memastikan kebermanfaatan hasil dari survey yang dilakukan terutama dalam hal pengambilan sampel (*purposive sampling*) yaitu dengan mempertimbangkan berbagai model bisnis e-commerce yang ada.

Perspektif bisnis

- Platforms e-commerce seperti Tokopedia, Shoppee, Bukalapak, Lazada dan Blibli merupakan platform yang paling banyak digunakan oleh konsumen di Indonesia. Pandemi COVID-19 telah memberikan insentif pada perusahaan e-commerce untuk fokus pada segmen B2C (*Business to Consumer*). Pada bulan Maret 2020, Bank Indonesia melaporkan kenaikan tajam dalam jumlah transaksi e-commerce sebanyak 18.1 per cent mencapai 98.3 juta transaksi, dan kenaikan dalam nilai transaksi sebesar 9.9 per cent hingga mencapai USD 1.4 milyar. Survei oleh RedSeer (2020) menunjukkan pandemi COVID-19 diperkirakan akan menarik 12 juta pembeli baru di e-commerce. Dalam keadaan normal, kenaikan ini bisa mencapai 1.5 hingga 2 tahun.
- Perusahaan yang menjual produk melalui *digital marketplaces* merasakan manfaat dari berbagai fitur yang tersedia seperti status pemesanan, riwayat pemesanan, proses verifikasi pembayaran secara otomatis, dan pilihan untuk bertukar pesan (*live chat option*).
- Sebagian besar perusahaan e-commerce yang diwawancara memasok daging sapi langsung dari produsen di luar negeri atau langsung dari importir, dan kemudian mencapai konsumen akhir, maka rantai pasok khususnya bagi pembeli di Jabodetabek menjadi tidak terlalu panjang. Produk daging sapi beku mendominasi penjualan secara online. Walaupun semua produk daging sapi impor yang masuk ke Indonesia bisa diasumsikan telah memenuhi persyaratan sertifikat Halal, informasi mengenai sertifikasi Halal ini tidak selalu tersedia untuk pembeli online.
- Keseluruhan perusahaan yang diwawancara menyatakan pandangan optimis mereka mengenai perkembangan e-commerce di masa mendatang. Salah satu perusahaan yang diwawancarai mengusung ide untuk mencoba memanfaatkan perjanjian dagang antara Indonesia dan Australia (the Indonesia-Australia Comprehensive Economic Partnership Agreement atau IA-CEPA)
- Hambatan logistik terkait keinginan pelanggan untuk dapat melihat dan memegang produk secara langsung, dan kompetisi dengan produk daging dan sumber protein lain merupakan tantangan yang dihadapi dalam mengembangkan pemasaran daging secara online. Perusahaan e-commerce yang diwawancari juga melaporkan tantangan terkait kebijakan seperti sulitnya mendapatkan status hukum bagi usaha kecil, peraturan pemerintah terkait *fintech* (teknologi keuangan) dan perpajakan, dan isu berkelanjutan mengenai kebijakan importasi.

Perspektif konsumen

- Konsumen menyatakan preferensi yang kuat terhadap produk daging sapi lokal, namun mereka yang pernah berbelanja daging sapi secara online lebih menerima daging sapi impor. Pasar basah tetap menjadi tempat pembelian daging sapi paling popular di kalangan konsumen dari berbagai umur. Saluran online lebih populer di kalangan responden muda.
- Walaupun proporsi dari konsumen yang membeli produk daging sapi melalui *marketplace* masih kecil, responden menyatakan bahwa kenyamanan, kualitas dan promosi sebagai alasan utama membeli produk daging sapi secara online. Sebagian besar (73%) responden yang tidak pernah membeli daging sapi secara online menyatakan akan menggunakan saluran online di masa mendatang.
- Pembayaran tunai dan dompet digital merupakan metode pembayaran yang paling populer digunakan oleh responden yang berbelanja online.
- Isu terkait kualitas dan logistik seperti mahalnya biaya pengiriman, keterlambatan dalam pengiriman dan rusaknya kemasan menjadi permasalahan bagi responden yang berbelanja secara online.
- Terkait informasi produk, survei ini menemukan bahwa informasi mengenai Halal sertifikat dan harga jauh lebih penting dari informasi produk yang lain. Review dari pengguna, update terhadap pengiriman dan *wish lis*t merupakan fitur penting ketika konsumen membuat keputusan untuk melakukan pembelian secara online.

1.4 Rekomendasi

Pengembangan sistem identifikasi ternak berbasis teknologi digital

Perkembangan sistem *traceability* di Indonesia masih terbatas. Walaupun tidak ditemukan bukti yang kuat bahwa konsumen saat ini menginginkan informasi keterlacakan terkait negara asal, peternakan asal dan atribut atau sertifikasi lain (seperti *grass-fed*, organik, dan lain-lain), konsumen Indonesia memiliki kepedulian tinggi mengenai kehalalan produk dan akan merasakan manfaat dari jaminan tidak adanya kontaminasi produk (dengan daging lainnya, residu dari pestisida). Dengan masih terbatasnya investasi dari sektor swasta di bidang ini, peran pemerintah Indonesia menjadi sangat krusial. Beberapa rekomendasi yang dapat menjadi bahan pertimbangan sebagai berikut:

1. **Menyediakan akses lebih baik terhadap ear tag berbasis identifikasi elektronik dan reader kepada para produsen:** Pemerintah Indonesia direkomendasikan untuk melakukan penilaian tentang kemungkinan menyediakan teknologi digital untuk identifikasi ternak berbasis teknologi digital seperti RFID/GPS ear tags dan reader secara lebih luas melalui penyediaan berbagai fasilitas pendukung.
2. **Mengembangkan sistem manajemen data yang dikelola oleh Kementerian Pertanian untuk mengelola data dari sistem identifikasi ternak elektronik:** Pendekatan sistematis dalam pengumpulan, penyimpanan dan akses data perlu diimplementasikan dan hal ini sebaiknya dilakukan oleh Pemerintah sehingga tidak ada kontrol dari kepentingan lain. Contoh yang baik dalam hal ini adalah sistem identifikasi ternak Australia (*National Livestock Identification Scheme*) yang mengelola semua data ternak dan dikelola oleh MLA/pemerintah. Berbagai *platform* yang saat ini dikembangkan seperti iSIKHNAS dan siJINAK dapat ditinjau untuk dilihat apakah dapat dijadikan basis dari sistem manajemen data yang diinginkan.
3. **Menyediakan pendidikan dan pelatihan tentang teknologi digital yang tersedia:** Program edukasi yang terpadu perlu untuk dikembangkan oleh Pemerintah Indonesia melalui kemitraan dengan asosiasi industri, universitas dan pusat pelatihan vokasi, organisasi penelitian, petugas penyuluhan, organisasi peternak dan pemangku kepentingan lain termasuk yang berada di Australia (misalnya ACIAR) tentang penggunaan berbagai teknologi yang tersedia di sepanjang rantai pasok, terutama menggunakan materi/platform yang tersedia (misalnya program pelatihan yang menjadi bagian dari platform iSIKHNAS.
4. **Mengidentifikasi peluang investasi:** Upaya oleh pemerintah sendiri tidak cukup untuk mencapai pengembangan teknologi digital di industri daging secara optimal. Kesenjangan teknologi (*technology gaps*) antara Indonesia dan Australia di industri daging sapi dan peluang dari IA-CEPA dapat diartikan perlunya untuk mengidentifikasi lebih lanjut peluang bagi investor baik dari Australia dan Indonesia untuk berinvestasi di bidang teknologi di kedua negara termasuk mengembangkan sistiem traceability yang berstandar internasional di Indonesia. Hal yang paling penting dalam mengidentifikasi peluang investasi ini adalah pertimbangan biaya dan tata kelola, yang membutuhkan studi lebih lanjut.

E-commerce development

Dengan fokus kepada sisi ritel di Indonesia, berdasarkan hasil analisis e-commerce, produsen dan penjual daging sapi yang ingin berpartisipasi di pasar online disarankan untuk:

1. **Melakukan penelitian lebih lanjut terkait dengan kesesuaian dari berbagai platform e-commerce:** Platform e-commerce menyediakan layanan, model bisnis dan target pasar yang berbeda, sehingga bentuk e-commerce apa yang paling sesuai bagi produsen dan ritel dalam memasarkan produknya perlu dikaji lebih lanjut. Bagi pendatang baru, penetrasi pasar digital dapat dilakukan dengan menggunakan platform *marketplaces* yang telah beroperasi, misalnya Tokopedia dan Bukalapak. Bagi para pelaku bisnis online yang sudah ada, salah satu alternatif yang dapat dilakukan oleh para penjual daging sapi adalah dengan melakukan strategi *upgrading,* misalnya menjadi toko yang mampu menawarkan lebih banyak fitur kepada pelanggan dan mengintegrasikan bisnis mereka dengan sistem e-commerce.
2. **Mengatasi kesenjangan (*gaps*) yang masih terjadi dalam pemasaran daging sapi secara online:** Penjual dan pengecer daging sapi harus mampu mengatasi permasalah seperti isu dalam pengiriman, menampilkan sertifikat Halal di toko online, menyediakan metode pembayaran yang bervariasi termasuk pembayaran tunai saat pengiriman (*cash on delivery*), memastikan berfungsinya fitur e-commerce lainnya (seperti penilaian pelanggan, status pengantaran, dan daftar barang yang diinginkan konsumen) dan menyediakan informasi produk yang lengkap serta memfasilitasi transisi dari toko offline ke toko online untuk mengjangkau konsumen yang lebih banyak.

3. **Mengembangkan sistem rantai dingin:** Solusi terkait isu rantai dingin tidak hanya melibatkan penggunaan teknologi tetapi juga meliputi berbagai regulasi. Wawancara dengan perusahaan e-commerce Indonesia menunjukkan bahwa kendaraan yang memiliki pendingin seringkali tidak tersedia terutama untuk pengiriman ke pelanggan. Mengingat pertimbangan biaya dan kondisi jalan, salah satu solusi yang paling mungkin untuk dilakukan adalah dengan menggunakan motor yang dilengkapi dengan kotak berpendingin dan fasilitas pendingin lainnya.
4. **Mengikuti perkembangan regulasi terkini terkait e-commerce**: Pemerintah Indonesia terus memperbaharui atau menambah peraturan-peraturan baru terkait pasar e-commerce termasuk sistem pendukungnya seperti pembayaran digital. Oleh karena itu, penting bagi produsen dan ritel pada komoditas daging sapi untuk selalu mengikuti perkembangan peraturan tersebut. Para pelaku usaha yang berasal dari luar negeri dapat memulai bisnisnya dengan melakukan kemitraan dengan pengusaha lokal (misalnya, importir, distributor, perusahaan e-commerce Indonesia). Pemerintah Indonesia memiliki peraturan khusus terkait sistem pembayaran, perpajakan, dan pendaftaran bisnis termasuk kategori risiko yang dapat mempengaruhi kemampuan mereka untuk melakukan bisnis secara online. Perizinan berusaha berbasis risiko ini menekankan lebih lanjut pentingnya adopsi teknologi untuk meningkatkan *traceability*, efisiensi dan keamanan pangan di rantai pasokan daging sapi, yang kemudian akan dapat membantu dalam bisnis dalam mengelola.

Segmen produksi juga dapat mengambil manfaat dari adopsi e-commerce. Telah ditemukan bukti awal bahwa dengan digunakannya e-commerce oleh peternak Indonesia mampu memfasilitasi mereka untuk mendapatkan input secara lebih mudah (seperti peralatan peternakan dan konsentrat) dan hal ini sebaiknya terus dikembangkan. Lebih lanjut lagi, produsen Australia dan usaha penggemukan sapi di Indonesia serta importir bisa meninjau kemungkinan penggunaan sistem lelang online seperti AuctionsPlus, yang dapat memungkinkan importir Indonesia untuk membeli sapi secara langsung dari Australia. Namun demikian, pengembangan dari sistem lelang ini sangat komplek dan melibatkan berbagai isu yang harus dipertimbangkan seperti kesejahteraan hewan, kebijakan ekspor dan importasi, dampak terhadap efisiensi rantai pasokan dan lain-lain, sehingga diperlukan studi lebih lanjut untuk hal tersebut secara lebih mendalam.

Dukungan untuk usaha kecil juga perlu ditingkatkan. Dukungan ini termasuk bagi usaha kecil di Indonesia dalam mendapatkan status badan hukum, yang menjadi syarat untuk mengembangkan usaha, dan bantuan bagi produsen skala kecil di Australia untuk menggunakan pemasaran produk daging sapi secara online langsung ke konsumen baik di dalam maupun luar negri.

Chapter 2
Background and Overarching Project Aims

2. Background and overarching project aims

Digital technologies offer potential efficiency gains in both Australian and Indonesian cattle and red meat sector supply chains. Australia has made significant progress in applying digital technologies to production issues, such as through the advanced monitoring and control of water, feed supplements and other production factors, as well as through online livestock sales platforms. For many years, the movement of every beef animal in Australia has been tracked from birth to slaughter by the National Livestock Identification Scheme (NLIS). Several of the innovations Australia introduced in this space, including the organisations (such as AUS-MEAT that control much of the activity) were introduced as a response to crisis situations, such as disease control programs, substitution of othermeats in export beef, and contamination from pesticide residues due to inappropriate feed. Indonesia could emulate Australia's example in this regard to deal with issues such as Halal certification and to control the sale of products like Indian buffalo meat that is sometimes passed off as beef.

Until now, Indonesia has used technology to improve producers' access to finance and for retail sales, including through online platforms. These improvements across different segments of the supply chain in both countries signal opportunities for Australia-Indonesia beef and cattle supply chains to strengthen efficiency and build partnerships. Central to this is a solid understanding of key trends in the supply chains.

Examples of relevant digital innovations may include, but are not limited to, those designed to achieve improvements in efficiency and profitability as well as marketing applications:

Remote sensing and telemetry applications:

1. Birthing sensors
2. Applications that monitor animal behaviour such as feed intake
3. Online animal health support systems
4. Systems to access and compare financial products available to the commercial beef sector
5. Online auction systems and other live cattle selling options.

Another key trend is the expansion of online retail marketing in Indonesia, including online sales of beef and beef products. There are concerns as to how this new marketing system will impact beef consumption, given the lack of clarity around product quality and cool chain maintenance. Online sales may ultimately lower consumer beef prices by reducing the number of players and associated margins in the sales process. A further investigation into current e-commerce companies' operations, and how these impact beef and cattle supply chains, beef consumption levels and online shopping behaviours, would therefore provide lessons to guide the development of Australia-Indonesia beef and cattle supply chains. Such an investigation should assess digital innovations such as online retail marketing applications, and innovative systems with traceability applications (e.g. preventing fake Australian meat entering the Indonesian market using blockchain technology or special packaging).

At the Eighth Partnership meeting in Bali, November 2019, members expressed the need to better understand the constraints and opportunities afforded by existing and pending digital technologies from the Australian cattle and beef sector, and how this might impact the industry in both countries. One issue of interest is whether Indonesian cattle buyers could participate directly in Australian cattle sales to reduce the involvement of intermediaries in the live cattle supply chain and improve profitability. This should be possible with the advent of on-line cattle auctions and overcoming the need to be physically present at cattle sales; however, subsequent logistical activities such as assembly of cattle into adequate numbers for shipment would probably still require a local agent to conduct the operation.

The aims of this Project, as they were outlined in the tender proposal, were to identify and raise industry awareness of currently available and future technologies for production and marketing that have potential to improve the efficiency and profitability of the beef industries in Indonesia and Australia.

Part 1: Technology identification and evaluation

1.1. Identify and review relevant innovations based on a desktop study.

1.2. Examine and review relevant work done by MLA (Meat and Livestock Australia), KADIN (Kamar Dagang dan Industri or Indonesia's Chamber of Commerce and Industry), GAPUSPINDO (Gabungan Pelaku Usaha Peternakan Sapi Potong Indonesia or the Indonesian Beef Cattle Businessmen's Association) and other peak bodies, private companies and other Australian and Indonesian agencies.

1.3. Examine and review learnings from regional countries such as Vietnam and Malaysia.

1.4. Assess innovations based on their ability to address constraints.

Part 2: Assessment of the use and perception of online marketing

2.1. Examine how consumers interact with technology; barriers to their use of digital platforms; the performance ranking of companies using digital platforms; and, the rules of transactions.

Part 3: A whole-of-chain digital technologies analysis

3.1. Identify constraints to application and adoption, including capital and investment requirements, technology gaps, training/knowledge and culture gaps and other constraining factors.

3.2. Examine the ways Indonesian and Australian companies and other stakeholders could benefit from new or improved digital technologies.

COVID-19 pandemic travel restrictions had an immediate impact on the Project and face-to face interviews were not able to be undertaken until later in the year, which hindered the ability to deliver some of the initial outcomes requested in the tender. For example, no face-to-face interviews were undertaken in the Australian Beef Supply Chain due to Australian Government travel restrictions, and interviews in the Indonesia Beef Supply Chain were mainly undertaken using Zoom due to stakeholders' lack of interest in meeting face to face. Part 3 (Whole of Chain Digital Analysis) was therefore quite severely limited in its extent.

Chapter 3
Methodology

3. Methodology

Three tasks were undertaken in order to address the Project Aims which are described in the Sections identified:

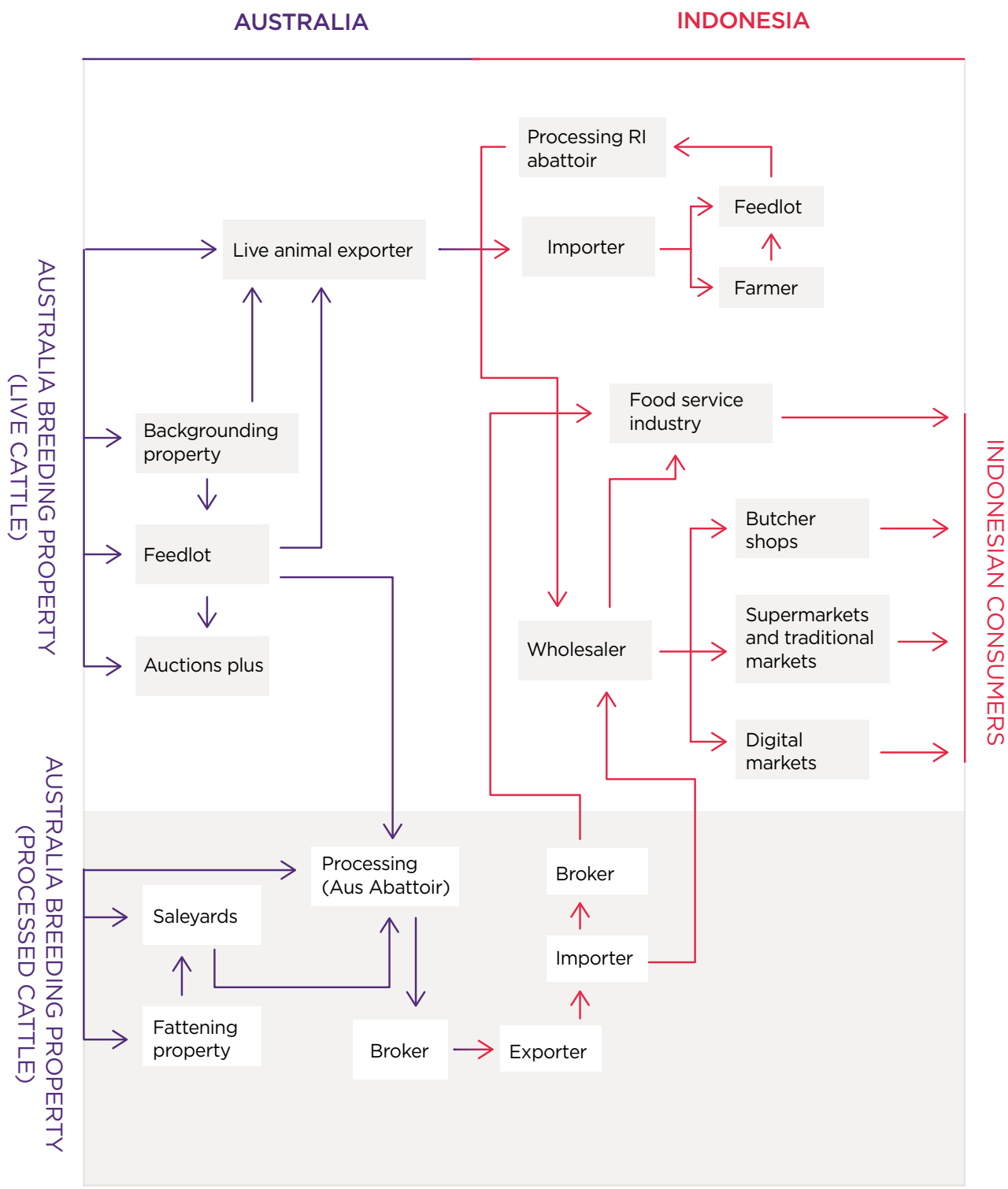
- Desktop review of existing Literature and examples of use (Section 4)
- An interview-based Digital Technology Audit (Section 5)
- An interview-based E-Commerce and Consumer Survey (Section 6).

With regard to Tasks 2 and 3, it should be noted that the COVID-19 restrictions under which this Project was conducted meant that it was not possible to undertake enough interviews to enable statistically significant analysis to be undertaken.

Figure 1 illustrates a generalised Australia-Indonesia beef supply chain that was used as the framework for the tasks identified. The supply chain map provides the situational background noting that variations exist between supply chains currently operating between the two countries. For example, the live cattle supply chain into Indonesia from Australia is different to that of boxed beef product (see Waldron et al 2019 for full details). Further we have included a 'Digital market' (e-commerce) along with the supermarket and traditional market as a means of selling beef products in Indonesia (following Maman et al 2018).

The Study received Ethics approval through The University of Queensland prior to the launch of the fieldwork (UQ Ethics ID Number 2020001527).

Figure 1: A generalised Australian Indonesian Beef Supply Chain with indications of where the tasks undertaken fit. Modified from Maman et al (2018).



Chapter 4
Desktop Review of Relevant Literature and Links

4. Desktop Review of Relevant Literature and Links

4.1 Digital Technologies in Agrifood Chains

Digital technologies across the agrifood sector have been available to businesses for many years (Salin, 1998; Scheifer, 2004; Bryceson, 2006; Bryceson, 2011; Shaklin, 2017; Askew, 2019; Renda et al., 2019) and have proved important in streamlining information flows, increasing efficiency, reducing human error and adding value (Whalen et al., 2010; WEF, 2014 and 2019, Robertson et al., 2018).

The technologies identified in **Table 1** are generic to all agrifood supply chains to a lesser or greater degree and can be found at different points in the chain, generally depending on the size of business involved (e.g. small companies will not have an ERP – but large companies will) as part of the optimisation of those supply chains (Bryceson, 2006; Bryceson & Yaseen, 2018; Denis et al., 2020).

Table 1: Technologies common to agrifood supply chains

Technology	Function
Telephone, fax, mobile (SMS messaging), iPhone , android, mobile phone applications	Communication, business, and social applications
Internet, intranet, WANs, LANs, email	Communication, electronic business information flow
Search engines (software)	Search databases on the internet – Google, AltaVista, Bing, etc
Social networking sites e.g. Twitter, Facebook, Instagram, YouTube, Skype, Zoom, webpages	Communication and marketing, online advertising
PCs, computerised office systems & software, IoT data warehouses, robotics and AI	Word processing, spreadsheets, accounting systems, data collection/ data mining, data storage and manipulation, automated warehousing
Business information systems e.g. Transaction processing systems, management information systems (MIS), executive (EIS), electronic Human Resources (e-HR), occupational health and safety (OH&S), asset management	Managerial and operational information management and decision support systems

Electronic transaction processing – e.g. electronic funds transfer, EFTPOS, BPAY, internet banking, e-commerce websites, online auctions	Electronic money movement, online transactions
Electronic Data Interchange (EDI)	Movement of information via electronic networks – primarily used in ordering & purchasing
Material Resource Planning (MRP) & Electronic Resource Planning (ERP) systems	Complete enterprise wide data & information manipulation resource
Electronic demand forecasting and supply chain management systems	More accurate forecasting of demand and supply based on real time electronic information flows, inventory management
Cold chain technologies	Temperature control (e.g. in food, pharmaceutical companies) shelf life extension
Logistics tracking technologies	Transport management, safety and traceability management, inventory management
RFID and bar codes as tracking technologies, point of origin trace element tracking	Electronic identification, traceability (in food and pharmaceutical companies)
B2B Marketplaces	Bring together suppliers and buyers into a virtual trading space. Public E-Marketplaces have not been successful – private ones more so (e.g. Proagrica)

4.3 Digital Technologies in the Australian Beef Supply Chain

Table 2 identifies specific technologies used in the Australian beef supply chain and their use over and above those identified in Table 1. A key recent report is Barlow et al. (2020) 'Global scan of technologies and systems enabling data capture and transfer across red meat supply chains.' Many of these technologies are currently termed "Disruptive Technologies" – that is, they have disrupted or changed the way that the stakeholders do business (Henry, 2016' Ferguson & Henry, 2016; Klerx et al., 2019). One company of note in **Table 2** is *Integrity Systems Company***,** a Meat and Livestock Australia (MLA) Company focused on on-farm assurance, animal identification and traceability from paddock to plate (integritysystems.com.au).

Table 2: Specific Digital Technologies in the Australian beef supply chain with examples

Production	Feedlot	Processing	Logistics	Cold Chain	Retail
Individual Animal Electronic Identification (EID) and tracking: **NLIS (RFID Ear Tags)* *mOOVable GPS Ear Tags* ***CSIRO Ceres Ear Tags* Herd Management software (Individual Animal Health & Welfare Management), (*e.g. Phoenix, Maia Grazing, Sapien Technology, iPaddock, Agworld, Agriwebb, Farmware, Practical Systems, Mobble*) Pasture Monitoring and Management *(Remote sensing (ESRI; Internet of Things (IoT) automated irrigation)* Online Auctions *(e.g. AuctionsPlus)*	EID NLIS (RFID) *(Product traceability)* Feed Out Systems *(e.g. Manabotix):* 1. Bunk Scanners (predicts feed remaining in feedlot bunks accurately and repeatedly), 2. Deliverease (automatic delivery system to delivery bins) **Some automated % mixers available in USA – in Australia still batching all inputs – not fully automated	Robotics (Scott Techs, JBS, MLA) – *Beef Rib cutter reduces waste, improves worker safety, increases efficiency*) Barcode/ RFID embedded in packaging (*Efficiencies, Traceability, value- add*) Meat Standards Australia (MSA) Grading (value-add)	RFID Tracking Techs *(LinFox Logistics)* **Automated and RFID locatable palletisation iGPS** Barcode and RFID embed in packaging (*Efficiencies, Traceability, value-add)*	RFID chips Temp data logger (*Temp tracking in transit*) Refrigeration Techs (*temp management, food safety, shelf life extension*) **Automated and RFID locatable palletisation iGPS**	Smart Packaging (*traceability, shelf life extension*) Automated retail (*Increase speed, efficiencies*) E-commerce Meatonline, Organic Meat Online, Our Cow, The Meat Man, Super Butcher (*Consumer demand, food services (wholesale) demand*) Supply/ demand forecasting techs *(facilitate inventory management, cost management, efficiencies*) E-Marketing (Webpage) social media & mobile phones and business apps (*advertising, consumer demand management*)
eNational Vendor Declaration (eNVD) link to EID for traceability (**Integrity Systems Company (ISC)**)	eNVD	eNVD			

Webpages (e.g. AACo, Stanbroke)	Webpage	Webpage	Webpage		
Mobile phone apps**	Mobile phone apps	Mobile phone apps	Mobile phone apps	Mobile phone apps	Mobile phone apps

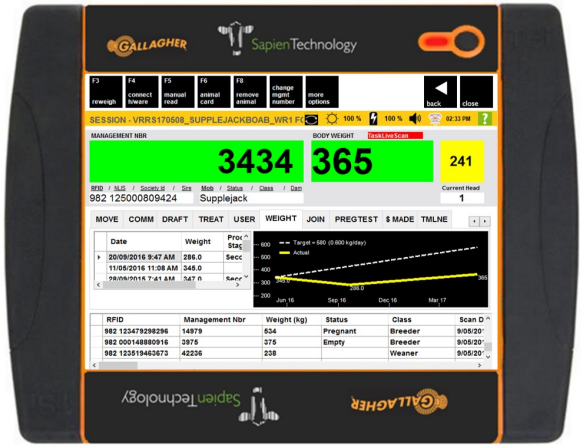
*Note: A range of these technologies are further outlined in **Box 1**.*

** NLIS – National Livestock Identification Scheme: integritysystems.com.au/identification--traceability/national-livestock-identification-system*
*** CSIR – The Australian Government's Commonwealth Scientific and Industrial Research Organisation*
**** Mobile Phone = Smart phones. A list of available mobile phone apps for the livestock industry is included in **Box 2**.*

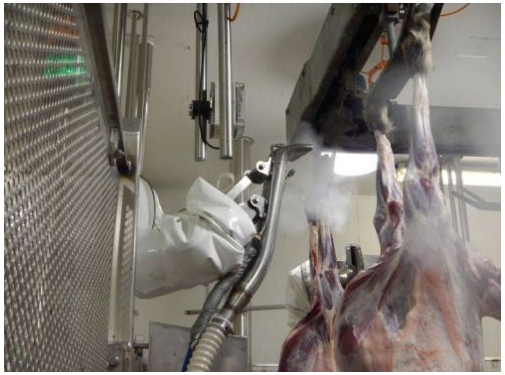
We find that connectivity can be patchy in rural areas in Australia therefore making electronic communication occasionally problematic. However, at the producer level, the National Livestock Identification Scheme (NLIS) is mandated for the whole Australian herd, and the other digital technologies as outlined in **Table 2** are available and used routinely across the Australian beef supply chains. NLIS provides Australia with a comprehensive ability to identify individual animals via an electronic tag, trace cattle movements through to slaughter, and store this information for retrieval if needed. This information underpins our systems of disease control, biosecurity, food safety, product integrity, and export market access. Feedlots use relatively sophisticated technologies such as bunker scanning and robotics, which are becoming more common in processing facilities. Barcodes, RFIDs embedded in packaging, and temperature loggers are used throughout the logistics chain.

Innovations at the retail end include smart packaging to improve shelf life and traceability, demand forecasting systems, and a wide range of e-marketing options. E-commerce begins with live cattle sales systems such as AuctionsPlus and extends to wholesale and retail platforms. AuctionsPlus could be used by Indonesian importers to buy cattle directly from Australia; this topic warrants future study. However, it should be acknowledged that a number of issues could make it challenging to implement such systems in Australia, including ensuring animal welfare standards can be maintained and reviewing how exporting and importing procedures impact on the efficiency of the supply chain.

Box 1: Examples of digital technologies in the Australia beef supply chain noted in Table 2.

Production	
	**TSI Weight graph** sapien.com.au/products/sapien-tsi2 Sapien TSi2+ is the world's fastest livestock recording system, featuring live weight capture, chemical treatment log, full history against each animal, updated user interface, simple and streamlined operation, connect to load cells, RFID readers and drafters/handlers.
	**AuctionsPlus online auctions** auctionsplus.com.au A smart online auction system for buying and selling cattle Australia wide. It allows participations of global traders to participate.
	**Cattle identification devices** integritysystems.com.au/identification--traceability/animal-identification These digital identification devices are key to Australia's NLIS, which ensure cattle and beef traceability across the country.

Feedlot	
	**Bunk scanner** http://manabotix.com/products/bunkscanner This is world-first technology, which predicts feed remaining in feedlot bunks accurately and repeatedly – outperforming human callers in both criteria.
	**Deliverease** manabotix.com/products#agriculture Linked with the bunk scanner, deliverease is a world-first automatic delivery system retrofittable to mixer and delivery bins of commercial grade delivery vehicles. This solution provides more accurate, faster, more even coverage, and less reversing for feed deliveries than manual operation.
Processing	
	**Robotic Beef Scriber Hero** scottautomation.com/products/beef-scriber A robotic system that provides very high accuracy and worker safety, and reduced waste in cutting ribs.

Processing	
	**BladeStop 400** scottautomation.com/products/bladestop This automatic saw reduces the risk of serious injury by mechanically stopping the blade when the unit senses that the operator has come in contact.
	**Robotic Beef Boning Unit** scottautomation.com/products/beef-boning-unit It is semi-robotic equipment that assists a mechanical arm that could speed up the boning process.
	**Robotic Forequarter Sani Vac** scottautomation.com/products/forequarter-sani-vac An automatic steam vacuum that replaces manual leg, neck, and brisket steam vacuum sanitisation for meat processing.

Processing	
	**Robotic Automated Boning Room** scottautomation.com/products/automated-boning-room This robotic boning room can optimise yield, minimise waste, increase food safety and reduce operational costs. The automated boning room is a fully automated system for processing “bone-in” meat products and can process carcasses at a rate of 12 per minute.
Logistics and Cold Chains	
	**Robotic CPR (Centralised Robotic Palletising)** scottautomation.com/products/centralised-robotic-palletising This equipment addresses fluctuating production requirements, controlling input costs and increasing the quality of beef packaged products.
	**iGPS Pallets** igps.net/why-igps/track-and-trace iGPS pallet has an integrated RFID technology that bears that platform’s unique serial number or GRAI (Global Returnable Asset Identifier). This information can be captured via instantaneous RFID scanning or by reading the bar code found on each pallet.

Box 2: Examples of mobile phone apps and platforms across agrifood chains including the beef industry

Examples of Mobile Phone Apps and platforms across Agrifood chains including Beef Industry			
1	AuctionsPlus	Online saleyard	auctionsplus.com.au
2	Livestock	Pricing	livestockpricing.com.au
3	Masterbeef	Carcass assessment app	masterbeef.com.au
4	Stockbooks	Livestock management app	practicalsystems.com.au/livestock-management
5	MOOvement	Cattle tracking using GPS tags	moovement.com.au
6	Agroninja	In-paddock liveweight measurement & analysis	agroninja.com/#/hello
7	Smaxtec	Monitor cow herds using a smart rumen bolus that monitors location, internal temperature and ph levels.	play.google.com/store/apps/details?id=com.smaxtec.cow&hl=en_au
8	FEAT online	Farm economic analysis tool	featonline.com.au/home
9	Elders Red Notebook	Online resource for those in the agribusiness sector for recording farm information, conversion calculators, communicating with staff and more	eldersrural.com.au/about-us/elders-red-notebook-app
10	Agrisync	Online assisted farming	apps.apple.com/us/app/agrisync/id988482432
11	Quickbooks	Small business accounting package	quickbooks.intuit.com/au/oa/online-accounting-software-for-small-business-b
12	Landmark	For weather and other information	apps.apple.com/au/app/landmark/id514811721
13	Weatherlink	App used to track at Davis tools open weather stations	apps.apple.com/au/app/weatherlink/id1304504954
14	Weatherzone	Weather in your region updated every 3 hrs	freepps.top/apps/weather/weatherzone?gclid=cj0kcqjwkk_qbrd8arisaoteukddmm2vsu3ge7p3ypkkd5q1epnexureevt8wewsdutpj2wpyjbfx9kaaqy9ealw_wcb
15	Iauditor	A quality control app that is customisable	apps.apple.com/au/app/iauditor-digital-inspections/id499999532

Examples of Mobile Phone Apps and platforms across Agrifood chains including Beef Industry			
16	Apunga	A web-based software that can be operated off an iPhone safari app. It is not offered in the app store, but will be developed into one as the company grows	apunga.com
17	Fieldmargin	Map paddocks and allocate work to said paddocks, sharing info to workers and able to check off allocated jobs, and keeping different types of records	fieldmargin.com
18	Fertiliser calculator	App that shows various fertiliser ratios, required doses, etc	play.google.com/store/apps/details?id=in.res.ccari.fertilizercalculator&hl=en_au
19	Agdna Prime	App used for record keeping, boundary mapping, scouting observations, and activity tracking	play.google.com/store/apps/details?id=com.agdna.app.xf.agdna&hl=en_au apps.apple.com/us/app/agdna-prime/id1079378479
20	Safe Ag Systems Australia	App used to understand, review and address safety issues in agriculure	play.google.com/store/apps/details?id=com.safeagsystems.sas&hl=en_AU&gl=US
21	Whatsapp	Secure messaging	whatsapp.com
22	Livestock Pricing	Livestock pricing, saleyard reports and market news. Designed specifically for Australian farmers	apps.apple.com/au/app/livestock-pricing-australia/id1436960206
23	Detrack	Track vehicles	detrack.com
24	Multiple different banking apps	Different banking functions	getapp.com/p/sem/banking-system-software
25	Agridigital	Cloud based commodity management	agridigital.io
26	Angon	Digital beef marketing in Indonesia	play.google.com/store/apps/details?id=com.angon.app&hl=en&gl=us
27	SIMPONI-Ternak	Price information for livestock	play.google.com/store/apps/details?id=id.go.pertanian.pippeternakan&hl=en&gl=us

Research, development and the evolution of technology in the Australian cattle and beef industry

There is no doubt that Australia runs one of the most modern, sophisticated, and technologically advanced cattle and beef supply chains in the world. This has not been achieved quickly, easily, or inexpensively. The country's distance from the rest of the world, and particularly historic markets in the United Kingdom in the years after colonisation, led to the quick adoption of refrigeration (after it was developed) so that meat could be shipped back to England from the second-half of the 19th Century. Subsequently, innovation and adoption of technology has been an essential feature of the Australian beef industry. Some landmark events have seen the elimination of tuberculosis and brucellosis from Australian cattle herds in the 1970s, the introduction of a National Livestock Identification Scheme, and more recent attempts to introduce robotics and automation into the labour-intensive process of cattle slaughter and carcass breakdown.

The livestock industries in Australia were introduced to the concept of paying levies to the government to fund animal disease control even before the various states formed the Federation of the Commonwealth of Australia in 1901. Payments for each dairy or beef animal, sheep, horses and pigs were made to each State Government to fund the employment of disease inspectors and keep the serious threat of animal disease under control. Subsequently, over time, the industry agreed to extend those levies to fund research on a partnership basis between government, research providers, and industry that has resulted in the development, after a series of interim organisations and changes to government policy, of a unique corporation, Meat and Livestock Australia (MLA) that coordinates the research portfolio for the livestock industries (cattle, sheep and goats) in Australia.

In June 2018, MLA had a research portfolio of 604 research projects valued at AUD $460 million. They planned to increase expenditure by nearly AUD $300 million in 2020 to benefit the livestock industries in areas such as livestock production, animal health and welfare, genetics and genomics, environmental sustainability, grazing land management, feedlots, product innovation, human nutrition, food safety and traceability, biosecurity, and digital agriculture. Their research is supported by several other specialist entities. For example, the Australian Meat Processor Corporation and Livecorp, which focusses on increasing processing efficiency, improving workplace safety, and maximising the saleable product from each carcass, as well as supply chain development and improving animal welfare in Australian domestic and overseas markets. MLA is primarily funded by transaction levies paid on livestock sales by producers that are used to supporting marketing, research and development activities. MLA also receives matched funding from the Australian Government as well as significant funding and co-investment from other industry stakeholders. The current levy is AUD $5 per adult animal sold.

Further information about MLA is available from their website: mla.com.au

One example of the technology being developed by MLA is an automated beef boning room. It follows the successful development of automated lamb boning technology that is already in commercial use. In 2015, MLA program managers began discussions with 15 beef processing companies about the strategy. Industry feedback indicated that the time was right to progress automation in boning beef carcasses. In 2016, a private research company working with MLA successfully completed the first two beef processing modules, which involved a Dual X-ray (DEXA) enabled automated beef rib scribing solution with evolving Rapiscan and 4DDI CT systems. These are the first two of 10 modules that will comprise the automated beef boning room. This will be the only fully automated and integrated beef boning system available in the world. This technology will provide additional supply chain benefits and efficiencies to the host processor and their producer suppliers.

While the evolutionary path for research and development in the Australian beef industry has been a long and sometimes tortuous journey from humble beginnings to the sophistication of current research, there is no need for Indonesia to follow the same route. Much like the adoption of other modern technologies such as smart phones, developing countries can leap over the many intermediary stages and take up the latest technology quickly. This can also apply in agricultural research and would be facilitated through international cooperation with appropriate organisations in countries like Australia. On the other hand, research and development can probably still be carried out more cheaply in countries like Indonesia than it can be done in Australia. Indonesia probably has the scientists and engineers to match the developmental work done in Australia, but still needs to develop an appropriate governance model. Indonesia also needs to set up a source of funding like that which the government-industry-research institute partnership model from Australia provides to generate solutions to genuine industry problems.

There is much for Indonesia to learn from Australian experience about developing the appropriate institutions and funding mechanisms. These are needed to develop an effective collaborative research structure that does not depend so heavily on government funding and government institutions to do the work. Commercial organisations have a pivotal role to play in such a structure and how this can be achieved should be the subject of ongoing research led from Indonesia by a group of individuals who have the insights, experience, and opportunity to visualise how to adapt what Australia has done to drive research and commercial development of technology in the Indonesian cattle and beef industry.

4.4 Online Beef Marketing

A desktop review of the literature on on-line marketing was completed around two themes: (i) growth in e-commerce generally, both globally and in Indonesia; and (ii) online beef marketing specifically. Refer to **Appendix 4** for the detailed review, while a summary of online beef marketing in Australia is presented in **Box 3** at the end of this section.

Potential growth in e-commerce

- Globally in the pre-COVID-19 period, both e-commerce sales and beef consumption recorded increasing trends:
  - According to the Global e-Commerce 2019 report by eMarketer, global e-commerce amounted to USD $2.9 trillion representing 12.2 per cent of total retail sales in 2018, up from USD $2.4 trillion and a share of 10.4 per cent in 2017.
  - A global report on the e-commerce market for food estimated the market for food sales to be USD $138 million in 2019 (IGR 2020). This figure was projected to reach USD $498 million in 2026 with a compound annual growth rate of 20.3 per cent.
  - Global beef consumption increased by more than 40 per cent over the 20 years to 2019 to reach 70 million tonnes.
- The Indonesian e-commerce market was thriving even before the COVID-19 pandemic:
  - Indonesia emerged as ASEAN's biggest e-commerce market with total sales of over USD $20 billion in 2019.
  - Based on a report by GlobalWebIndex in 2019, around 90 per cent of internet users in Indonesia aged between 16 and 64 years old have purchased goods and/or services online.
  - In 2018, McKinsey reported that Indonesia's e-commerce market was projected to grow by eight times from USD $8 billion in 2017 to USD $65 billion by 2022. This was based on an estimated market penetration of 74 per cent of internet users in 2017 to 84 per cent of internet users in 2022, and an increase in average individual online spending from USD $260 to $620 per annum.
  - In 2016, a consumer survey by Deloitte highlighted three main advantages to online shopping: practicality, wider product choices, and promotion.
  - The 2018, a McKinsey report argued that growth in e-commerce creates significant socio-economic impact: (i) financial benefits (noting that 30% of online purchases were new consumption); (ii) job creation (supporting 26 million jobs by 2020); (iii) buyer benefits (consumers outside Java reported 11-25% savings from online buying compared with traditional retail stores, while those in Java reported a savings range of 4-14%); and (iv) social equality (up to 35% of online revenue was generated by women compared with 15% in offline retail).
- There is a wide range of e-commerce platforms and payment methods operating in Indonesia:
  - **Mobile commerce** – JP Morgan (2019) concluded that mobile commerce, or e-commerce completed on a mobile device, drives Indonesia's e-commerce growth accounting for USD $7.1 billion or more than half of all e-commerce completed transactions. This is compared to USD $5.3 billion of mobile commerce completed 'in-app' and USD $1.8 billion of mobile commerce completed on a browser.

- **Social commerce** – With 160 million Indonesians being social media users in 2020, the role of social media is key in promotional activities (e.g. through the power of influencers), and interactions between sellers and buyers. According to JP Morgan (2019), micro-enterprises selling via social media or "social commerce" are estimated to represent 40 per cent of all e-commerce sales in Indonesia. YouTube, Facebook, Instagram, and WhatsApp are the most popular social media channels in Indonesia. Meanwhile, PayPal suggests that WhatsApp and Instagram are the most popular platforms selling goods online.
- **Payment methods** – JP Morgan (2019) suggests that debit/credit cards make up 34 per cent of e-commerce payments in Indonesia, followed by bank transfers (26%), digital wallets (20%), cash (6%) and other methods (6%).
- **Digital wallets** are the fastest-growing payment method expected to grow at a compound annual rate of 47 per cent per annum to 2021 (JP Morgan, 2019). By 2021, digital wallets are expected to be used in nearly one-third of all e-commerce transactions. According to Ipsos (2020), GoPay has the biggest market share in e-wallets (60%) followed by OVO (28%), Dana (8%) and LinkAja (4%). About one-third of e-wallet payments are made for online food/beverage delivery services.

Online beef marketing

- The shifting consumer preferences towards online purchases have presented opportunities as well as challenges for beef supply chains:
  - Lessons from online beef marketing in China indicate some factors that drive customers to purchase online: convenience, having trusted suppliers/platforms, a large range of products to choose from, getting access to products that are not available at local brick and mortar stores, and getting access to more information about the product.
  - However, consumers are also concerned about the freshness of food products purchased through e-commerce markets, food fraud, and food safety.
  - From a company perspective, logistical challenges to ensure that customers receive quality products are seen as a major issue.
- In addition to understanding the evolving landscape of e-commerce markets, beef producers and retailers must also continue to consider the various factors affecting beef consumption:
  - Determinants of beef consumption can be classified as three factors: (i) marketing factors (e.g. price, availability, labelling, certification, brand); (ii) psychological factors (e.g. lifestyle values, socio-cultural effects, expectations, risk and attitudes); and sensory factors (e.g. visual appearances, in-mouth texture, flavour, and odour) (Font-i-Furnols & Guerrero, 2014).
  - The significance and the extent to which these factors influence consumer preference is an empirical matter given variations between countries and retail outlets. For example, given their inability to touch and see beef products, online customers may rely on product information, user reviews, the credibility of the company, and product photos, among other information in their buying decisions.
  - Within the Indonesian context, previous studies highlight several factors that influence consumers to consume beef including market prices, individual and household characteristics (e.g. income, education, the number of household members, health perceptions, living in urban areas, special celebrations (e.g. the fasting month of Ramadan, Eid al-Fitr, Eid Qurban), and social media promotion.

Despite the extensive literature on beef consumption and beef supply chains, as well as a growing literature on e-commerce, particularly related to the effects of COVID-19, studies looking at the use of e-commerce for beef purchases remain very limited. Existing knowledge on online beef marketing is mostly from developed economies such as Australia and the USA, as well as China, the world's global e-commerce leader.

Meanwhile, most industry reports on e-commerce in Indonesia present information at a broad category level e.g. food and beverages, making it difficult to assess the applicability of such information to beef consumers. Apart from acknowledging various e-commerce methods (e.g. social commerce, mobile apps, and web-based e-commerce), there has not been much written on how these different business models might affect beef producers and retailers' participation in the e-

commerce market as well as their use of technologies. Also important, and yet subject to little research, is how consumers rate their online shopping experience across different e-commerce platforms.

Box 3: Online beef marketing in Australia.

E-commerce landscape in Australia

The use of e-commerce in Australia is widespread. According to Statista, the total e-commerce revenue in Australia will be USD $29.7 billion in 2021. Meanwhile, the number of users is expected to reach 19.4 million in 2021 representing over three quarters of the country's population, with the average revenue per user amounting USD $1527. The food and beverages sector is among one of the strong sectors in Australia's e-commerce market with market volume projected to reach USD $4.5 billion in 2021.

Within the context of the Australian beef sector, e-commerce discourse is mostly focused on understanding how the global e-commerce boom, particularly in its main export destinations such as China, impacts Australia's export strategy. This export focus is particularly due to the relatively small size of the Australian domestic beef market absorbing about 634,000 tonnes or a quarter of its total beef and veal production (MLA, 2020a), and in contrast, a massive growth in China's e-commerce market. Alibaba, for instance, had achieved total revenue in 19 years that it had taken the United State's largest 'bricks and mortar' retailer, Walmart, 54 years to achieve (Condon, 2018b). For Australian beef producers, lessons from ongoing work to penetrate into the Chinese digital market highlight:

1. **A focus on consumption upgrade** – Previous learnings that chilled red meat from Australia had gained from mature markets such as Japan and Korea regarding 'consumption upgrades' would apply in emerging markets such as China, particularly in the areas as provenance, consistency, the quality of products, and traceability. In 2018, the MLA teamed with Alibaba to promote 'True Aussie Beef and Lamb' campaign to allow online consumers to identify high quality Australian beef and lamb (Farm Online, 2018)
2. **A stronger focus on chilled beef products** – The Chinese e-commerce market currently not only offers processed and frozen meat products, but also sees a recent expansion in the range of chilled products. This is facilitated by significant investments in cold chain storage and logistics by Chinese e-commerce giants such as Alibaba, which took a stake in Ex-Fresh, China's second largest cold chain business. To increase chain efficiency, hence allowing online consumers to access 'fresh' or chilled products, global meat processor JBS (whose Australia's division is the largest meat processing company in the country) signed a USD $1.5 billion memorandum of understanding with Alibaba Group's Win Chain in 2019 to supply 330,000 tonnes of beef imports over three years (Condon, 2018a).

Beef marketing in the Australian e-commerce market

Despite a strong focus on the export market, Australian domestic beef market remains an important marketing channel for Australian beef producers. During the COVID-19 pandemic, the domestic market remained resilient and has served as a 'safe-haven' as export volumes declined significantly. In Australia, there are at least three business models currently offering beef products through online platforms. **Table 4** presents the summary on page 44.

Paddock-to-plate model: Platforms such as Maleny Black Angus Beef (see Table 3 for main features), Our Cow, and Organic Meat Online, cater for 'ethical' consumers who are concerned about the source of their food including how the animals are being raised. They put strong emphasis on communicating to their customers about their farming practices (e.g. 100% Australian owned, GMO-free, organic certification, animal welfare standards, no antibiotics, no growth-promoting hormones, grass-fed, contribution to the local/rural community), and high quality or fresh beef products produced by their own farms and butchers. The business 'story' (that often involves a family journey), and direct communication with farmers is another important feature to engage with their customers. Each platform typically serves quite a niche local market. The time between ordering and delivery varies between platforms, and can take up to three to four weeks especially for those that sell meat in bulk (See **Table 3** as an example). Only a few of these businesses have an offline presence. Maleny Black Angus Beef has installed a freezer at a local dairy shop, while other businesses such as Our Cow and

Organic Meat Online are fully-online. An example of one of Our Cow's online products, 'Build Your Box', can be seen in **Figure 2**.

Table 3. Example of farm-to-plate beef products: Maleny Beef Angus Beef

	A Taste (Eighth Beast)	Mixed Quarter (Quarter Beast)	Half Beast	Whole Beast
Price per kg dressed weight	$16.95/kg dressed weight	$15.95/kg dressed weight	$14.95/kg dressed weight	$13.95/kg dressed weight
Approx. weight	25kg-35kg	50kg-70 kg	100kg-140kg	200kg-280kg
Approx. total price	$423.75-$593.25	$797.50-$1,116.50	$1495–$2093	$2,790-$3,906

Source: malenyblackangusbeef.com.au/buy-beef-online

Figure 2: Our Cow's Build Your Box

Our Cow's Build Your Box gives buyers flexibility to choose from a wide range of beef cuts and products as well as other meat types (e.g. chicken, pork and lamb). The products are vacuum sealed and some cuts can last up to 42 days in the fridge and 180 days in the freezer.

Source: ourcow.com.au/product/build-your-box

Online wholesale or butcher model*:* The absence of an 'agent' and their associated fees, hence value- for-money products, are typically presented as the key value proposition by online wholesalers. Customers can purchase other meat types (e.g. poultry, lamb, pork), and purchase bulk/value packs making it convenient for businesses such as restaurants, hotels, catering organisations to purchase from these online wholesalers instead of individual beef producers. Platforms such as Meatonline deliver to all states in Australia, but only serve 'trade customers' operating from a business address that is attended during delivery hours. The e-commerce growth also presents an opportunity for an existing (offline) business – whether an exporter, a wholesaler or a butcher – to improve their customer's experience. The Sydney-based Meat Man has 20 years of experience as a local butcher, and now offers online services in addition to continuing the operation of their meat shop with a 'click and collect' option for their customers. Similarly, Brisbane-based Super Butcher started as a beef exporter before opening up a number of retail outlets and offering online services. However, their services are usually confined to local customers. While most beef is sourced from Australian producers, connection with and information about local farmers supplying these platforms is not always easily visible. Some companies also offer beef products from overseas (e.g. New Zealand).

Established supermarkets expanding online presence: With the supermarket industry being one of the most fiercely competitive industries in Australia, consumers shifting online leaves no option for existing supermarkets but to embrace this transformation. Coles and Woolworths, which have had Australia's largest market shares in the industry for years, continue to expand their online presence and have introduced innovations to present unified online-offline offerings. Customers can pick their products online and collect from various outlets including drive-thru stores and refrigerated lockers located at airports (see **Figure 3**). To increase efficiency, minimise handling errors and in-store congestion, Woolworths launched its first eStore located in a 2400-square-metre facility in Melbourne in 2020. The eStore deploys micro-automation technology developed by a Boston-based eGrocery startup TakeOff, which helps the retail giant to dispatch five times the online order volumes of a standard Woolworths store (Skantzos, 2020). Despite this convenience, customers might find it difficult to pick specific beef brands especially those from a premium range, or communicate directly with farmers or producers given relatively limited beef product information available on these supermarkets' websites.

Figure 3. **Click and Collect facilities offered by Coles and Woolworths**

A drive-thru option is available at 100 Woolworths stores allowing shoppers to stay in their car while Woolworths staff bring their groceries out to their car. A minimum spend of $30 per order applies (Connolly, 2020).

Frequent flyers can pre-order a day in advance, and collect their groceries including fresh produce from smart lockers outside Melbourne Airport upon their arrival. A minimum spend of $30 per order applies (Graham, 2019).

Lessons learnt: responsible consumption and convenience

The above overview suggests that the development of online beef marketing in Australia has been centred on at least two themes, namely responsible consumption, and convenience. With regard to responsible consumption, the importance of animal welfare, food safety, and health concerns as well as supporting local communities has led to a growing number of customers wanting more transparent information regarding how beef is being produced, and how production impacts local jobs and the environment, among others. Individual beef producers or a group of local beef farmers have responded by providing a paddock-to-plate option for customers in surrounding areas. Food services, such as restaurants, catering companies and hotels might find that sourcing from those producers gives them limited product options and delivery areas. Online wholesalers therefore provide an option to access products including buy in bulk from across Australia to be delivered nation-wide. The convenience feature, however, is most apparent around innovations and services introduced at online services offered by supermarkets. The major supermarkets such as Coles and Woolworths continue to expand the click and collect omni-channel strategy to let customers decide how they select and receive their grocery order, so the distinction between offline and online shopping is becoming blurred.

Table 4. Examples of business models currently offering beef products in Australia

	Paddock-to-plate Focus: Family farm, ethical production, traceability			Online wholesale/butcher Focus: Value for money, bulk purchase, a wide range of beef products		Supermarket Focus: One stop shopping for end-customers, seamless online-offline options	
Company name	Maleny Black Angus Beef	Our Cow	Organic Meat Online	Meatonline	Super Butcher	Coles	Woolworths
Company's values/story	Family farm and business, Grass-fed, hormone-free cattle	Started as a family farm, traceability, involving 50 other farmers in the network	A network of Australian Certified Organic farms and Organic Principles farms	Wholesale meat supply, value for money products, website-based ordering	Exported beef to over 75 countries during the last 18 years – opened up retail outlets and now offer online services	Established in 1914. From 2010 launched a series of animal welfare and responsible sourcing initiatives e.g. hormone-free beef. In 2012, launched Australian First Sourcing Policy – first orders in 1999 for Sydney and Melbourne delivery; a new website in 2008	Established in 1924. Offered a limited form of online shopping in Sydney in 1992
Retail physical presence	Limited e.g. freezer at a local dairy	No	No	No	Stores across Brisbane and Gold Coast	Stores across Australia and Click&Collect facilities (e.g. Concierge, Service Desk, Temperature-controlled Lockers, Remote Collection in regional Australia)	Stores across Australia – in 2020 launched its first Australia 'eStore'
Beef suppliers/brands	Own farm (slaughtered at a local accredited abbatoir)	A network of local farmers	Cape Grim Beef, Australian Organic Meats, Kobe Cuisine (Wagyu brand from Aaco), Darling Downs Wagyu	Australian suppliers (manufacturer's names not listed on the webpage)	Australia's Bass Strait, Darling Downs Wagyu, Oakey Beef Export, Jack's Creek, Cape Grim, The Vintage Beef Company, Australian Organic Meats, Great Southern, Wallumba Beef, Black Onyx The Marbled Beef, Stanbroke Flinders Natural – also NZ's Silver Fern Beef	Australian suppliers (manufacturer's names not always listed on the webpage)	Australian suppliers (manufacturer's names not always listed on the webpage)
Quality grading, certification and product information	Grass-fed, no antibiotics, no growth-promoting hormones	Grass-fed, sustainable, ethically raised, local	Organic certification (some), grass-fed, Wagyu marbling score (some)	Meatonline (own) grading system and Halal (by request in FAQs)	Own grading (platinum, diamond, gold, silver, bronze ranges). Certified Black Angus beef, no added hormones, antibiotic free,	Information on the packaging is not always accessible on the online platform e.g. nutrition facts, ingredients,	Information on the packaging is not always accessible on the online platform e.g. nutrition facts, ingredients; Made

	Paddock-to-plate Focus: Family farm, ethical production, traceability			Online wholesale/butcher Focus: Value for money, bulk purchase, a wide range of beef products		Supermarket Focus: One stop shopping for end-customers, seamless online-offline options	
					100% traceable, 'Produced in Australia'	allergen. Made in Australia/Product Australia logo – storage instructions and preparation instructions	in Australia/Australian grown logo
Customers	Public	Public	Public	Trade customers (a business delivery required and attended during delivery hours) – products available for export markets	Public	Public	Public
Delivery	Free delivery to the Sunshine Coast, Brisbane and Gold Coast areas – 3-4 weeks	All states in Australia – 5-10 days and delivered in recyclable boxes	Shipped fresh in a vacuum-packed package (except products such as beef cheek, liver, kidney and bones) – order cutoff each Wednesday for Thursday/Friday delivery	All states in Australia; free for metropolitan customers – next day delivery (conditions apply)	Deliver throughout Brisbane, Gold Coast and Sunshine Coast; free store pickup; vacuum sealing (lasts up to 10 days in the fridge and 1-3 years in the freezer) – delivered in a polystyrene esky with ice packs	Home delivery (with fee restrictions), and Click and Collect (minimum order $50 – subject to collection time slot)	Home delivery (with fee restrictions) – pick up and direct to boot (minimum order $30)
Loyalty program	Meat Lovers rewards	The Meat Club	N/A – subscription to mailing list for updates	The Meatonline loyalty rewards program	Super Rewards	Flybuys	Everyday Rewards
Examples of beef products	A Taste (1/8), Mixed Quarter, Half Beast, Whole Beast	Build Your Box, The Teaser Box, Farmers Selection Subscription, Mega Beef Box, Mini Beef Box, Mega Beef Box	Grass-fed beef, Black Angus, Wagyu, Organic Certified; various cuts	Various beef cuts, hamburgers, beef schnitzels, sausages, etc.	Various beef cuts, Wagyu, Value packs (with other meats e.g. $50 BBQ pack, 5 meals for $50 pack, protein pack, $40 burger pack)	Various beef cuts, a range of processed products	Various beef cuts, a range of processed products
Other information available at website	FAQs, blog, reviews, Facebook	Recipes, FAQs, farmers' profiles	FAQs, Facebook and Instagram,	FAQs, meat cutting, cooking and service plan	FAQs, recipes, suppliers' details,	Recipes, sustainability programs	Recipes, customer product reviews, Sustainability Plan 2025

Note: The table summarises information publicly accessible on each company's website as at 25 January 2021. There is a possibility that the company has certifications, services, facilities (e.g. offline facilities) and information (e.g. suppliers' names) that are not mentioned on the website.

Source: Authors' compilation from various companies' website.

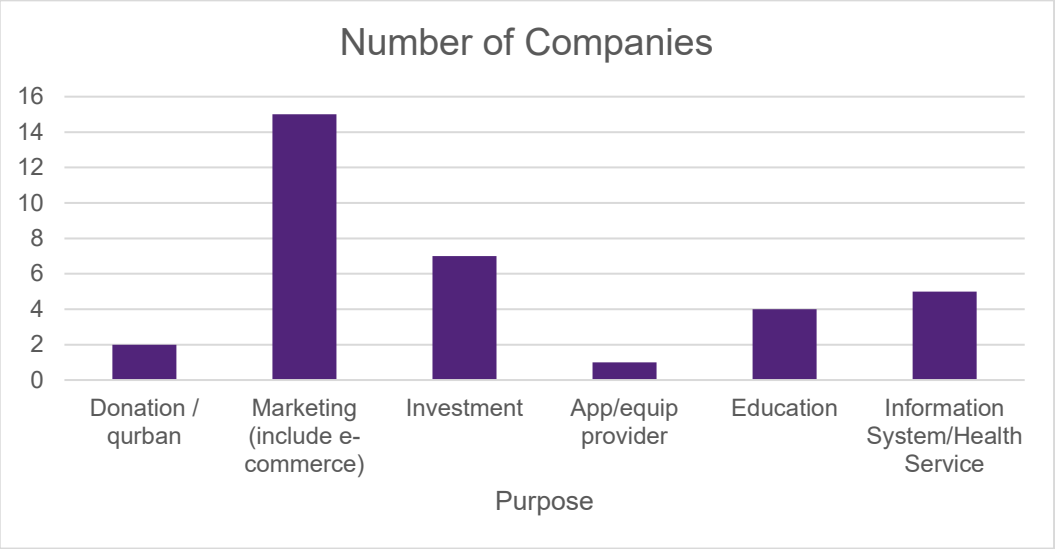
Chapter 5
Digital Technology Audit of Indonesian Beef Supply Chain

5. Digital Technology Audit of Indonesian Beef Supply Chain

The presence and use of multiple technologies that are used across global food chains for specific tasks associated with individual products and for general business needs, have been identified (Section 4, Table 1). In particular, the technologies in use in the Australian Beef Chain from producers through to export were identified (Section 4, Table 2). In this section, the results of a Digital Technology Audit of the Indonesian Beef Supply Chain analysed in two parts (Desktop Review and Audit) are presented.

A Desktop Review of the companies in Indonesia dealing in technology that might be relevant to the cattle and beef industry was undertaken to provide information that would otherwise have been obtained via face-to-face interviews. The information on who to contact was acquired from local knowledge and company webpages. There are at least 26 digital platform companies that are involved in the Indonesian beef and cattle industry. Companies involved mainly in marketing (including e-commerce companies) predominate, followed by investment companies that attract investment/crowdfunding from the community. The other uses include companies providing information systems, monitoring animal health, and software for education (see **Figure 4** for the distribution across activities). **Appendix 1** lists these companies and their specific businesses.

Figure 4: Number of companies involved in technology in the Beef Cattle industry in Indonesia



A Digital Technology Audit across the Indonesian Beef Supply Chain was undertaken in November 2020 to determine what technologies are used currently and how they are used, as well as what technologies might be used in the future. The Audit was based on an existing Technology Audit Questionnaire used for many years in the Australian Agribusiness industry (Bryceson, 2010), but was edited to include questions that enabled specific data on the Indonesian Beef industry to be collected (**Appendix 2**).

Three focus group discussions (FGDs) for producers and 11 interviews were conducted, with the distribution of interviews across the chain shown in the table below.

Producers (by FGD)	Feedlots	Importer	Processors/ Abattoirs	Oft-Taker/ Investment platforms	IT/ Hardware provider	Central Govt (Min of Agriculture)	Provincial and district government
3	3	1	2	1	1	2	2

Interviewees were chosen to get a good spread of players across the chain and/or because they were referred to the Project by other interviewees. The results of the FGDs are presented below, with a summary of technologies in the Indonesian beef chain presented in **Table 5** at the end of this section.

5.1 Results of Digital Technology Audit

Producers (Small holders)

- Three FGDs were conducted in West Sumbawa, Sumbawa, and Dompu districts of NTB. These districts were selected as they already use a cattle identification system (a traditional identification system based on iron branding, earmarking, and individual characteristics such as hide colour and horn shape). Due to the COVID-19 restrictions, there were only 15 participants in each FGD. The participants represent smallholders (1-4 cattle per household) and farmers with larger herd sizes (5-20 cattle per household).
- The FGDs started with a presentation on the use of digital technologies across the cattle value chain in Indonesia (using Ternaknesia and Dycodex Indonesia platforms (see **Appendix 1**) as examples, because most of the smallholder farmers involved in the FGD are not familiar with digital platforms used in the cattle value chain. The follow up questions were related to the readiness of the cattle producers to use digital technology especially for a cattle identification system and marketing.
- Except for some farmers in Sumbawa district who received information on a plan to trial the use of RFID ear tags from the local livestock service office, no participant had heard of the use of digital technologies in cattle production and marketing such as those promoted by Ternaknesia and Dycodex Indonesia.
- Most participants thought that digital technologies were both interesting and useful. They could see the potential use of RFID/GPS technologies to monitor or track free grazing cattle.
- Most participants are familiar with and use smart mobile phones in their daily activities. This means that most of them have the capacity to receive and send data if they are trained to use a particular program or application.
- In summary, the majority of the FGD participants were interested in the technologies demonstrated, have the connectivity capacity to participate but are still reluctant to pay for it. Farmers focussed on improving cattle productivity, so the use of digital technologies is not a priority at this stage. However, if the government invested in these technologies, the farmers would use them.

Feedlots

- The feedlots are starting to use digital technology (RFIDs) for electronic cattle identification (EID) mainly to comply with animal welfare standards imposed by the Australian exporters. They have RFID readers to record each animal's EID after arrival at the international port, at the feedlot, and at the abattoirs. All animal data are reported back to the Australian exporters and stored at the Indonesian feedlots. RFID data is used to ensure the traceability of beef. They usually sell cattle for slaughter at Exporter Supply Chain Assurance System (ESCAS) compliant abattoirs. The feedlot company employ an animal welfare officer at the abattoir to monitor the slaughter process.
- One company interviewed already uses QR codes to allow consumers to identify the beef product's history using an Android phone app.
- Monitoring feed efficiency, cattle growth and health are still conducted manually by trained officers. The main digital equipment used apart from RFIDs is a digital cattle weighing scale, but there is no transfer of data electronically into the company databases. It is still recorded manually and printed out for entering into the company's main computer.
- Purchase and sale data are managed electronically in the main computer system (using an ERP) so the company can monitor cash flow easily.
- There is a need to automate the information system, especially in relation to the traceability of beef products to meet consumer demands.
- The use of digital technology is constrained by a lack of awareness among the other supply chain partners. For example, cattle traders still use cash transactions when buying cattle from the feedlot.

Processors/ Abattoirs

- There are at least four abattoirs that supply premium quality beef cuts in Indonesia. All of them are Halal certified. Two of them were interviewed, and are referred to as Company P and Company Q.
- **Company P** is one of the largest and most modern abattoirs in Indonesia. It has the capacity to process up to 300 cattle per day, but currently processes 50 head per day. Chilled beef cuts are delivered to customers via eleven three-tonne cool box trucks. Other parts of the carcass (bone in products) are frozen in blast freezer rooms. The abattoir's customers are modern markets (80% in and around Jakarta) for secondary cuts, hotels and restaurants (premium cuts), beef wholesalers (manufacturing products like fat and bones) and industry (beef processing). The customers manually enter the data from the abattoir into their inventory.
  - They have a large chilling room (90 tonnes capacity), and large storage capacity (>30 horsepower (HP) cold storage).
  - They also market their beef online by the name of WMeat (wmeat.id) and collaborate with e-commerce companies like Tokopedia and Shopee. Company P also collaborates with e-commerce to market the beef (frozen).
  - They plan to fully integrate the data in the abattoir in the next three years. They are looking to reach ISO 22000 standard by the end of this year.
- **Company Q** is also one of the best abattoirs in Indonesia. It has the capacity to slaughter 300 cattle per day, but only has the capacity to debone 150 cattle per day. Company Q sells whole carcasses to butchers. They have a mix of cold chain transportation ranging from small trucks to containers as they serve almost all the major cities in Indonesia. The transportation system is equipped with GPS that records the vehicle's position, room temperature, and speed. Their customers are modern markets, hotels and restaurants, food industries, retail stores, and wet markets. This company also collaborates with an e-commerce company to market frozen beef.
  - It has achieved ISO 9001 accreditation (the international standard for quality management).
  - Both companies interviewed are partly digitalised. They use automated cattle restraining and pneumatic stunning, and carcasses are lifted using hydraulic hoists. However, slaughter and skin removal are still carried out manually due to Halal requirements. Their employees are skilled, trained and certified so they can butcher standard primal cuts.
  - Cattle slaughtered are identified by RFID (recording data such as country/region of origin, weight, etc.), and the primal cuts produced are identified using barcodes. For traceability, both companies record their data mostly for internal use. All data are entered manually into their ERP system. At slaughter, cattle data (RFID) are recorded and after deboning, the primal cuts of beef are identified using barcodes. The information printed on the packaging for consumers include item name (cuts), slaughter date and packing date. Customers can enter these data points into their own ERPs manually. If there is a complaint from a customer, the barcode will be used to trace back to individual animals to ascertain the provenance of the problem.
  - Both companies have their own applications to process and store data. They both have IT personnel capable of using the applications and are always ready to participate if there is capacity building in IT management available. Both companies also do regular training for their staff.

Offtakers / Investment platforms

- Offtakers usually have the capacity to aggregate livestock products and store them as frozen foods in the cold chain.
- One of the most significant uses of digital technology in this sector of the Indonesian Beef Supply chain is for attracting investment (crowdfunding). Ternaknesia (ternaknesia.com) for example has gained a total investment of IDR $40 billion so far due to their ability to demonstrate the profitability of their farm operations and ensure that the investors can receive regular updates on the business' performance.
- Currently, the company collaborates with the community leaders to collect data and supply this data to the company to minimise costs.

- For B2B purpose the company has a cold chain system with a large capacity (300 tonnes), while for B2C (business to consumer) trade they have a much smaller cold chain with a capacity of one to two tonnes.
- There is an interest in improving the digital platform from its current use for connecting producers with consumers. In the future, they may use an Internet of Things (IoT)-based automated system that could integrate the whole supply chain. These improvements may include IoT based data for farm production, the development of IT based logistics systems for abattoirs using GPS, and temperature sensors as well as an online auction system to minimise costs.
- Offtakers also use omni-channel marketing to address the needs of offline consumers.

IT / hardware provider

- One company interviewed (Smarternak by Dycodex Indonesia dycodex.com/smarternak) has an IT system (a wearable device for livestock) that can be used to monitor animal movements, count animals, provide virtual fencing and record ambient temperature, animal health and feeding behaviour. All data are integrated into the cloud for storage and analysed for use in a rich web-based smart dashboard and Android app. The whole system can monitor animal performance to minimise potential losses.
- The hardware is all made in Indonesia and designed by Indonesian experts. Development started in 2018 and the hardware has been available off the shelf for more than one year.
- It is hoped that the IT system will be able to monitor individual animal feed efficiency based on feeding behaviour. However, the system still needs to be upgraded to convert the individual animal's feeding frequency into daily feed intake and calibrate the results.
- The IT solution hardware is starting to be accepted by users (in the private sector and government). More than 100 users have started to use the wearable device. The government (MoA) has trialled the hardware on a government farm to monitor grazing cattle with good results.
- The company's main marketing targets are large companies (feedlots) and the government. They do not envisage that smallholder producers will see the advantage of using their technology as yet. The government may develop a system to enable the use of the hardware for cattle identification and to monitor cattle health in the Indonesian domestic cattle industry. However, adoption of this system remains to be seen and is very dependent on the government's decision to invest or not.
- This company has the capacity to produce tailor-made hardware required by a customer. It can produce a device to monitor feed intake of individual animals to generate a set of data that can be linked with the daily live weight gain of individual cattle, and monitor if an animal has sufficient feed intake or not. This device can be useful in a decision-making context to determine what adjustment should be made for example on diet formulation or for animals that eat less than requirement. The current wearable device can monitor feeding activities, but calibration is needed to convert eating frequency into kilograms of feed eaten per unit time.

The Central Government (Ministry of Agriculture)

- **Peraturan Menteri Pertanian (MoA decree)** No. 16/2010 is a policy that regulates the use of cattle identification systems for large ruminants in Indonesia. It states that all large ruminants should be identified using a) ear tag or microchip, and/or b) Livestock Card (Kartu Ternak) and Farmers Card (Kartu Peternak).
- However, only a few districts in Indonesia have adopted the cattle identification system. None of them use microchips. There were several trials by the MoA to apply the RFID system in cattle, but it is not generally adopted. It was mentioned in the interview with MoA staff that farmers are not very interested in using the RFIDs as there is no price incentive (no difference in the price of cattle with or without an RFID).
- Livestock Cards and Farmer Cards are provided to farmers by the Agriculture Department in each district. A Livestock Card should be available for every cattle transfer activity (e.g. given to a new owner, or when shipped to a slaughterhouse).
- A Livestock Card is meant to be available for every activity or service related to the management of animal health and it should also be available whenever there is an inspection at the livestock

market, check points, quarantine, and abattoirs. ***Ear tags are mandatory if livestock are shipped to different islands***.

- A Livestock Card and the Farmer Card should be filled in by a specifically appointed officer. For smallholders, the costs of cattle identification (ear tag/microchip) and the Farmer Card are paid by the district government, but farmers with more than 21 head of cattle pay their own costs.
- The government (MoA) has undertaken several trials on the use of RFID-based identification systems, but this is not yet implemented in practice. The constraints include lack of willingness by farmers to pay for the devices as they have not seen any real benefits e.g. an increase in cattle price, with the application of RFIDs.
- **Peraturan Menteri Pertanian** No. 45/2019 is another MoA decree related to the use of technology. It is outlined in this decree that business permits are managed in an integrated electronic system called Online Single Submission (OSS).
- **Government Online Digital Platforms:** There are five digital platforms developed by the government that are relevant to livestock producers:
    1. iSIKHNAS (an information system for animal health and production)
    2. Smart Feed (information on feed composition and feed formulation – specially developed for poultry)
    3. SIMPONI Ternak (information system that provides price information on livestock and livestock products)
    4. SIUPin (information system for livestock product marketing)
    5. DILAN KESMAVET (information system for community feedback on veterinary community health services).
- The first three of these platforms have both a website and android based applications while the last two are web based only. All platforms are being developed to improve adoption rates and their effectiveness. Further details on iSIKHNAS and SIUPin are provided below:
    - **ISIKHNAS (wiki.isikhnas.com)** is the most widely used government information system across the whole country. It is an integrated real time information system used for animal health and production services. It is used to input production and health data for the local authorities for their immediate response.
    - *Animal data* inputs including health diagnostics, disease surveillance, and the outcome of animal health treatments.
    - *Production data* includes data about the herd, Artificial Intelligence (AI) services, vaccination and slaughter. There is a structured training program to ensure operators can operate this information system.
    - **iSIKHNAS** was developed in a collaboration between the Ministry of Agriculture of the Republic of Indonesia and the Australian Department of Agriculture through the Australia-Indonesia Partnership for Emerging Infectious Diseases (AIP-EID). Through iSIKHNAS, the government field staff record information from the farmers and can take immediate decisions on each case and record the outcomes of actions.
    - **SIUPin** is a platform for all livestock companies to promote and sell their products and to establish partnerships between them. All participants are encouraged to update their data on this platform so consumers can easily access it.
    - Feed ingredients such as maize can be accessed through the e-commerce platforms such as Tokopedia, Bukalapak, etc.
    - The MoA also collaborates with software developers. The development of the ISIKHNAS is an example of such a collaboration.

Local Governments

- One interview was conducted with the provincial NTB (West Nusa Tenggara) Livestock Office. They reported that not all districts in Indonesia have applied the cattle identification system despite the mandate implied by the MoA decree No. 16/2010. In NTB for example, only in Sumbawa Island is cattle identification required and none of the districts in Lombok have adopted

the cattle identification system. The identification system is very traditional, based on physical characteristics of the cattle that are entered into a card. No ear tag or modern identification system is used.

- NTB province is among the most active users of MoA information systems (ISIKHNAS and SIUPin).
- An interview was also conducted with one district of NTB (Sumbawa), which has just developed an application called siJINAK (isijinak.sumbawakab.go.id), an information system to track real time cattle population, cattle exports, slaughter, etc. The identification system will be based on RFID technology, which has now been trialled with 300 cattle using only one reader. Next year they plan to purchase 14 readers and 1400 RFID ear tags. The underlying database for this development is now in the process of being finalised. In the long term, siJINAK will be used as the basis for a traceability system for beef produced in this district. This innovation is a part of the 100 Smart City innovation competition in Indonesia, and one of only two innovations related to livestock.

Table 5: Summary of Technologies in the Indonesian Beef Chain

Production	Feedlot	Importer	Processing	Logistics	Cold Chain	Retail
Information system for animal health and production (e.g. http://wiki.isikhnas.com) Wearable device to monitor cattle activities (on trial) (https://dycodex.com/smarternak/) Investment platform: (https://bantuternak.com/, https://jualternak.com/, https://ternaknesia.com/)	RFID/GPS ear tag (For cattle identification. See **Box 4** for examples of Animal Electronic Identification EAR TAGS currently available	Barcode on packages from the exporters (but cannot be tracked back for cattle origin)	Barcode/ RFID embedded in packaging (*efficiencies, traceability, value-add*)	RFID/GPS	RFID/GPS	Smart Packaging (*traceability, shelf life extension*) Cattle price information system (e.g. SIMPONI-Ternak https://simponiternak.pertanian.go.id/.com) Cattle product information system (http://siupin.pertanian.go.id/) Marketplace Online marketing (Shopee, Tokopedia, Jd.id, Blibli.com, Bukalapak, Olx, GrabFood, GoFood)
Webpages (e.g. https://kandang.in/)	Webpages (e.g. https://www.kasafeedlot.com/)	Webpages (e.g. https://www.supplierjualdaging.web.id/)	Webpages (e.g. https://cianjurartamakmur.co.id/)	Webpages (e.g. https://www.ali.web.id/web2/)	Webpages (e.g. https://www.kibif.com/what-we-do/abattoir)	Webpages (e.g. https://www.tokopedia.com/)

*See **Appendix 1** for list of webpages of these companies.*

Box 4: Examples Animal Electronic Identification EAR TAGS currently available

Examples Animal Electronic Identification Ear Tags currently available

NLIS RFID ear tags: AllFLex
4tags.com.au/shop/allflex-nlis-cattle-tag/

- AllFlex RFID cattle tags – tag of choice used by almost all large pastoral companies in Australia as well as throughout the supply chain. Available in white (Breeder) or orange (Post Breeder).
- Can only be read with a reader stick or monitor.

GPS ear tags – mOOvement
moovement.com.au/gps-ear-tags

- The GPS Ear Tag allows you to track and trace your cattle over long distances, even in remote areas without mobile coverage.
- Ear tags are the size of a standard management tag and animals can be tagged using a normal applicator. Placed on the back of ear to optimise functionality. Use of solar power and transmission capabilities over LoRaWAN.
- The reusable GPS ear tag is powered using a battery and integrated solar panels.

Ceres ear tag – CSIRO
csiro.au/en/Research/AF/Areas/Livestock/Ceres-Tag

- Ceres Tag – direct to satellite livestock information platform with proprietary smart ear tag for the supply chain network for biosecurity and provenance.
- The smart ear tag delivers GPS location, health and welfare monitoring and theft detection.
- See PWC – Ceres Ear Tag Report 2020 in References.

5.2 Conclusions

Overall, the above results from the digital technology audit suggest that the traceability system in the Indonesian beef supply chain is not currently considered as a priority. There is no evidence of a strong push from consumers to track the source and history of the beef they purchase. However, learning from the multi-year experience in the Australian beef supply chain to ensure food safety, and quality assurance, the Indonesian beef supply chain should still consider development of the traceability system as critical. This is due to the need to assure Halal compliance, which is of the utmost importance for Indonesian Muslim customers, and that the marketed beef is not contaminated with other types of meat or unlawful/unwanted products such as pesticide residue.

To this end, some initiatives should be considered to form a basis for further development. The Indonesian government has initiated a program to develop a local premium beef product for export or import substitution. This requires a traceability system to ensure Halal attributes of the beef and to avoid adulteration of lower quality beef or non-beef products. At least one Indonesian company has already implemented this traceability system and has increased their sales as a result. This indicates that the Indonesian cattle and beef supply chain might have the capacity to develop a traceability system using digital technologies available in Indonesia. Additionally, multiple initiatives currently being developed by the Indonesian government including information systems for animal health and production (iSIKHNAS) and siJINAK might serve as a basis for the desired fit-for-purpose and user-friendly data management system. The challenge is to scale-up such a development to increase the availability to and uptake by broader industry players, including smallholders.

Furthermore, the audit found that connectivity to allow some of these functions to operate is still an issue in rural areas. This puts smallholder farmers at a disadvantage in adopting and using technology on a regular basis. In fact, smallholder farmers use very little digital technology on farms to manage production. In small feedlots, the use of digital technology in the production process is limited to the use of digital weighing scales but these are not yet integrated into any electronic data management system together with the data generated from other devices such as RFID tags.These are used in Australia to address traceability and animal welfare requirements with data being transferred into company-wide data systems or passed on as purchase/sale data. In the large feedlots in Indonesia, there is greater adoption of technologies including RFIDs for cattle identification and traceability, ERP systems and the government information management systems. Meanwhile, large Indonesian processors have the facility to read RFID tags when cattle come in from a large feedlot, but otherwise they deal with cattle management manually and use barcode technology thereafter for product identification.

In brief, the digital technology audit suggests variations in the adoption rates of digital technologies exist across cattle and beef chain segments, and across regions in Indonesia. Despite some development of traceability systems in several districts, more effort is required to improve the accessibility, availability, effectiveness and adoption rates of various digital platforms and technologies, and develop partnerships between government, industry, producers, and other stakeholders.

Chapter 6
Beef Consumer Demand Analysis: An E-commerce Focus

6. Beef Consumer Demand Analysis: An E-commerce Focus

6.1 Approach

This part of the Project was an investigation into key issues regarding online beef marketing in Indonesia by adopting a three-staged approach. Prior to presenting results from the e-commerce and consumer survey, some additional literature was reviewed to update the growing level of information on the impacts of COVID-19 on e-commerce markets, as shown in Section 6.2.1.

The e-commerce survey was designed to highlight business and consumer perspectives as shown in the following schematic:

Business perspectives	Consumer perspectives	Synthesis
•E-commerce business models •E-commerce features •Online beef marketing •Perception of market trends, driving factors and regulatory frameworks •The use of technology	•Beef consumption and shopping behaviours •The use of e-commerce •Online beef purchases •Preference towards e-commerce features	•Gap in online availability of beef products •Gap in e-commerce features •Gap in e-commerce product information •E-commerce responses to issues facing consumers •Identification of opportunities

Given the small sample size, findings from this activity should not viewed as representative of consumer behaviour in Indonesia. However, various measures were adopted to ensure the usefulness of the results from this survey, including purposive sampling to capture e-commerce companies with different business models.

The CEO/owners or senior representatives of six companies were interviewed. They were selected to represent various business models with company sizes varying from less than 20 to over 1000 employees. All companies' headquarters were in Greater Jakarta region (*Jabodetabek*). Each interview was conducted in Bahasa, and on average took about 1.5 hours to complete. Due to COVID-19 restrictions, all interviews were held via Zoom. Some characteristics of the companies that were surveyed are presented in **Table 6**.

Table 6: Company descriptions

	E-commerce platform	Product varieties			Number of employees
		Australian and/or local beef	Other food and agricultural products	Non-food and agricultural products	
BEEF	Company A (butchery providing online and offline services)	Yes	Yes	No	>100
	Company B (butchery providing online services)	Yes	Yes	No	<20
	Company C (beef processor providing online services)	Yes	Yes	No	>100
GENERAL	Company D (supermarket providing online services)	Yes	Yes	Yes	>100
	Company E (Agrifood e-commerce platform with company-owned distribution channel)	Yes	Yes	No	<20
	Company F (digital marketplace)	Yes	Yes	Yes	>100

Notes: Companies may perform other 'tasks' in the supply chains such as importing cattle or beef and running a feedlot in addition to servicing end-consumers and food services.

Respondents in the consumer survey were selected from five districts in the *Jabodetabek* region, namely East Jakarta, West Jakarta, South Jakarta, North Bogor, and West Bogor. Within each district, six respondents were selected using systematic sampling with an interval of three i.e. after every successful interview; two houses were skipped before the next house was approached subject to quotas. Quota sampling was used to capture consumers from different backgrounds considering three factors: (i) Location i.e. across different Greater Jakarta regions; (ii) a proxy for household income; and (iii) Experience of online shopping. To ensure adequate representation across household income classes and different levels of experience of online shopping, enumerators were asked to assess the physical features of the targeted household's residence and meet the set quotas. Two other screening questions were also asked to ensure that all respondents were aged 18 years or over, and were the person who did most of the food shopping for the household. A breakdown of the respondents is summarised in **Table 7**.

Table 7: Quotas in the consumer survey

Income class (proxied)^	Experience of online beef shopping		
	No experience	Experience of buying beef over social media e.g. WhatsApp, Facebook, Instagram	Experience of purchasing beef using food delivery services (e.g. GRAB, GoFood, GoShop), online marketplaces or supermarket/ butchery with online services
Lower income class	5 respondents (1 from each district)		N.A.
Middle upper income class	5 respondents (1 from each district)	5 respondents (1 from each district)	15 respondents (3 from each district)

Note: ^ To 'screen' prospective respondents' by income class from outside, enumerators classified respondents as 'middle-upper' if at least two of the following four aspects were met: (i) at least one car manufactured after 2010 was parked in front of the property or in the garage, (ii) land size was approximately above 150 square meters, (iii) good quality house structure including permanent roof and walls, and (iv) good quality fencing.

Due to COVID-19 restrictions, five qualified enumerators from the five districts were recruited. This strategy was to minimise cross-district movements. Intensive virtual training was organised to ensure the enumerators' understood the COVID-19 health protocols, sampling, and recording survey data using the world's leading secure web application for building and managing online surveys and databases 'RedCap'. Although the questionnaires could be accessed online and enumerators recorded the interview results using RedCap, respondents were given flexibility to choose the interview method: via Zoom (57%), face-to-face interviews (37%) and WhatsApp (6%). This approach (as opposed to a full-online survey) was to ensure an adequate representation of the above criteria including by interviewing those who have limited access to internet, and a high response rate.[1]

6.2 Business Perspectives

6.2.1 COVID-19 contexts

- The COVID-19 pandemic has put e-commerce under the spotlight. Its impact on consumer spending via e-commerce, however, has not been uniform between countries, or across product categories.
  - Prior to the COVID-19 pandemic, it was forecast that 2019 and 2020 would see a decline in the global e-commerce growth rate amid economic uncertainty and slower growth in consumer spending around the world (eMarketer 2019). In 2019, global e-commerce was expected to grow by 20.7 per cent before declining to 19.0 per cent in 2020 and declining even further to 18.1 per cent in 2021.
  - The eMarketer Global E-commerce 2020 Report issued in May 2020 estimated a decelerated growth of the global e-commerce market to USD $3.9 trillion, representing a 16.5 per cent growth rate, down from 19.0 per cent as previously estimated.
  - Despite COVID-19, Statista projected USD $236.5 billion global market volume for the food and beverages sector in 2020 with the number of users expected to reach nearly two billion by 2025. Increased investments by traditional retailers in setting up their own online channels, and the readiness of major e-commerce companies to disrupt new markets, have been the main driver of this growth.
- The COVID-19 pandemic has further accelerated the offline-to-online transition among Indonesian consumers.

[1] The response rate for this consumer survey was 48% which is calculated by dividing the number of completed interviews divided by the number of all persons being approached; and 81% if it is based on the number of completed interviews divided by the number of all respondents meeting the quota criteria. This implies a low rate of refusals (13%).

- In March 2020, the Indonesian Central Bank (BI) reported a significant increase in total e-commerce transactions by 18.1 per cent to 98.3 million transactions, and in the total transaction value by 9.9 per cent to USD $1.4 billion.
- A survey by RedSeer (2020) suggests that the COVID-19 pandemic is expected to bring about 12 million new e-commerce users in Indonesia. Under normal circumstances that growth could have taken 1.5-2 years. Forty per cent of those new customers are willing to continue to use e-commerce platforms even when the pandemic is over.
- A survey by McKinsey (2020) reports a clear shift from offline to online channels in nearly all consumer product categories. Based on a survey by SIRCLO (2020), the food and beverages category show an increased share of product mix from 17 per cent in the pre-COVID period to 20 per cent.

- COVID-19 has provided the incentive for e-commerce companies to focus on the B2C segment.
  - The pandemic has forced producers and retailers to take e-commerce more seriously than ever before particularly regarding the expansion of the B2C segment. The B2C growth has been partly driven by mobility restrictions related to COVID-19, with the consequent slowing down of businesses such as food services e.g. restaurants and catering.
  - E-commerce platforms such as Tokopedia, Shoppee, Bukalapak, Lazada and Blibli draw the most consumer traffic (iPrice 2020), as outlined in **Table 8**.

Table 8: Major e-commerce platforms in Indonesia

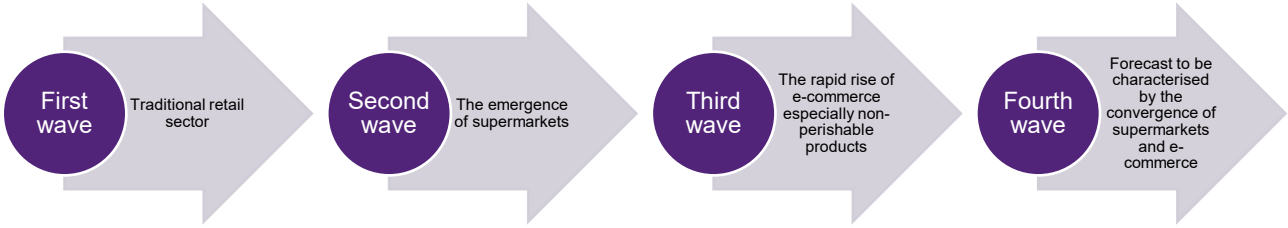
E-commerce platform	Q3 2019		Q3 2020	
	Number of employees	Monthly web visits	Number of employees	Monthly web visits
Tokopedia	3431	65,953,400	4300	84,997,100
Shopee	3225	55,964,700	7000	96,532,300
Bukalapak	2651	42,874,100	2300	31,409,200
Lazada	2372	27,995,900	3500	22,674,799
Blibli	1559	21,395,600	1900	18,695,000

Source: iPrice 2020, accessed on 20 November 2020, from: iprice.co.id/insights/mapofecommerce/en

6.2.2 Evolving business models

Indonesia is a fitting case study of the urban food retail evolution. Historically, looking at the growth of e-commerce in the USA, Western Europe, then more recently in developing economies in Asia, Latin America and Africa, the urban food retail evolution is perceived to come in four waves as outlined in **Figure 5**: (1) traditional retail sector, (2) the emergence of supermarkets, (3) the rapid rise of e-commerce especially non-perishable products, and (4) the convergence of supermarkets and e-commerce (Lu & Reardon, 2018).

Figure 5: The evolution of urban food retail



Source: Adapted from Lu and Reardon (2018)

The first three waves are particularly relevant to the Indonesian context with many Indonesians having their first encounter with e-commerce shopping to purchase non-perishable products. Results from the consumer survey (shown in the next section) suggests that on average it takes 2.5 years for consumers to get from their first online shopping experience to online purchases of perishable products such as beef.

Looking at the fourth wave i.e. the convergence of supermarkets and e-commerce, we find that companies established before the 2000s have added online services to their business portfolio, responding to demand from customers. This is typically followed by an increased share of B2C segments in their business revenue as witnessed during the COVID-19 pandemic. The diversity of the business models of the companies interviewed is summarised in **Table 9**. The interviews with e-commerce companies further suggest some unique features:

- **The role of new players**: The growth of online beef sales in Indonesia is not necessarily driven by existing food retailers such as supermarkets and butcheries given the emergence of new players in the digital market.
- **Offline-online convergence**: The convergence of online and offline services takes many forms beyond the conventional supermarket-website concept. Among newer companies, the idea of having a physical outlet is no longer seen as necessity for a food retailer. However, it is widely acknowledged that many Indonesian communities remain under-served by digital services, hence the importance to bridge this gap with offline customers. For instance, Company E, which started as an e-commerce platform, recruited 'agents' and provided additional support for small businesses to serve customers with limited digital access and digital literacy with the convenience of online buying e.g. home delivery, competitive prices, and a simple ordering process via WhatsApp to agents.

Table 9: Diversity of company business models

	BEEF		GENERAL			
	Company A	Company B	Company C	Company D	Company E	Company F
	Butchery providing online and offline services	Butchery providing online services	Beef processor providing online services	Supermarket providing online services	Agrifood e-commerce platform with company-owned distribution channel	Digital marketplace
Year of establishment	1980s	2000s	1980s	1990s	2000s	2000s
Offering online services since the company's establishment	No (online services launched in 2020)	Yes	No (online services launched in 2017)	No (online services launched in 2017)	Yes	Yes
Online presence	Online sales through other companies' marketplaces	Online sales through own website, other companies' marketplaces, WhatsApp ordering	Online sales through other companies' marketplaces	Online sales through own website	Online sales through own e-commerce platform	Online sales through own e-commerce platform
Retail physical presence	Yes (multiple outlets)	Limited services to residents in the area	Through supermarkets/ retail shops	Yes (multiple outlets)	No (but 'agents' recruited to serve offline customers)	No

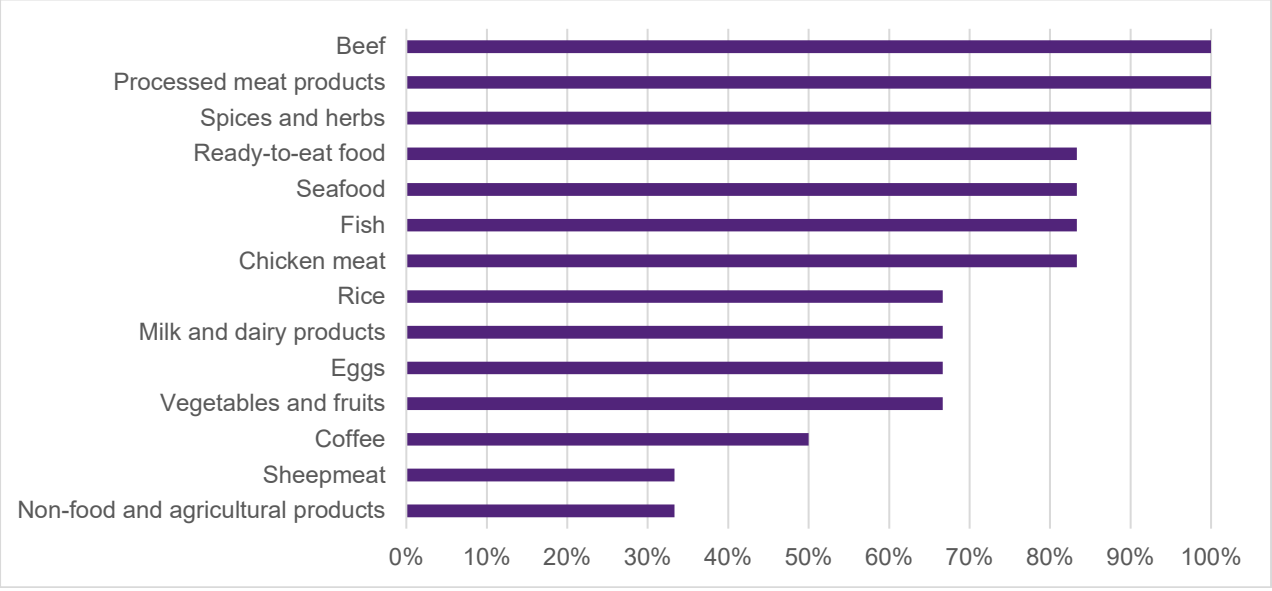
Source: Authors' compilation using survey data

In terms of the impacts of COVID-19 on their business models, the interviews suggested **company agility** as a key success factor. The global pandemic is perceived as a 'super disruptor' leaving companies no option but to adapt. 'Leaner' (i.e. small company size or number of employees) and newer companies with digital sales being their core business position (e.g. Company E) saw 'pivoting' as a priority more than established companies that started their business in the offline space. The range of pivoting strategies varies from changing their customer segment, or distribution channels to updating the digital platform interface to expand their customer base and company revenues. Meanwhile, beef-focused companies (e.g. Company A and Company C) with years of experience in the beef market used their online presence to maintain their company's market share.

Business transformations undertaken by the surveyed companies in response to the COVID-19 pandemic include:

- **Shifting from B2B to B2C**: This is a result of the slowing down of the food services sector, and, in contrast, increased consumer preference towards cooking at home particularly during the first half of 2020. Following the partial lifting up of mobility restrictions in the second half of the year, companies reported the gradual recovery of B2B sales.
- **Offline to online (and vice versa)**: For instance, Company A, which initially operated in production and processing segments and mainly served food services outlets (hotels, restaurants and catering), recently shifted to the digital market to cater to the B2C segment because of COVID-19. Given the time pressure to shift to online markets, the company tapped into existing marketplace platforms such as Tokopedia. In contrast, as previously mentioned, Company E decided to strengthen its offline presence by recruiting agents to serve offline customers including middle-low income customers who were not previously perceived as typical e-commerce buyers.
- **Improving product varieties:** Product diversification clearly characterises the approach chosen by all the companies interviewed. In addition to both fresh/chilled/frozen beef and processed beef products such as sausages and bakso (meatballs), the interviewed companies also sell other meat products (e.g. seafood, fish and chicken meat), ready-to-eat food, and spices and herbs as seen in **Figure 6**. Since the outbreak of COVID-19, efforts to diversify offerings have become even more evident in response to demand from stay-at-home customers for 'one-stop shop' services.

Figure 6: Product diversification



Source: Authors' compilation using survey data (n=6 companies) Question: "Which of the following products are marketed at your platform?"

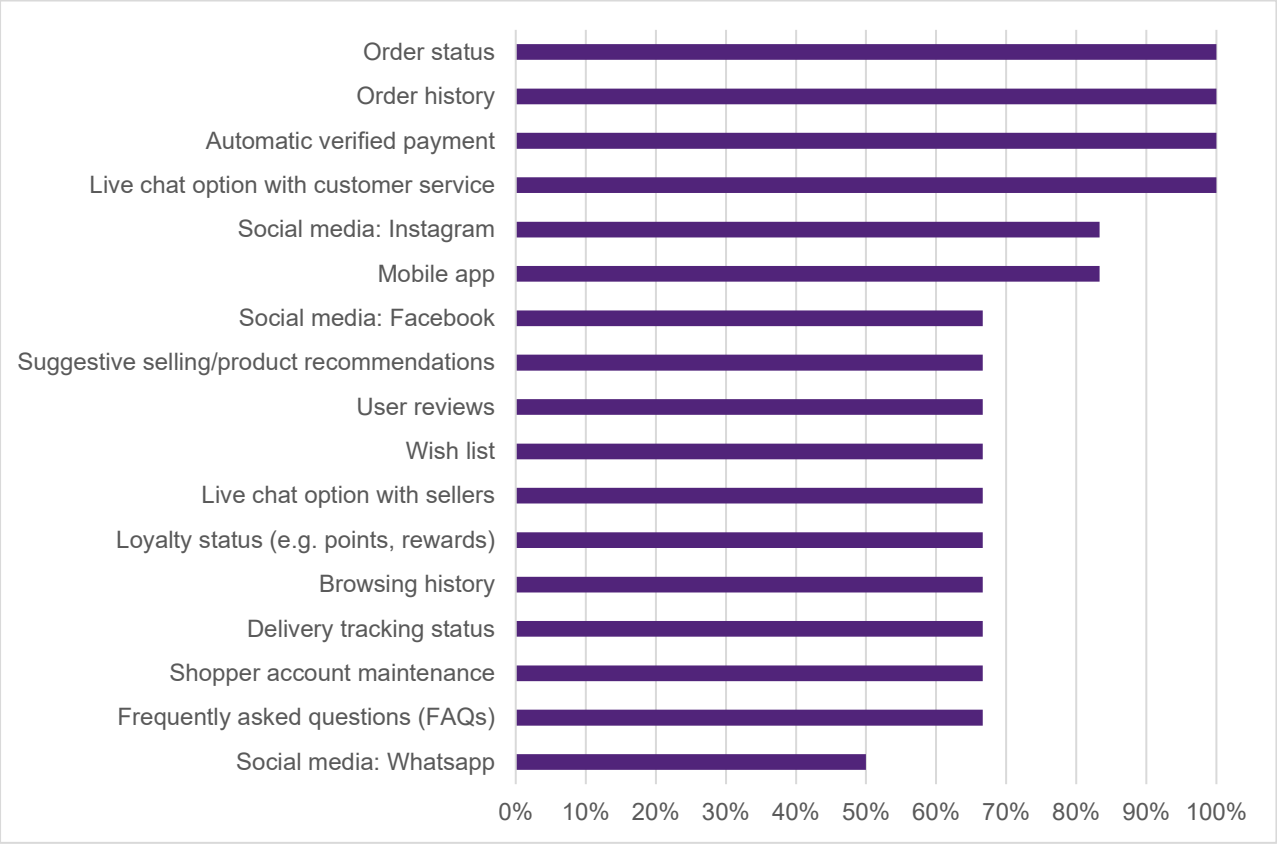
6.2.3 E-commerce features

The attractiveness of e-commerce arises from improved accessibility both in terms of obtaining physical products, a 'personalised' shopping experience, as well as getting information about the availability of goods and services (Borenstein & Saloner, 2001). Shoppers often assess the information and functionality of an e-commerce platform even before assessing product-level information such as price, delivery charge and time. That highlights the importance of various e-commerce features, both at the platform level and product level.

At the platform level, observations on the e-commerce platforms by the six companies being surveyed are summarised in **Figure 7.** These observations suggest the following:

- Companies selling their products through a major **digital marketplace** benefit from wide-ranging features that they can access as 'a merchant'.
- Features such as order status, order history, automatic verified payment, and live chat option with customer services can be classified as **basic features**.
- Features such as product recommendations, browsing history, wish list, and shopper account maintenance (e.g. profile, preferred payment methods) are seen as **secondary features**, the adoption of which should be considered to provide a more personalised shopping experience; Likewise, there is room for improvement to increase the adoption of features such as the live chat option with sellers, FAQs, and user reviews to enhance customers' access to information.
- The use of social media particularly Instagram to enhance the companies' brand reputation is also evident.

Figure 7: e-Commerce Features



Source: Authors' observations on the six surveyed companies' e-commerce platforms; The features for Companies A, B and C are based on those that are accessible at a major digital marketplace through which they are selling their products.

To monitor customer satisfaction and sales, companies adopt various approaches, which are influenced by factors such as the size of customer base and e-commerce capabilities:

- Communication via WhatsApp to gain feedback from customers

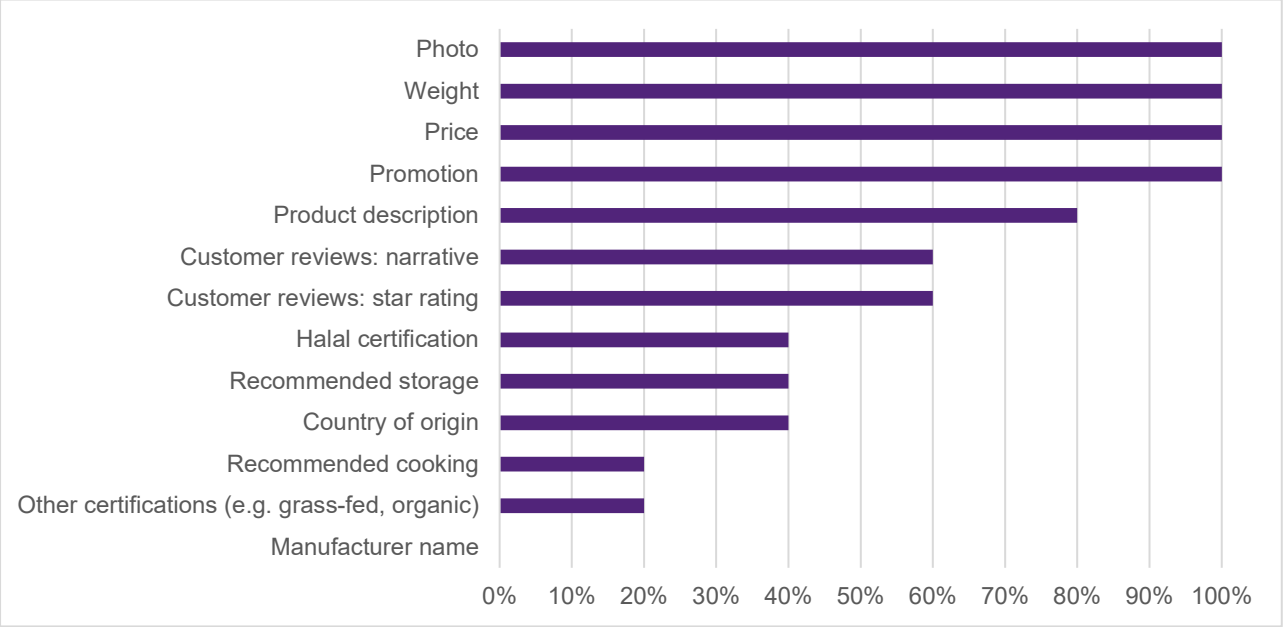
- Dedicated staff to monitor ‘user reviews’ submitted to the digital platform and on social media
- A customer survey
- Analysis of online customer data (e.g. basic profile data, purchase history)
- The use of business management software e.g. FINA
- Using services provided by major marketplaces, which include a regular and comprehensive report of trends in sales and customer reviews
- Integration between the company’s and the digital marketplaces’ systems, the API (application programming interface).

At the product level, full description of the products being sold is crucial for food products. Previous studies highlight that in addition to security and logistics issues, customers’ inability to physically touch, smell and examine the products as well as the lack of information about the date of packing and expiry date are some of the key issues facing e-commerce customers (Hobbs, Boyd & Kerr 2003; IGR 2020).

Observations on product information available at the online platforms of Companies A to E is summarised in **Figure 8**. This information suggests the following:

- Information such as photo, weight, price and promotion can be classified as **basic information**
- Companies also provide **additional information** such as more detailed product descriptions and customer reviews (star rating and narrative) to provide further confidence to online customers about their product quality
- One way to **upgrade product information** available from the online platforms is to add information such as recommended storage and cooking methods and country of origin
- While all imported beef coming into Indonesia presumably has met **Halal certification** requirements as set by the Indonesian government, information about Halal certification is not necessarily visible to online customers
- The lack of information about non-compulsory **certifications** such as grass-fed and organic accessible by online customers implies the still-limited demand from e-commerce markets for certified beef. One company that has such information focuses on a relatively niche market serving high-end restaurants and hotels and middle-upper income households.

Figure 8: Product Information



Source: Authors' observations on product information accessible by beef customers at the five surveyed companies' e-commerce platforms. Company F (digital marketplace) is excluded given high variations in the extent of product information between its sellers.

6.2.4 Online beef marketing

Looking at the supply chains in which the six surveyed companies are involved, the following observations emerge:

- **Imported beef**: There is evidence of imported beef penetrating into the Indonesian e-commerce markets. Similar to competition in the offline markets, Australian beef faces competition from other major producing countries such as the USA and New Zealand. All companies interviewed sell Australian beef on their online platforms with the majority claiming to source it directly from either Indonesian importers, or even Australian exporters. The number of suppliers varies between the interviewed companies from one supplier to having 10-20 suppliers to diversify risks.
- **Country of origin information**: Information about country of origin is not always transferred to online customers. While some mention the country of origin of their beef products in the product description, some others do not. One company noted that its contract with a supplier does not stipulate country of origin.
- **The shortening of beef supply chains**: With most of the surveyed companies sourcing beef either directly from overseas beef producers or Indonesian beef importers, the e-commerce company's ability to reach end-customers may have significantly shortened the supply chain especially for customers residing in Greater Jakarta region.
- **The role of intermediaries**: Despite the shortening of beef supply chains in Jakarta, companies involve or facilitate the participation of new types of intermediaries and other chain actors to reach end-customers. This includes opportunities for any individuals (including household wives and university students looking for extra incomes) to be their agents and for small businesses to be their product resellers.
- **The extensive area coverage of digital marketplace:** Compared to other platforms, digital marketplaces currently have a stronger presence in cities outside Jakarta. Major digital marketplaces provide the possibility for beef sellers outside Jakarta to upgrade their online presence by creating an 'accredited' store, and to hire a warehouse facility giving Jakarta-based businesses (beef importer, distributor or wholesaler) the opportunity to expand and/or partner with regional businesses.
- **Diverse customers**: The COVID-19 pandemic gave a boost to online sales and overturned the long-established perception of middle-income, full-time employed customers as the only segment catered for by the digital market. Companies reported increased demand for beef products through their online platforms from small businesses such as home-based catering and small shops with the latter acting as resellers.
- See **Table 10** for further details

Table 10: Online beef marketing channels

Product focus	BEEF			GENERAL			Adoption rate (%)^	Rationale
	Company A	Company B	Company C	Company D	Company E	Company F		
Type of company	Butchery providing online and offline services	Butchery providing online services	Beef processor providing online services	Supermarket providing online services	Agrifood e-commerce platform with company-owned distribution channel	Digital marketplace		
Beef suppliers	Overseas beef producers	Beef importers	Overseas beef producers, beef importers, feedlot	Beef importers	A beef importer	Beef merchants	N.A.	
Online platforms:								
Company's own e-commerce platform		Yes		Yes	Yes	Yes	67%	No services fee paid to digital marketplace; flexibility to add features; improve own branding
Company's presence at other company's digital marketplace	Yes	Yes	Yes	Yes			67%	Easy entry; large customer base; access to services such as secured payment systems, data analytics
Marketing channels:								
Company-recruited agents					Yes		17%	Reach offline customers including low-income groups
Company's physical outlets	Yes			Yes			33%	Allow customers to touch and see products; distribute to outside Jakarta

Small businesses (e.g. small shops or *warung*)			Yes			Yes	Yes	50%	Reach offline customers including low-income groups
Food services	Yes	Yes	Yes	Yes	Yes	Yes	100%	Typically, strong demand for beef from food services
End customers	Yes	Yes	Yes	Yes	Yes	Yes	100%	COVID-19 restrictions have increased the propensity of customers to cook and organise social gatherings at home

Note: ^ The adoption rate is based on the number of companies distributing to a specific chain actor/segment divided by the number of surveyed companies i.e. six companies.

Source: Authors' compilation using survey data

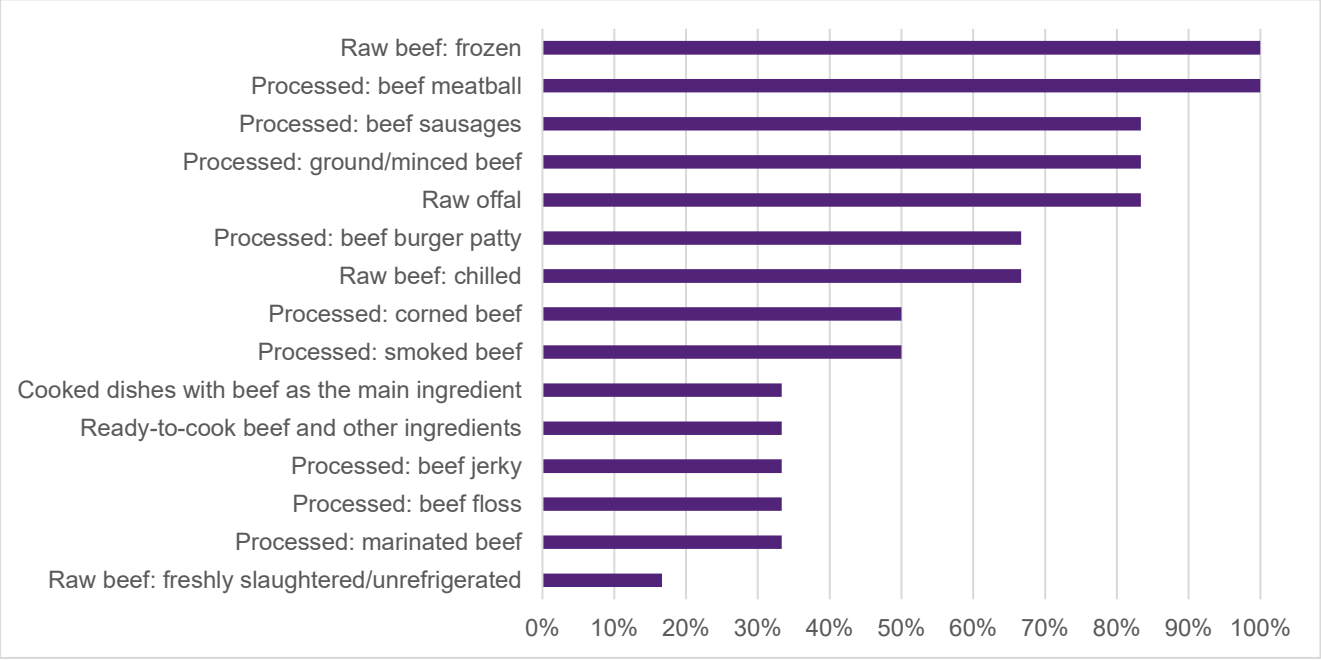
Within the beef product category, the six companies being surveyed sell between three and 15 of the beef products we asked about through their online platforms. Company F (digital marketplace) offers the most extensive range of beef products benefitting from their many merchants. The extensiveness of each company's beef product range seems to be associated with several factors:

- The diversity of their customer base
- Their experience in beef marketing, hence ability to identify those beef products sought by customers
- The extent of their supplier base, hence ability to procure beef products sought by customers.

Similar to offline beef marketing channels, the online markets also offer both raw and processed beef products. **Frozen beef** dominates the online beef sales. In contrast, freshly slaughtered beef can only be found at a digital marketplace such as Company F. However, looking at customer reviews, many customers of this fresh (unrefrigerated) beef reported logistical issues particularly delayed delivery resulting in customers receiving spoiled beef (e.g. bad smell, colour change, slimy texture). Obviously, these issues are less pronounced with frozen beef delivery. One company also reported that the spread of COVID-19 virus has increased people's preference for frozen products, which are perceived to be more hygienic than freshly slaughtered/unrefrigerated beef.

Processed beef products popular among online customers include meatballs, sausages and minced beef. Given COVID-19 restrictions, the increased likelihood of people organising small family/social gatherings and cooking at home, combined with the adoption of new lifestyles among Indonesians such as Korean BBQ parties, have led to increased demand for marinated beef. A quick search at a major digital marketplace for the term "marinated beef", for instance, revealed over 300 products; though this was considerably less than the resulted from searching for "beef sausages, which yielded over 5000 products, and over 4000 products when the term "beef meatball" was used.

Figure 9 Online availability of beef products:



Source: Authors' compilation using survey data (n=6 companies); Company F (digital marketplace) information is based on various products marketed by its many merchants.

6.2.5 Perception of market trends, driving factors and regulatory frameworks

Optimistic views of e-commerce growth: All companies are of the view that the number of e-commerce platforms marketing beef products has increased in the past two years and so has the value of online purchases of beef products in the past six months (i.e. during the COVID-19 pandemic). Factors such as increased income per capita, new trends among urban customers particularly young people that mimic western cultures (e.g. BBQ), and continued mobility restrictions in Jakarta are mentioned as driving factors for growth in e-commerce.

IA-CEPA: One company is exploring the idea of leveraging off the IA-CEPA trade agreement to position Indonesia as a processing hub for Australian beef. To achieve this, the company proposes upskilling programs for Indonesians to learn best practices from Australia in the areas of certification and operational standards. Processed beef products produced in Indonesia can then be exported to other countries. Other companies, however, express their preference to focus on the domestic market and highlight some challenges for Indonesia to be able to export processed beef products.

Factors limiting e-commerce development: The surveyed companies highlight logistical challenges, customers' preference to see/touch products in person (at retail outlets), as well as competition from other meat types and sources of protein as significant challenges facing companies wanting to grow their e-commerce business.

Regulatory challenges: Based on the interviews, these include difficulty in obtaining legal status for small businesses, government regulations related to fintech (financial technology) and taxation, and persistent issues relating to import policy. Some relevant regulatory frameworks are outlined in **Box 5**.

Box 5: Regulatory frameworks related to e-commerce operations in Indonesia

The regulatory frameworks related to e-commerce operations in Indonesia are evolving with several regulations recently launched.

- **The Indonesian national e-commerce roadmap:** The Presidential Regulation Number 74 of 2017 was issued as the roadmap for the e-commerce sector. The roadmap is the country's first ever plan for the sector.
- **E-commerce government regulations:** In November 2019, the Indonesian government introduced the Government Regulation Number 80 of 2019 (GR 80/2019) on Trading through Electronic Systems:
  - The Regulation applies to both domestic and international businesses and individuals engaging in e-commerce activities.
  - E-commerce business actors are classified into three groups:

1. merchants (offering goods and/or services electronically)
2. e-commerce operators (marketplaces, online retail/e-retail outlets, online classified advertisements, price comparison platforms, and daily deals)
3. Intermediary services operators (search engine companies, social media companies, hosting companies, caching companies).

- These regulations stipulate set-up requirements for e-commerce entities such as a business licence (through the government's Online Single Submission System), a tax identification number, a technical licence, and a business identification number (ASEAN Briefing, 2020).
- The Indonesian Ministry of Trade Regulation Number 50 of 2020 on Provisions for Business Licensing, Advertising, Guidance and Supervision of Businesses Trading through Electronic Systems took effect on 19 November 2020 to implement GR 80/2019:
  - **Tax compliance:** Online sellers must comply with tax regulations under Law 30 of 2008. Online businesses classified as SMEs must pay 0.5 per cent income tax, while large companies pay 25 per cent corporate tax rate. Furthermore, individuals earning more than IDR $4.8 billion (or USD $342,000) from their online business must charge their customers value-added tax (VAT).
  - **Import tax:** In January 2020, the Indonesian government lowered the import tax threshold value on consumer goods sold via e-commerce platforms from USD $75 to USD $3.

- **Consumer protection:** The Government Regulation Number 80 of 2019 states that e-commerce businesses must comply with consumer protection and rights as defined in Law 8 of 1999, which addresses issues such as personal data protection, consumer complaints, and dispute resolutions.
- **Payments:** Online marketplaces are permitted to partner with online payment service systems, which are regulated by the Indonesian Central Bank and required to maintain security standards for electronic systems governed by the Financial Services Authority (OJK), the State Cyber and Cryptography Agency (BSSN), and the Central Bank.
- **Food control:** The Indonesian government recently issued a Regulation from the National Agency of Drug and Food Control of Republic Indonesia Number 8 of 2020 on Supervision of Drugs and Food Distributed Online, which restricts the sales of unregistered products online, and prohibits the sales of alcoholic beverages online.
- **Business licensing:** In end-2020, the Indonesian House of Representative ratified the Jobs Creation Bill (RUU Cipta Kerja, widely known as the Omnibus Law). The Omnibus Law introduces a new risk-based business licensing approach. An assessment of business' potential hazards (e.g. health, safety, environment, utilisation and management of natural resources, and/or other aspects) will be done to classify new businesses into low, medium and high-risk businesses.

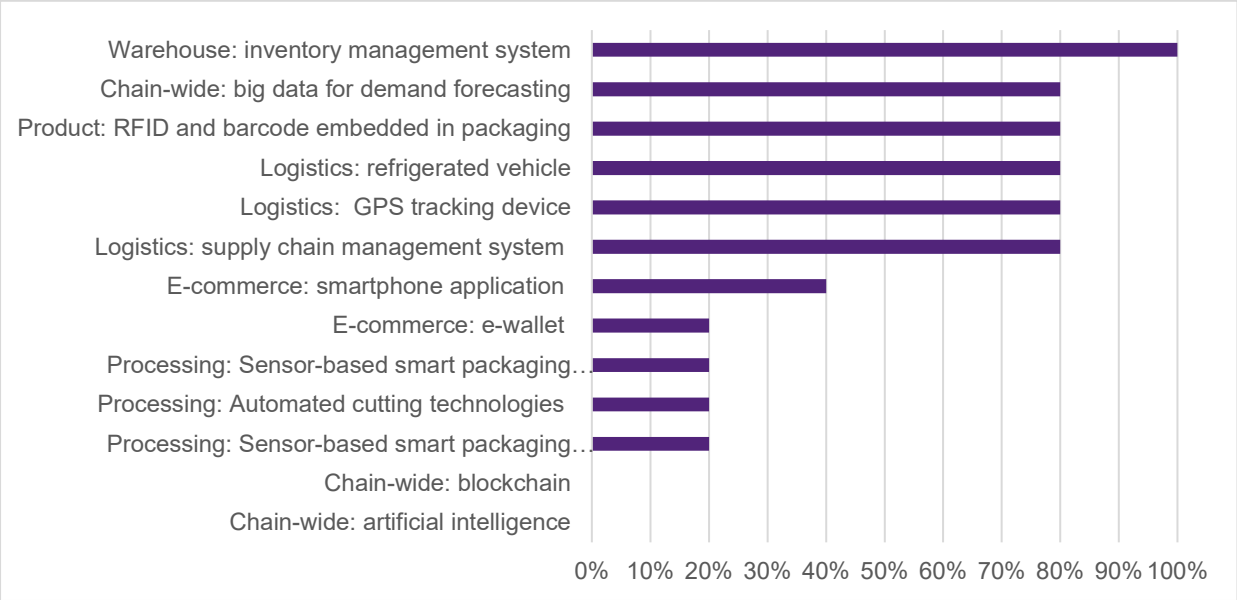
6.2.6 The use of e-commerce technology

The adoption rates of different e-commerce technologies vary among companies as outlined in Figure 10: A long-established beef processor, for instance, uses technologies such as barcoding, refrigerated vehicles with GPS tracking devices, in addition to management software. Meanwhile, an agrifood e-commerce platform has developed its own e-wallet and smartphone application. There is no evidence of the use of artificial intelligence or block chain technology.

Factors affecting the adoption of technology: Companies assess factors such as costs, the technology effects on product quality, and workforce consideration.

Opportunities: Companies highlight automation (to reduce human contact in beef processing and distribution), and improved efficiency in the use of refrigerated vehicles as potential areas that they would consider in the future.

Figure 10: The use of technology



Source: Authors' compilation using survey data (n=5 companies; no information from Company F)

6.3 Consumer perspectives

In this section, data from the consumer survey were assessed to identify (i) their patterns of beef consumption from both offline and online outlets, (ii) their experience of online beef purchases, and (iii) their perceived importance of e-commerce features and product information. Questions in the first part were developed by making references to a report by EY (2018) to test any possible differences between results from our sample and their survey, which interviewed more than 1000 respondents in Jakarta. Despite our much smaller sample size, it is pleasing to note that our findings in terms of overall beef consumption echo those of EY (2018). This similarity in results from a bigger consumer survey means that results from parts (ii) and (iii) on aspects that are not addressed in the EY report might be applicable to a large group of consumers in Greater Jakarta region.

Detailed characteristics of respondents (n=30) participating in the survey are presented in **Appendix 3** with key features defined below.

- **Gender:** Given our sampling criteria requiring that the respondent must be a person who does most of the food shopping for the household, most respondents are women (90%) with most of them married (73%).
- **Age group:** Most of the respondents were between 20 and 35 years old (43%) followed closely by the 36-50 year old age group (37%), and then over 50 years (20%).
- **Education:** Compared to national statistics, our respondents have higher educational backgrounds with 90 per cent having completed at least secondary education, and 53 per cent of the total sample holding a bachelor's degree.
- **Employment status:** Those who are employed full-time make up 30 per cent of the respondents. The rest of the respondents are non-working housewives (27%); self-employed (17%); student/university students (17%); and seeking opportunities (3%).
- **Household characteristics:** Most of the respondents have a household size between four and six people (43%) followed by households with one to three members (40%), and more than seven members (17%). Household income shows quite a range with only seven per cent of respondents reporting a household income of less than IDR $5 million a month; 43 per cent reporting an income of IDR $5 million to IDR $10 million; and more than a half having an income of at least IDR $10 million. A similar pattern is also shown by household expenditure, with 57 per cent of respondents reporting household expenditures of IDR $5 million to IDR $10 million.[2]

6.3.1 Beef consumption

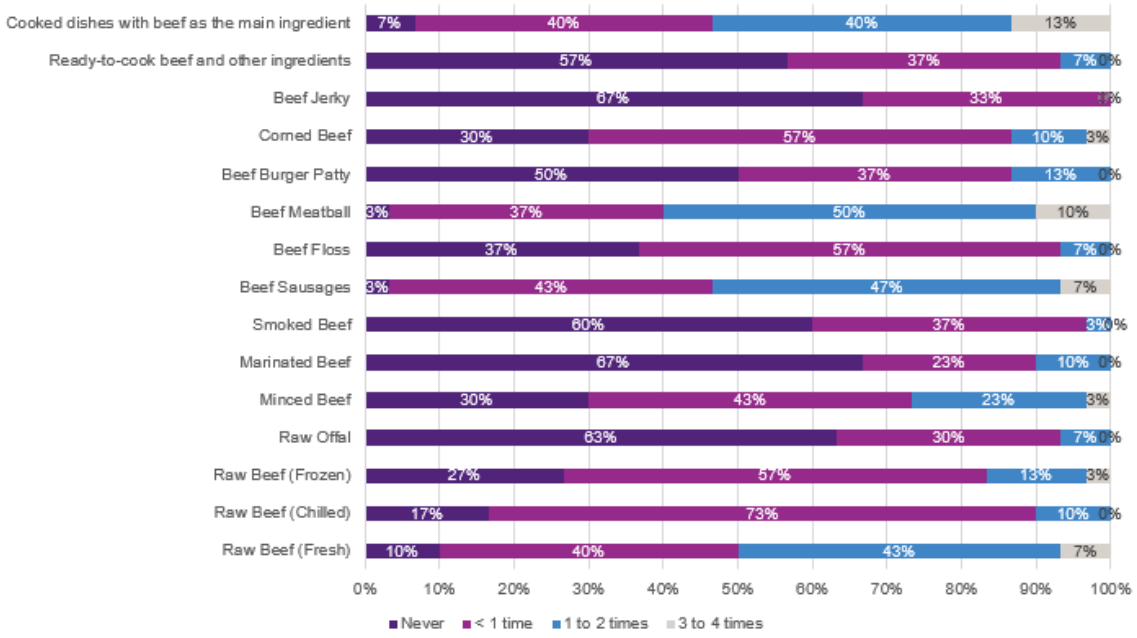
The frequency of beef purchases for home cooking varies by product with beef meatballs and beef sausages being among the most commonly purchased products for home consumption.

- Beef meatballs and beef sausages are the most frequently bought beef products for home consumption, with only three per cent of respondents never having bought these items. This popularity of beef meatballs and sausages replicates results from the EY (2018) study, which surveyed 1307 respondents in Jakarta.
- More than 60 per cent of consumers never buy beef jerky, marinated beef, raw offal, or smoked beef.
- Apart from fresh raw beef, beef meatballs, and beef sausages, respondents on average buy most beef products less than once a week.
- In terms of raw beef products, the difference between frozen, chilled, and fresh beef conditions affects consumers' shopping frequency. About 73 per cent and 57 per cent of respondents respectively buy chilled and frozen beef less than once a week. Meanwhile, fresh (unrefrigerated) beef is purchased at least once every week by half of the consumers. There remains quite a high percentage of respondents who never buy frozen beef (27%).
- See **Figure 11** for full details.

[2] It is worth noting that according to the central statistics agency (BPS) the average per capita monthly expenditure in urban areas in 2019 was IDR1,388,212, which indicate that our respondents have relatively higher household income expenditure than the national average.

Figure 11: Frequencies of beef product purchases for home cooking per week

Question: How often do you buy each of the following beef products for home cooking each week?
Sample size: 30



Consumers show a strong preference for local beef, but those with experience of online beef purchases have more acceptance of imported beef than those with no online shopping experience.

About 80 per cent of respondents prefer local beef rather than imported beef for home cooking. This percentage is in line with findings from EY (2018) that also highlights a significant difference between Jakarta and Medan markets in terms of preference for local beef (98% of Medanese respondents versus 80% of Jakartan respondents).

A closer look at the data suggests that 100 per cent of respondents who never purchase beef from online channels prefer local beef. Meanwhile, only 50 per cent of respondents who have purchased beef online prefer local beef; 30 per cent prefer imported beef; and seven per cent are indifferent between local and imported beef.

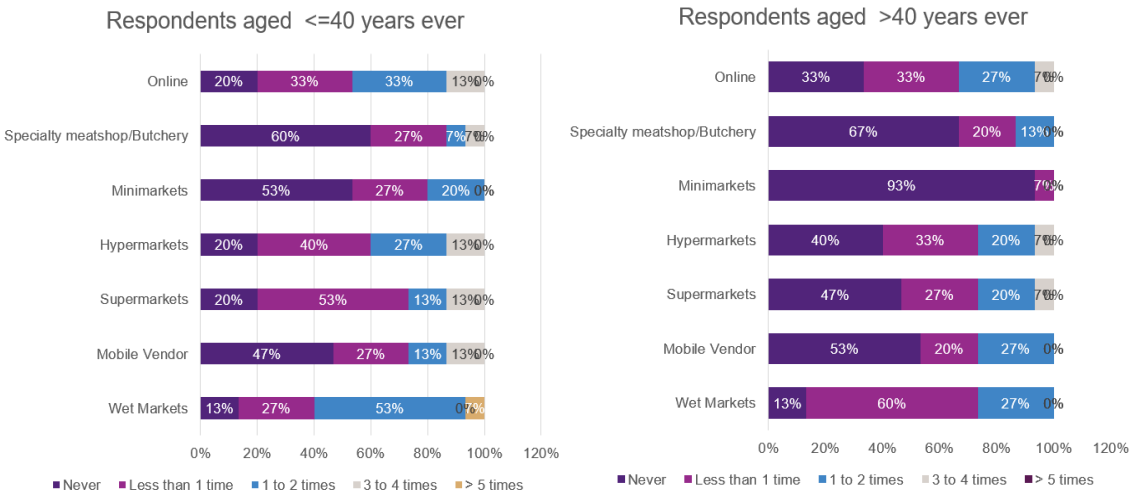
Wet markets remain the most popular outlet for beef purchases across consumers from different age groups, while online channels are more popular among young respondents.

After classifying respondents into two age groups, 40 years or under and over 40 years, the survey found the following:

- Respondents in both age groups prefer wet markets as the main outlet for purchasing beef products. This finding mimic results from EY (2018). Respondents over 40 years buy beef products at wet markets less frequently than the younger respondents.
- Respondents over 40 years are less likely to shop in other forms of outlets, such as hypermarkets, supermarkets, minimarkets, and online channels, compared to those aged 40 years and under.
- Across the two age groups, outlets such as specialty meat shops/butcheries and minimarkets are among the least frequently visited for beef purchases.
- Younger respondents have more experience of online beef shopping with only one-fifth having never purchased beef online compared to one-third of the above 40 group.
- Full details are outlined in **Figure 12**

Figure 12: Frequencies of purchasing beef products for home cooking from different outlets by income group

Question: How often are beef products bought for cooking in your household from the following outlets each week?
Sample size: 30



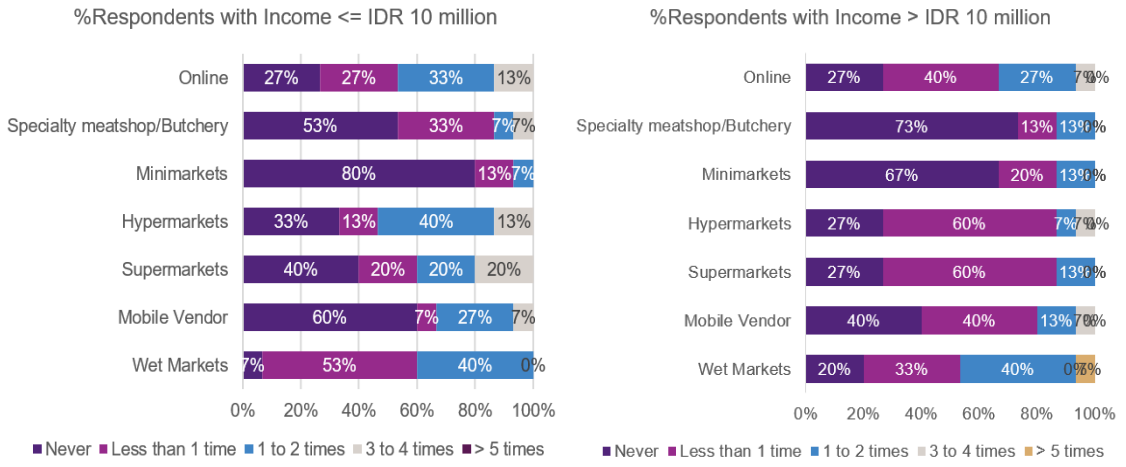
*The popularity of wet markets for beef purchases is evident across income classes, as outlined in **Figure 13**. More than 70% of respondents in low and high income groups have experience of purchasing beef online.*

We further assess consumer preferences towards outlets for beef purchases across two income groups, namely less than IDR $10 million (middle-lower income class, shortened to 'low') and over 10 million (middle-upper income class or 'high'). The survey suggests the following:

- Wet markets are the most popular outlets for consumers in both income groups. However, when comparing the two groups, consumers in the low income group are more likely to buy beef products for home cooking from wet markets with 93 per cent of respondents reporting shopping at wet markets compared to 80 per cent of those in the high income group.
- Besides wet markets, hypermarkets and supermarkets are also popular outlets among respondents in both income groups.
- Interestingly, the likelihood of buying beef products online is quite similar among the two income groups with about 73 per cent of respondents in each group having experienced shopping for beef products from online outlets. This indicates that the propensity to use online channels for beef purchases is more likely to be affected by respondent age than income class.

Figure 13: Frequencies of purchasing beef products for home cooking from different outlets by income group

Question: How often are beef products bought for cooking in your household from the following outlets each week?
Sample size: 30



6.3.2 Online beef purchases

To understand consumers' online beef purchasing behaviour, we first examined their use of devices to access online channels, familiarity with existing online platforms, and experience of online shopping (food and non-food products). We then assessed specific online beef purchase issues such as preferred outlets, reasons to purchase online, etc. As discussed earlier, retail transformation typically entails a shifting from offline to online markets for non-food products (such as fashion goods, electronics) before further shifting to perishable products, which require more efficient logistics than non-food items. One hypothesis to be tested is therefore whether those with experience of online shopping are more likely to purchase beef online, and how long such a shift takes. Respondents are more likely to use smartphones and mobile internet to access online shopping outlets, which reflects than now 52 per cent of the e-commerce market in Indoneisa is now done through mobile commerce (JP Morgan, 2020).

To access online outlets, consumers need to use a device (e.g. smartphone, laptop/computer either at home or at work) and be connected to the internet (e.g. mobile, home internet). Including the different permutations of these options in the questionnaire, the survey found the following:

- All respondents use smartphones with 87 per cent of them using mobile internet. This high percentage of smartphone ownership is expected, given that there is more 158 million smartphone users and a 58 per cent smartphone penetration in Indonesia 2020 (Newzoo, 2020).
- About 53 per cent and 23 per cent of respondents respectively use home internet and workplace internet.
- About 57 per cent of respondents have home laptops/computers and only 27 per cent of respondents have work computers.
- Results from this survey highlight the potential for mobile commerce, both through smartphone applications and mobile websites.

Among online channels, food delivery services and general marketplaces are the most popular outlets.

This survey looked at a wide range of channels that would be considered by consumers as 'online channels' and found the following:

- Food delivery services and general marketplaces are the most common online channels used by respondents, 97 per cent and 90 per cent respectively.
- Social media platforms particularly WhatsApp and Instagram are among the top channels used by 87 per cent and 70 per cent of respondents respectively to buy food and non-food products.
- Online stores provided by supermarkets/hypermarkets are accessed by about 20 per cent of respondents.
- About 13 per cent and 7 per cent of respondents purchase goods from special agrifood marketplaces and online butcheries, respectively.

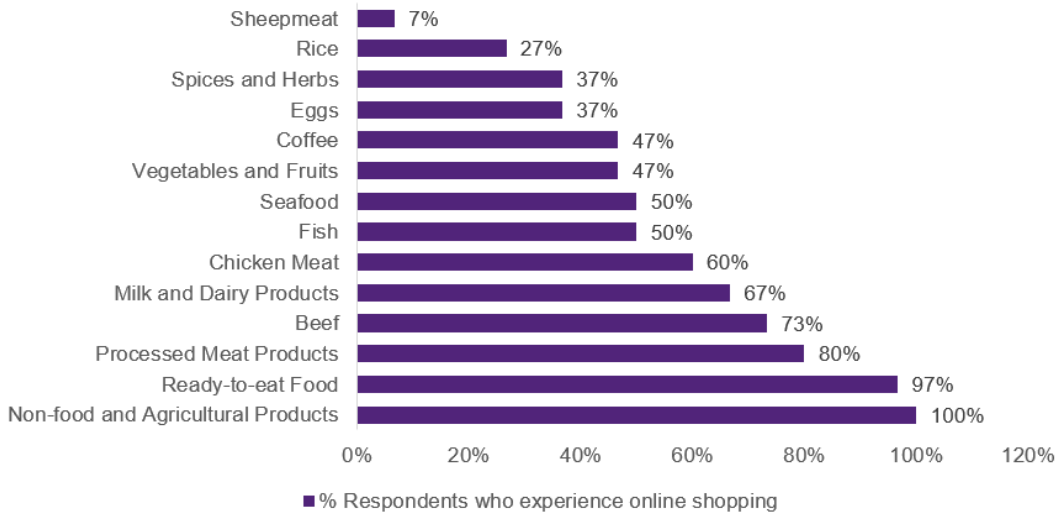
*In addition to non-food and agricultural products, Indonesian consumers are increasingly purchasing food items online, as outlined in **Figure 14**.*

Given our quota sampling to ensure the inclusion of those with no experience of online beef purchases, we should expect that at least one-sixth (17%) of respondents never buy beef products online. The percentages presented here should therefore be interpreted as indicative only to illustrate product types purchased by consumers at online outlets.

- All respondents have bought non-food and agricultural products online. This finding is not surprising given that all respondents have smartphones and 87 per cent of them have mobile internet access, and according to a report by GlobalWebIndex, 90 per cent of internet users have purchased goods or services online.
- Among food products, ready-to-eat-food is the most popular category as stated by 97 per cent of respondents. This is in line with the popularity of food delivery services mentioned earlier, used by 97 per cent of respondents.
- Processed meat products and beef are among the top four products purchased online as reported by 80 per cent and 73 per cent of respondents, respectively.

Figure 14: Types of products purchased through online channels

Question: What products have you ever purchased from online channels?
Total sample: 30



Main barriers to online beef purchases include consumers' inability to see/touch products and concerns about the product's freshness. A majority (73%) of respondents who never purchase beef products online are likely to use online channels for beef purchases in the future.

Of the 23 per cent of respondents who never buy beef through online channels, it was assessed that

- More than half (57%) are in the 36-50 years age group;
- About 43 per cent of them have an income of IDR $5-10 million. However, this is influenced by our quota sampling, which required at least 25 per cent of the respondents in the high income group to be those who never buy beef products online;
- The top five reasons for not buying beef through online channels are the inability to see/touch products (86%), products are not fresh (71%), lack of information about the producer (45%), expensive delivery fees (29%), and not enough options (29%);
- About 71 per cent of respondents state that they will buy beef through online channels in the future.

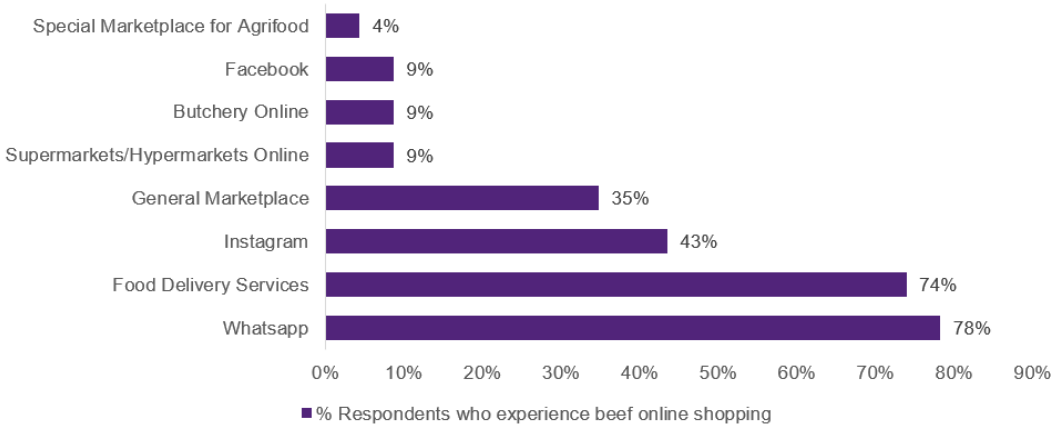
Social commerce plays an important role in online beef marketing in Indonesia. In contrast, the share of end-customers purchasing beef through digital marketplaces remains small.

Of those with experience of buying beef products through online channels (n=23), the survey found the following:

- Social media platforms WhatsApp and Instagram are the first and third most popular channels as stated by 78% and 43% of respondents, respectively. This finding confirms a report by PayPal on the two platforms' popularity in Indonesia to sell goods online.
  - Membership in WhatsApp groups is very popular in Indonesia connecting family members, community group members, and workplace staff, among others. Hence, it is a fast and very affordable way for small businesses to promote their products. One new piece of information from the interviews with e-commerce companies is that WhatsApp is also used by 'agents', small businesses, and re-sellers, who source beef products from online channels (e.g. they buy from a marketplace or act as an agent of an e-commerce company to receive commissions) and sell to 'offline' consumers using WhatsApp. These offline consumers usually have limited digital literacy to access web-based platforms or mobile applications or have concerns about buying food items online from sellers whom they are not familiar with.
  - Meanwhile, Instagram is seen more to communicate food trends, and therefore promote beef products often using the power of social media influencers to attract buyers.
- About 74 per cent of respondents buy beef products using food delivery services channels such as Grabfood and Gojek.
- Only a limited number of respondents purchase beef through online marketplaces. Among them, Shoppe is the most popular as stated by 78 per cent of respondents purchasing beef through online marketplaces followed by Tokopedia (67%), Bukalapak (33%), and Sayurbox (11%).
- Full details are outlined in **Figure 15**.

Figure 15: Online channels used to purchase beef products

Question: Which one of the following online channels have you used to purchase beef products?
Sample size: 23



Respondents cited convenience, quality and promotion as their main reasons for online beef purchases.

A consumer survey by Deloitte (2016) highlights three main advantages to online shopping, namely practicality, wider product choices, and promotion. It is interesting to note that both practicality (or termed as 'convenience' in our survey) and promotion are also cited by our respondents as two main reasons for online beef purchases. As stated by 43.5 per cent of respondents the importance of good quality, instead of wide product choices as suggested by Deloitte (2016), might reflect the critical issue of food safety for food products such as beef. This is consistent with our earlier finding that worries about the freshness of beef products sold online are cited as the second main reason for customers not to buy online. Full details are outlined in **Figure 16**.

Figure 16: Reasons for online beef purchases

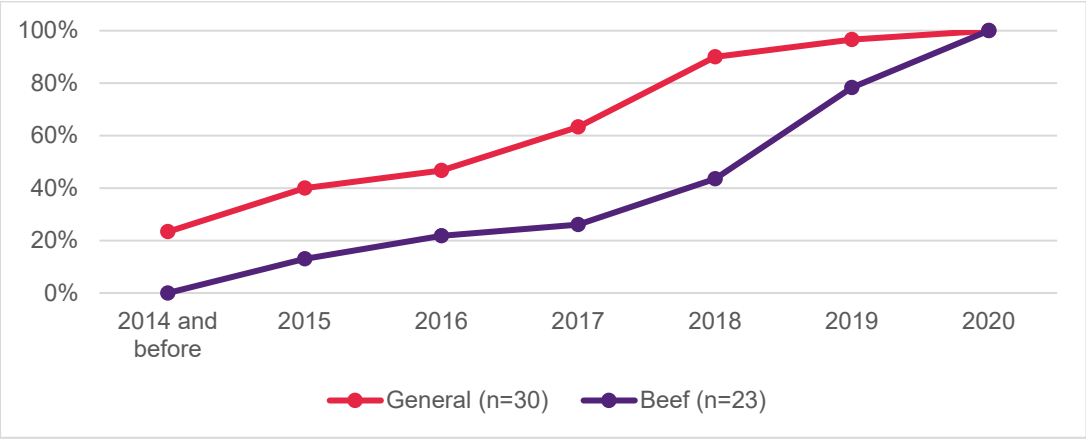
Question: What are your reasons for buying beef products using the online channels?
Sampe size: 23

On average, it takes 2.5 years for respondents to buy beef online after their first online shopping experience. This gap might be much shorter given the push from COVID-19 and an increased number of online beef sellers.

In the survey, the respondents were asked when they first did their online shopping (for both food and non-food products), and when they first bought beef products online. The results are outlined in **Figure 17** and suggest the following:

- A quarter of respondents had their first experience of online shopping before 2015. Meanwhile, all respondents first purchased beef online after 2015. This finding confirms an earlier hypothesis that consumers would first try online shopping to buy non-food products before trialling the purchase of food items such as beef that are perceived to be more 'risky' given their perishable nature. We find that there is a 2.5-year gap between respondents' first interaction with online shopping channels and their first online beef purchases.
- More than half of respondents first bought beef through online channels in the past two years i.e. 2019 (35%) and 2020 (22%). A majority (80%) of respondents who started buying beef online in 2020 gave COVID-19 as the main reason to purchase beef online.
- Regarding the likelihood of continuing to buy beef online after COVID-19, about 69 per cent of respondents stated that they will continue the online beef purchases.

Figure 17: Year of first time using online channels

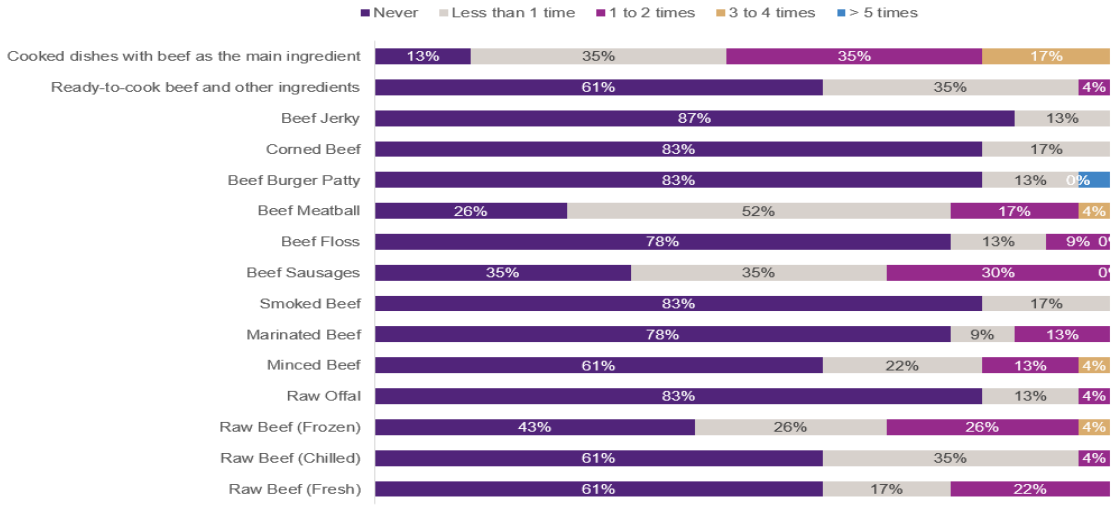


The respondents were also asked if the had purchased a range of beef products online, as outlined in **Figure 18**. The results suggest the following:

- Cooked dishes with beef as the main ingredients (such as rendang, beef steak, etc.) are the most popular 'beef products' bought online by the respondents. This is in line with the high penetration of food delivery services (e.g. Gofood, Grabfood) in Indonesia allowing consumers to order ready-to-eat-dishes from restaurants and food stalls.
- Like results in the earlier section, beef meatballs and beef sausages are among the top three beef products purchased by about 70 per cent of respondents online.
- It is interesting to note that frozen raw beef is the fourth most frequently bought online product. This is contrary to a popular perception that Indonesians have low preference to frozen beef. About 26 per cent of respondents buy frozen beef less than one time a week, 26 per cent buy frozen beef once or twice a week, and 4 per cent buy frozen beef three to four times a week.
- About 43 per cent of respondents have experience of buying imported beef online, while 48 per cent of respondents never purchase imported beef for home cooking. Given that information about country of origin is not always available on the online channels, nine per cent of respondents do not know whether or not they have purchased imported beef for home cooking.

Figure 18: Frequencies of online beef purchases

Question: Have you purchased the following beef products using the online channels?
Sample size: 23



The impact of COVID-19 on online beef purchases varies significantly between beef product categories.

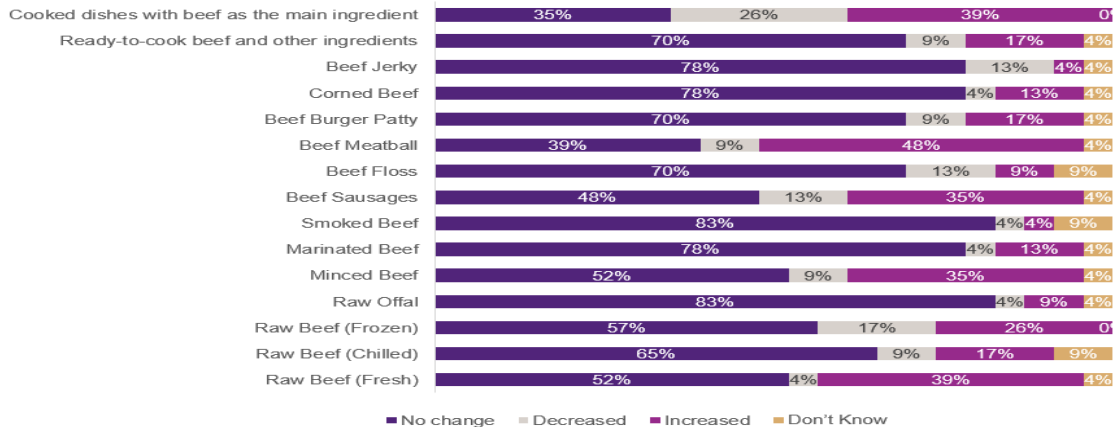
This survey also examined the changes in the quantity of online beef purchases due to COVID-19, with December 2019 used as a pre-COVID baseline. Responses are outlined in **Figure 19** and suggests the following:

- Despite the wide media coverage and industry reports highlighting the growth of digital markets during COVID-19, more than half of respondents had not changed their online purchases since December 2019 in any of the beef product categories assessed in this survey. This is except for the following three products: cooked dishes with beef as the main ingredient (35% of respondents reporting no change), beef meatball (39%), and beef sausages (48%).
- The top three beef products with the largest proportion of respondents reporting an increase since December 2019 include beef meatballs (reported by 48% of respondents), fresh beef (39%), and cooked dishes with beef as the main ingredient (39%). Other beef products, which respondents purchased more frequently through online channels than their pre-COVID purchases included beef sausages (reported by 35% of respondents), minced beef (35%), and frozen beef (26%).

Figure 19: Change in the quantity of online beef purchases since December 2019

Question: Has there been any change in the quantity of your online beef purchases since December 2019?

Sample size: 23



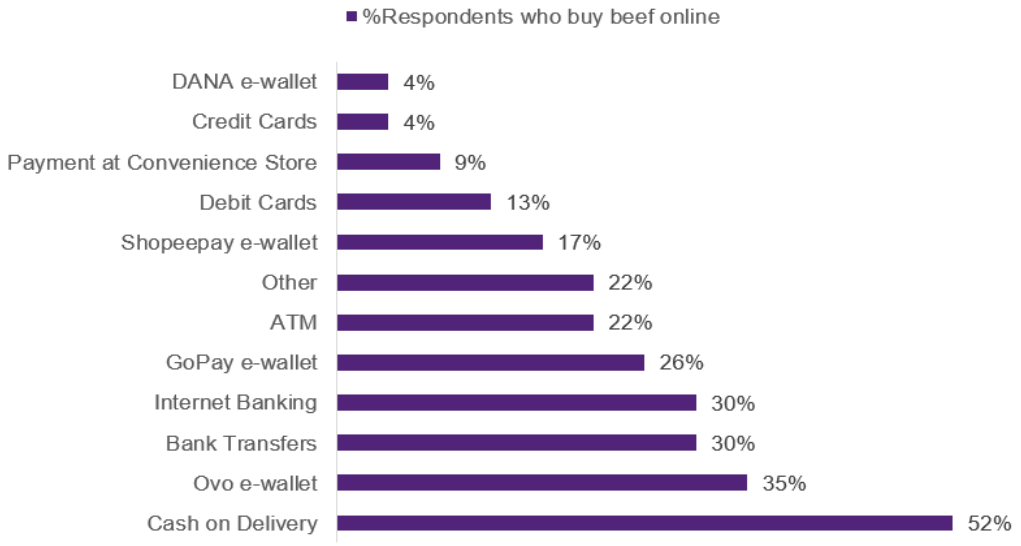
Both cash payments and digital wallets are popular payment methods among online customers.

To facilitate online shopping, Indonesia has many alternative payment methods. According to JP Morgan (2019), debit/credit card transactions comprise one-third of e-commerce payments in Indonesia, with digital wallets being the fastest-growing payment method and predicted to account for one-third of e-commerce transactions by 2021. Using this information as a reference point, the survey found the following:

- Cash payments are still one of the most popular payment methods as stated by 52 per cent of respondents. This figure, which is higher than the seven per cent cash payment share suggested by JP Morgan (2019), might be due to the high use of WhatsApp as an 'online channel' for beef purchases by our respondents. Cash payments (e.g. cash on delivery) are a convenient option for consumers as WhatsApp promotions are typically confined to the seller's neighbourhood area (hence face-to-face interactions between sellers and buyers occur during delivery). Cash payments are also preferred by those with limited digital literacy, including limited understanding of the use of digital wallets.
- Transfer of funds from customer's bank accounts through internet banking and bank transfers are also quite popular as used by 60% of respondents.
- Digital wallets are also used by respondents, particularly OVO (used by 35% of respondents), GoPay (26%), and ShopeePay (16%).
- The survey confirms the low use of debit and credit cards by online beef consumers in Indonesia as noted by earlier studies/reports.
- Further results are outlined in **Figure 20**.

Figure 20: Payment methods for online beef purchases

Question: Which payment method have you ever used when purchasing beef products through the online channels?
Sample size: 23



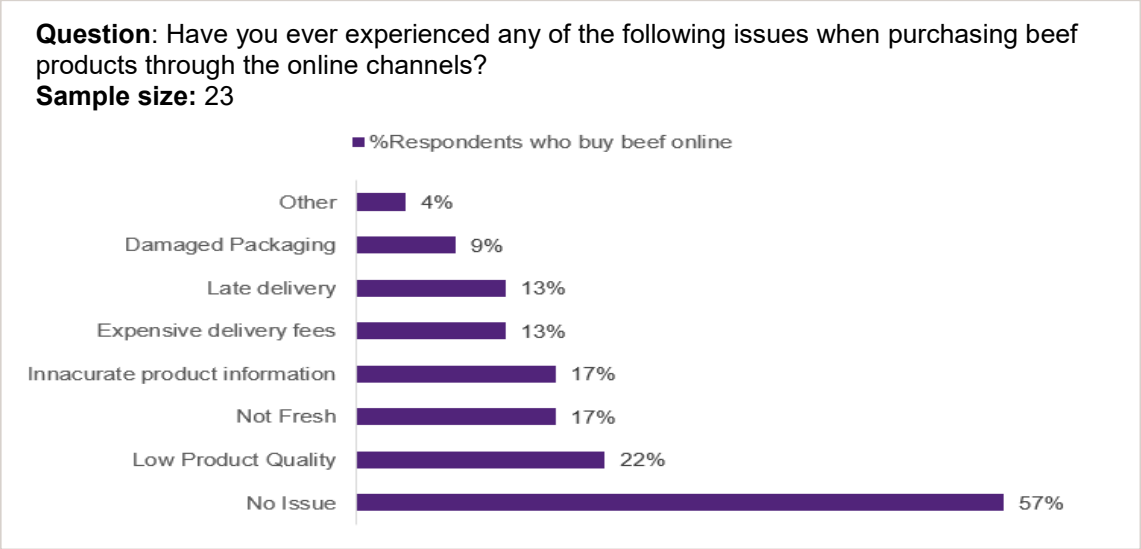
Although half of respondents have no issues when purchasing beef online, quality-related and logistical issues remain a concern.

Despite the potential for expansion of online beef marketing, issues experienced by customers during online beef shopping should be addressed. The results are outlined in **Figure 21** and showed the following:

- Most respondents never experience any issues with online beef purchases (57%).

- Quality-related issues are one of the main concerns with 22 per cent of our respondents reporting low product quality, and 17 per cent having issues with the freshness of the purchased beef.
- Respondents also reported a range of logistics-related issues such as expensive delivery fees (reported by 13% of respondents), late delivery (13%), and damaged packaging (9%).

Figure 21: Issues when purchasing beef products through online channels



Cold chains in Indonesia are still developing.

Most of the issues highlighted above can be addressed by improved efficiency in the cold chain and distribution systems. Such improvements will reduce delivery times and costs, and ensure that product quality and freshness is maintained until the product reaches end-users.

It was found that the delivery of chilled and frozen beef to online consumers still relies on limited cold chain options with only 9 per cent stating that refrigerated vehicles were used to deliver their orders. In contrast, the survey found that 70 per cent of respondents receive chilled or frozen beef in regular plastic bags (no special treatment); 43 per cent receive it in Styrofoam containers; 30 per cent receive it in an ice pack/ice gel; and less than 10 per cent receive the products in other packaging options (e.g. cool bag, ice cubes, regular carton).

6.3.3 E-commerce Features

Customers value the importance of user reviews, delivery tracking updates, and wish lists.

E-commerce features were previously classified into two categories: **basic features** or those features offered by almost all platforms (e.g. order status, order history, automatic verified payment, and live chat option), and **secondary features** (e.g. user reviews, delivery status tracking, wish lists, etc.), which can differentiate services offered by different platforms. In the consumer survey, we asked respondents the extent to which these various e-commerce features would affect their online beef purchase decisions as outlined in **Figure 22**. The following was found:

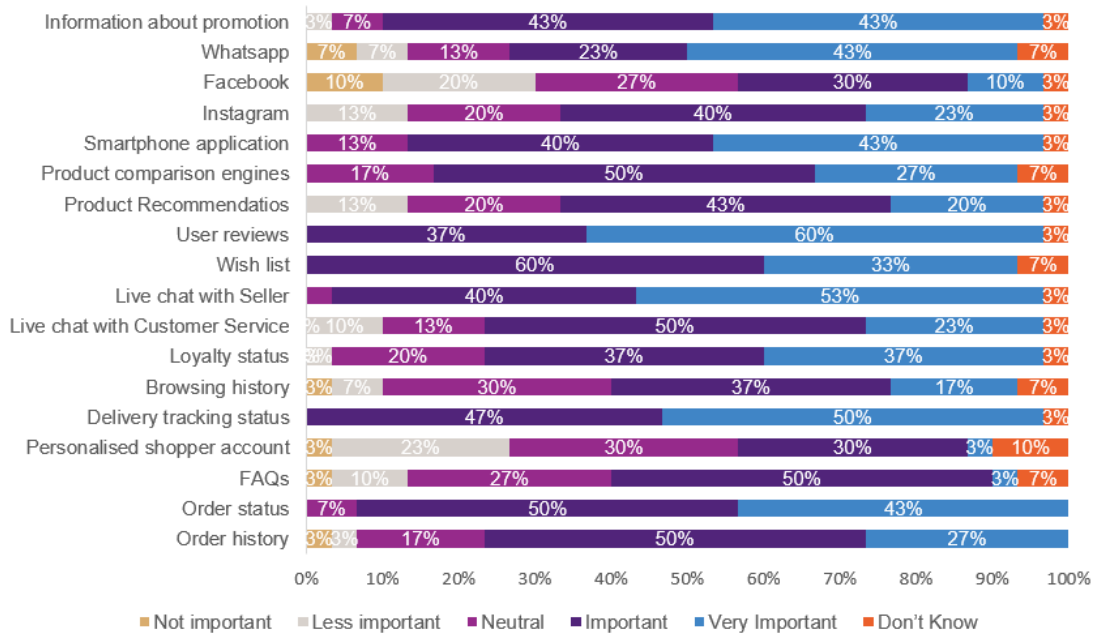
- **User reviews, delivery tracking updates, and wish lists** top the chart as the most important features for customers' online beef purchase decision making. The user reviews feature, for example, stated by 60 per cent of respondents as 'very important'. The fact that these three features are classified 'secondary' or yet to be offered by some e-commerce companies implies opportunities for e-commerce companies to improve their range of features.
- **Social media presence** by the e-commerce platforms is not seen as important by some respondents. In particular, 30 per cent of respondents see it is not important or less important for

an e-commerce company to have a Facebook page, while WhatsApp and Instagram are seen as not important or less important by 14 per cent and 13 per cent of respondents, respectively.

- It is interesting to note that despite JP Morgan's (2019) finding that apps are the primary mobile sales channel, 'only' 83 per cent of our respondents view **smartphone applications** as important or very important.

Figure 22: Important features at online marketplaces

Question: If you visited online marketplaces to order beef products, how important would each of the following features be for your purchase decision making?
Sample size: 30



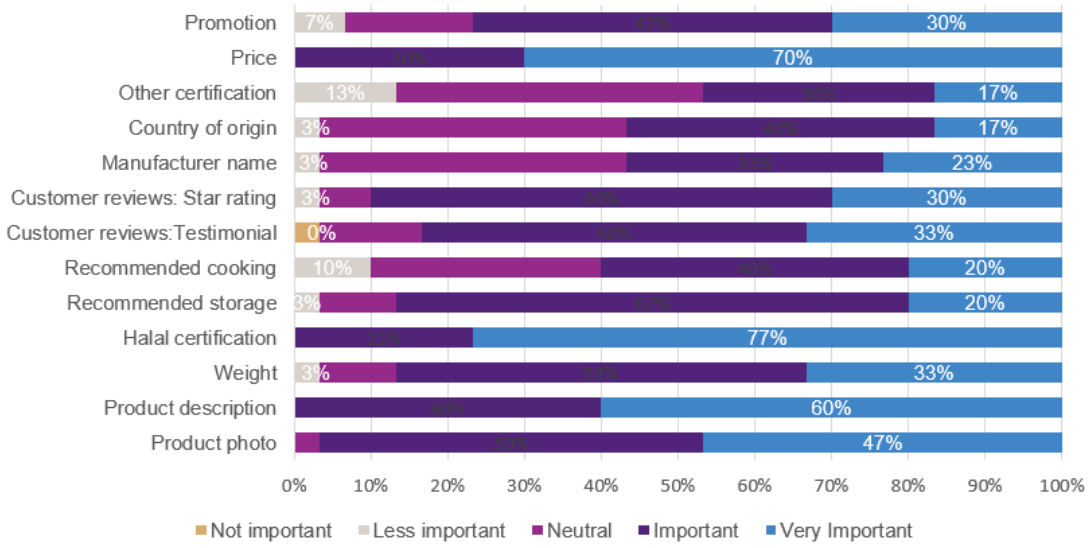
*Consumers view information about the detailed product description, Halal certification, and prices as most important features in purchase decision making, as can be seen in **Figure 23**.*

At the product level, the survey found the following:

- Product description, information about Halal certification, and price are substantialy more important than other attributes with none of the respondents stating that those features are not or less important.
- Contrasting this finding to our observations on e-commerce platforms suggests a gap particularly in providing detailed product descriptions and information about Halal certification that is not necessarily easily accessible from some e-commerce platforms. Halal information, for example, is seen as 'very important' by 77 per cent of respondents, but was only accessible in two of the six companies' e-commerce platforms interviewed.
- About half of respondents see the importance of information about country of origin and the manufacturer's name. This finding might have some implications for the marketing of imported beef via digital markets.

Figure 23: Important features when consumers browse a specific beef product at online marketplace

Question: If you browsed a specific beef product at the online marketplace, how important would each of the following features be for your purchase decision making?
Sample size: 30



6.4 Conclusions

The analysis using data from interviews with e-commerce companies and the consumer survey as well as secondary information from existing reports suggests that an e-commerce presence for beef retailers and producers is no longer just a marketing channel option. It is now a necessity. Current data indicates 160 million Indonesians are smartphone users, and COVID-19 has put additional pressure on businesses to expedite the offline-to-online transition, while estimates of future digital growth strongly signal the significance of online beef marketing to stay competitive in the Indonesian market. This pressure to improve each company's online presence is expected to continue in the long run. Nearly 70 per cent of our respondents stated that they will continue their online beef purchases. Additionally, the increased female participation rate in the Indonesian labour market is forecast to contribute to the continued growth of online channels in the country. Working outside their home increases the opportunity cost of women's time, hence creating stronger incentives to access the convenience of online shopping.

The growth of online marketing channels, however, does not necessarily imply a complete dismissal of offline presence and facilities. Instead, it is predicted that we will see more businesses adopting the so-called 'omni-channel strategy' which integrates the various business models e.g. online and offline, B2C and B2B, etc. Such integration allows customers to move seamlessly across points of contact, and optimise their shopping experience regardless of the platform they use to select and pick-up the products. Central to this strategy are a fully integrated online system that links various aspects of offline and online facilities such as warehousing operations, sales and payments, resources, and customer services.

Chapter 7
Digital Technologies Gap Analysis

7. Digital Technologies Gap Analysis

A gap analysis of technology availability and use throughout the Australian- Indonesian beef Supply Chain was undertaken and results are presented in Tables 11 and 12.

Table 11: Gaps identified in the use of Digital Technologies between the Australian and Indonesian Beef Supply Chains

Stage in Chain	Australian Beef Supply Chain Use of Digital Technologies	Indonesian Beef Supply Chain Use of Digital Technologies	Gap in availability Use of Digital Technologies
Producers	Electronic ID – RFID and GPS tags, herd management software, accounting apps, weather apps, market price apps	Manual recording system based on management tags, paper and pencil	Lack of availability and use of tags and readers at reasonable cost. Lack of education in use and need and value-add
Feedlots	Feedlot – electronic ID – RFID tags, ERPs as an integrated corporate system stock management and feed management systems	Electronic ID – RFID tags, ERP for inventory, sales and financial management	Lack of integrated systems across chain from producers to retail Automation system to improve feed efficiency. System to integrate data from the RFID ear tags
Processors	Processors (abattoirs) – automated processes, robotics for cutting and boning	Some automated processes, no robotics	No robotics
Logistics	GPS/RFID tracking technology, e.g. igps.com.au, inventory management	Some tracking technology, warehouse management system adopted by a few importer/distributor	Lack of common availability and use of tracking technology and integrated systems
Cold Chain (See Box 6 on cold chain solutions for further details)	Advanced refrigeration technology the norm, automated IoT cold chain temp sensors (e.g. Semtech Whitepaper 2020)	Basic refrigeration technology, delivery to customers using motorbike with refrigerated box (e.g. South Korean start-up Quiks Frozen who currently partner with etanee (asian-agribiz.com/2020/05/15/online-agri-grocery-shopping-startups-gain-traction)	Cold Chain Technology is available but not widely used – education around importance of temperature monitoring for food safety Refrigerated vehicle is often absent at the last leg i.e. delivery to customers; still limited options for affordable cold packaging and delivery options

Retail	Distribution centres: robotic warehouses Supermarkets / butchers / e-commerce: digital stock inventories, digital financial waste identification systems, automated checkouts, EFTPOS, debit/credit cards, e-wallets, cash, retail and online marketing channels (e.g. web-based and smartphone applications such as ourcow.com.au fourdaughters.com.au	Distribution centres: inventory management systems e.g. Microsoft Dynamics AX warehouse management system Supermarkets /butchers / e-commerce: debit / credit cards, e-wallets, cash, retail and stock management system (eg FINA software), online marketing channels (eg web-based and smartphone applications, and social media)	More manual handling is observed at Indonesian retailers E-commerce features – similar in both countries Key information (eg Halal certification) is not always easily accessible for Indonesian beef consumers Cash remains important in Indonesia, hence the need to improve consumer literacy on non-cash payment methods Offline marketing channels remain importance, to use intermediaries and social media (e.g. WhatsApp)
Exporters / importers		Basic refrigeration technology, delivery to consumers using various type of cold chain vehicles.	No compatible technology linked with the technologies used by the exporters to track back the beef history

Table 12: Online beef marketing: Gap analysis and potential follow-up strategies

Gap	Current State	Desired State	Possible follow-up strategy
Logistical issues (See **Box 6** on cold chain solutions for further details)	Delayed delivery often occurs resulting in online customers receiving spoiled beef (e.g. bad smell, colour change, slimy texture) 70 per cent of respondents receive chilled or frozen beef in regular plastic bags The lack of product freshness is cited as a main reason not to buy beef online	Consumers receive 'fresh' good quality beef at delivery	Refrigerated vehicles (only 9% of respondents stated they received beef products delivered using a refrigerated vehicle) Provide information about delivery time and recommended storage method Provide (at no cost / as adds-ons / part of the loyalty programs) options for customers to get their chilled or frozen beef orders delivered with ice-gel, ice cubes or in a cool bag Avoid Styrofoam given the environmental impacts, and also to differentiate their product offerings
Halal certificates	Since all imported beef coming into Indonesia must meet Halal certification requirements as set by the Indonesian government, information about Halal certification is often 'assumed' and not necessarily displayed on e-commerce platforms All of respondents deem Halal certificate as either 'important' or 'very important'	Information about Halal certification is easily accessible on e-commerce platforms	To display Halal certificates for meat products on e-commerce platforms
Payment methods	Majority of online channels use non-cash payment methods (e.g. credit card, e-wallet) More than 50 per cent of respondents in the survey) still prefer cash payments and bank transfers	Online consumers can use their preferred payment methods, both cash and non-cash; with a gradual shifting to non-cash methods	To improve consumer literacy on non-cash payment method To cash on delivery (COD) method option to cater respondents with limited knowledge of non-cash methods
E-commerce features and product information	Variations in terms of the range of features and product information between e-commerce platforms Inability to see/touch is cited as a main reason not to buy beef online	Consumers want to access full product information before they purchase beef products online, and enjoy the convenience of online shopping	E-commerce platforms to add features as preferred by the customers (e.g. user reviews, delivery tracking status, wish list) To ensure the accuracy of product description, information about Halal certification and price
Online and offline channel options	Several e-commerce platforms provide smartphone applications to facilitate consumers to shop Not all respondents see smartphone applications as 'important' or 'very important' More than 70 per cent of respondents use WhatsApp and Instagram to buy food and non-food products	Customers can buy products through online channels of their preference, including through social media and web-based or app-based e-commerce platforms	To improve the user friendliness of web-based and app-based e-commerce platforms To use intermediaries (e.g. agents) to assist customers with limited knowledge of online purchases by allowing these customers to order through social media (e.g. WhatsApp and Instagram)

Box 6: Cold chain solutions

Cold chain solutions involve both the use of technologies and regulatory frameworks. In Australia, for example, the Australian Food Cold Chain Council is the country's first advocacy group to improve compliance and standards in the handling of food at all levels of the cold chain with activities including online training. In Australia, cold chain operations are governed by several standards, including:

1. The Food and Grocery Code of Conduct – A voluntary code that governs certain conduct by grocery retailers and wholesalers in their dealings with suppliers
2. HACCP Australia – a leading food science organisation specialising in the HACCP Food Safety Methodology and its applications within the food and related non-food industries
3. AS4982-2003 - This standard covers the thermal performance of refrigerated transport equipment - specification and testing
4. Australian Cold Chain Guidelines 2017 – An initiative of the Australian Food & Grocery Council to maintain the safety and quality of food products during handlings, transport, and storage from producer to consumer.

There is a wide range of technologies to improve cold chain operations from Radio Frequency Identification (RFID), as a means to track the geographical location of individual packages, pallets, and shipping containers. It is also a means to store real-time environmental data (e.g. temperature) to the IT system from refrigerated transport, insulated containers, and temperature-controlled warehousing. This complexity and, therefore, demand for an integrated and company-specific solution has lead to the emergence of cold chain specialists offering 'a one-stop shop' such as Karras Cold Logistics, Linfox, Auscold Logistics, and Cannon Logistics, to assist Australian producers and retailers in their distribution channels. Some examples of cold chain solutions are outlined in **Figure 24**.

Figure 24: Examples of cold chain solutions

ArticBlast portable blast freezers and rapid chillers	*KoolTemp® PUR Polyurethane Containers, combined with Koolit® refrigerants*
	
Source: titancontainers.com.au/au/new-refrigerated-cold-storage-containers-hire-sale-buy/rapid-chill-blast-freezer#blastfreezing	Source: coldchaintech.com/product-details/polyurethane

According to the Research and Markets' Indonesian Cold Chain Market Outlook 2021, the cold chain market in Indonesia is a concentrated market with PT Diamond Cold Storage, Maersk Line and GAC being the leading companies in the industry. While temperature-maintained transport and warehousing has increasingly become a common practice, our interviews with e-commerce companies suggest that refrigerated vehicles are often absent at the last leg i.e. delivery to customers. Cost and road conditions (between the warehouse and customer's delivery address) are a major factor.

There are at least two solutions. First is a refrigerated vehicle. Indonesia's agrifood e-commerce Etanee partnered with Quiks Frozen to use motorbikes with a refrigerated box, which allows delivery of small packages to customers living in areas not accessible by cars or trucks (**Figure 25**). The second solution is insulated packs. Simple technologies such as ice pack, reusable gel pack, and cooler bag (for example, as a reward in a customer loyalty program) can be considered.

Figure 25: Quiks Frozen refrigerated motorbike in Indonesia

Source: *exhibitors.informamarkets-info.com/event/2020FHTB/en-US/exhibitor/242683/sentras-box-indonesia-pt/product/100228/box-pendingin-untuk-motor*

Chapter 8
Conclusions and Recommendations

8. Conclusions and Recommendations

The Australian beef chain currently uses several different technologies as a standard with good digital information flow along the chain that enables traceability of product back to source. In comparison, very few of the Indonesian beef supply chain stakeholders either have access to, or make use of digital technologies for these purposes. Consequently, while some traceability of product is possible in Indonesia, this currently occurs mainly via manual records, which are subject to human handling errors and make for slow recall of information.

In contrast, the Australian beef industry, which provides a significant contribution to the country's export earnings and national economy, has a very sophisticated supply chain and all industry participants are comprehensively involved and integrated into the system. All participants usually adopt world's best practice in production, animal welfare, processing, logistics and marketing. Several of the innovations that Australia introduced regarding animal identification and product certification (including the organisation set up to manage some of those processes) were responses to serious crisis situations that needed to be dealt with. These include a national cattle disease eradication program, product substitution in export beef, and pesticide residue contamination in meat due to inappropriate feed provided to cattle in feedlots. Indonesia could benefit from drawing on this experience to deal with somewhat similar situations in animal identification and traceability as well as the important issue of Halal certification and identification of other meat that might be sold as beef.

E-commerce on the other hand, is being successfully used in both Australia and in Indonesia to better connect beef producers and retailers with consumers. In Indonesia, the young, active smartphone user customer base, and the pressure of the COVID-19 pandemic means that the need for beef producers and retailers to have a strong e-commerce presence is no longer just another option as a marketing channel – it is now a necessity. Nevertheless, following the Indonesian example, there could be further opportunities, especially for small-scale producers in Australia, to take advantage of greater involvement in online marketing of beef and beef products directly to both domestic and international consumers. It is recommended that this be investigated further. The wider adoption of on-sales of live cattle could also offer advantages to the Australian industry, possibly even extending as far as participation by overseas buyers.

The present study provides a snapshot of what is happening in the rapidly changing digital environment and follow up work is recommended to review how some of these suggestions might develop in practice. The following recommendations are made because of the current investigations:

The development of electronic cattle identification system

It is clear that the development of a traceability system in Indonesia remains limited. While there is no strong evidence of consumer demand for traceability in terms of country of origin, and farm of origin and other attributes or certifications (e.g. grass-fed, organic, etc.), Indonesian consumers have great concern over Halal compliance and may benefit from assurances regarding product contamination (e.g. with other types of meat, pesticide residue, etc.). Given the still-limited private investment in this area, the role of the Indonesian government is crucial. The following is recommended:

1. **Provide better accessibility to Electronic Identification (EID) ear tags and readers to producers:** The Indonesian government should assess the possibility of making digital technologies for electronic cattle identification such as RFID/GPS ear tags and readers more widely available by supporting their acquisition.
2. **Develop a data management system maintained by the Ministry of Agriculture for EID records**: A systematic approach to how this data is collected, stored, and then accessed needs to be implemented and it is best that this is undertaken by the government, so that no vested interests take control. A good example is Australia's NLIS database, which holds the data of cattle in Australia and which is maintained and managed by Meat and Livestock Australia (MLA's Data Management Group). Platforms such as iSIKHNAS and siJINAK should also be reviewed to assess whether they can serve as a basis for the desired data management system.
3. **Provide education and training about available technologies:** A concerted education program needs to be put in place by the Indonesian government in partnership with industry

associations, universities and vocational education centres, research organisations, extension officers, farmer organisations, and other stakeholders, including in Australia (e.g. ACIAR) about technologies available throughout the chain – preferably using existing materials/platforms (e.g. a structured training program rolled out as part of the MoA's iSIKHNAS).

4. **Identify investment opportunities:** Efforts by the government alone are not sufficient to achieve the optimal technology development. The technology gaps between Indonesian and Australian beef industries and opportunities presented by the IA-CEPA imply the need to identify further investment opportunities for both Australian and Indonesian investors in the technology sector in both countries. This includes developing internationally comparable traceability systems in Indonesia. Central to this identification of investment opportunities are cost and governance considerations, which warrant the conduct of a future study.

E-commerce development

Focusing on the Indonesian retailer sector, the e-commerce analysis suggests that beef producers and retailers wanting to enhance their online presence are recommended to do the following:

1. **Undertake research into the suitability of e-commerce platforms:** E-commerce platforms offer different services, business models and target markets, hence the importance for beef producers and retailers to research the suitability of those platforms for their individual business requirements. For new entrants, penetrating the digital market through major digital marketplaces such as Tokopedia and Bukalapak, could be an expedited solution, while existing online businesses can consider upgrading options e.g. becoming an accredited store or adopting click and collect strategies.
2. **Address current deficiencies in online beef marketing strategies:** Beef producers and retailers should address existing deficiencies including logistical issues, to display Halal certificates, provide varied payment methods including cash on delivery, ensure appropriate functioning of e-commerce features (e.g. user reviews, delivery tracking status) and provide full product information, as well as facilitating offline-to-online transition for many customers.
3. **Develop cold chains:** Cold chain solutions involve not only the use of technologies, but also improved regulatory frameworks. Interviews with Indonesian e-commerce companies suggested that refrigerated vehicles for the last stage are often absent i.e. delivery to customers. Given cost consideration and road conditions, affordable solutions may include the use of refrigerated motorbike boxes and insulated packs.
4. **Monitor evolving regulatory frameworks:** The Indonesian government continues to update or enhance regulations related to the e-commerce market and supporting systems such as digital payments. Beef retailers and producers are therefore recommended to get a regular update on these changes. Foreign businesses may therefore see a partnership with local companies (e.g. Indonesian importers, distributors, e-commerce companies) as critical. The Indonesian government has particular rules about payment systems, taxation, and business registration including risk category that may affect their ability to conduct on-line business. This risk-based business registration further highlights the importance of technology adoption to improve traceability, efficiency and food safety in the beef and cattle supply chain, and therefore, manage business risks.

The production segment could also benefit from greater adoption of e-commerce. There is emerging evidence of the use of e-commerce to procure production inputs (such as farm tools and concentrate) among Indonesian farmers and this should continue. Furthermore, Australian cattle producers and Indonesian feedlots and importers should also assess a possibility of using Australia's online auction systems (such as AuctionsPlus), which would allow Indonesian importers to buy cattle directly from Australia. However, the development of an effective system is complex and includes consideration of such issues as animal welfare, exporting and importation procedures, and impacts on the supply chain efficiency, and so, future studies into this area are recommended.

Support for small businesses should also be improved. This may include support for Indonesian small businesses to obtain appropriate legal status, which is a prerequisite for their business expansion, and assistance for Australian small-scale producers to use online marketing of beef and beef products directly to both domestic and international consumers.

References

9. References

ABC Landline. (2019). China is hungry for Australian beef, but every second kilo shoppers buy could be fake. https://www.abc.net.au/news/2019-11-03/blockchain-detecting-beef-fraud-in-australian-exports-to-china/11662950

ASEAN Briefing. (2020). Indonesia's Law on E-Commerce: Clear guidelines and compliance by November 2021. https://www.aseanbriefing.com/news/indonesias-law-on-e-commerce-clear-guidelines-and-compliance-by-november-2021/#:~:text=Online%20sellers%20must%20now%20adhere,25%20percent%20corporate%20tax%20rate

Askew K. (2019). *Tech and innovation to 'future-proof' the food chain: 'It is not going to be the same old model'.* Food Navigator.com. https://www.foodnavigator.com/Article/2019/03/28/Tech-and-innovation-to-future-proof-the-food-chain

Austrade. (2018). *E-commerce in Indonesia: A guide for Australian business* [Fact Sheet]. Retrieved from https://www.austrade.gov.au/australian/export/export-markets/countries-and-economies/indonesia/industries/ecommerce-to-indonesia

Austrade. (2020). *Digital technology to Indonesia: Trends and opportunities* [Fact Sheet]. Retrieved from https://www.austrade.gov.au/Australian/Export/Export-markets/Countries/Indonesia/Industries

Baker McKenzie. (2019). Indonesia now has specific e-commerce regulation. https://www.bakermckenzie.com/en/insight/publications/2019/12/indonesia-specific-e-commerce-regulation

Barlow, R., Ferguson, D., Valencia, P., Dedeoglu, V., Cameron, L., & Dave Dawson. (2020). *Global scan of technologies and systems enabling data capture and transfer across red meat supply chains* [Final Report]. Meat and Livestock Australia Limited. https://www.mla.com.au/globalassets/mla-corporate/research-and-development/final-reports/2020/v.rda.2001-final-report.pdf

Barton, H. (2003). New Zealand farmers and the Internet. *British Food Journal, 105*(1), 96-110. http://dx.doi.org.ezproxy.library.uq.edu.au/10.1108/00070700310467519

Condon, J. (2018a). JBS signs $2.1 billion supply deal with China's Alibaba. https://www.beefcentral.com/trade/jbs-signs-2-1-billion-supply-deal-with-chinas-alibaba/

Condon, J. (2018b). Australian red meat well positioned to ride China's e-commerce boom. https://www.beefcentral.com/trade/australian-red-meat-well-positioned-to-ride-chinas-e-commerce-boom/

Borenstein, S., & Saloner, G. (2001). Economics and Electronic Commerce. *Journal of Economic Perspectives*, *15*(1), 3-12. Retrieved from http://www.jstor.org/stable/2696535

Bryceson, K. P. (2006) *'E' issues for agribusiness: The 'what', 'why', 'how'*. CABI Pub. https://doi.org/10.1079/9781845930714.0000

Bryceson K. P. (2011). Agrifood systems and the eLandscape. In O. Bak and N. Stair, N (Eds.), *Impact of E-Business Technologies on Public and Private Organizations: Industry Comparisons and Perspectives* (pp. 198-213). Pennsylvania, USA: Business Science Reference.

Bryceson, K. P. and Yaseen, A. (2018). Smart technologies – Disruptive technologies and the agrifood industry – Fit for practice? In O. Bak (Ed.), *E-business and supply chain integration: Strategies and case studies from industry* (pp. 27-50). London, UK: Kogan Page.

Cabinet Secretariat of the Republic of Indonesia. (2017). This is Presidential Regulation No. 74 of 2017 concerning?? Road Map of E-Commerce?? 2017?? 2019. Retrieved from

https://setkab.go.id/inilah-perpres-no-74-tahun-2017-tentang-road-map-e-commerce-tahun-2017-2019/

Carl, M. S., & Rahimi, A. (2020, June 22). Indonesia introduces new requirements for e-commerce companies. Retrieved from https://www.mondaq.com/corporate-and-company-law/956332/indonesia-introduces-new-requirements-for-e-commerce-companies

ChinaSkinny. (2020). The Impact Of COVID-19 on Beef Industry in China. Retrieved from https://www.tiq.qld.gov.au/download/TIQ-Beef-COVID-19-Impact-China-Skinny.pdf

Connolly, M. (2020, April 6). Breaking: Woolworths supermarket launches Community 'click and collect' at hundreds of stores. *Practical Parenting*. https://www.practicalparenting.com.au/coronavirus-woolworths-supermarket-launches-community-click-and-collect-at-hundreds-of-stores

Denis, N., Dilda, V., Kalouche, R., & Ruben, S. (2020, May 12). Agricutural Supply Chain Optimisation and value creation. *McKinsey and Company.* https://www.mckinsey.com/industries/agriculture/our-insights/agriculture-supply-chain-optimization-and-value-creation

detikFinance. (2020). Pesanan Sayurbox Naik 5 Kali Lipat Sejak WFH (Order for Sayurbox increased fivefold during working from home period). Retrieved from https://finance.detik.com/berita-ekonomi-bisnis/d-4976034/pesanan-sayurbox-naik-5-kali-lipat-sejak-wfh

eMarketer. (2019). Global Ecommerce 2019: Ecommerce Continues Strong Gains Amid Global Economic Uncertainty. https://www.emarketer.com/content/global-ecommerce-2019

EY Sweeney. (2018). Indonesia's beef consumption and preference trends. Retrieved from http://www.redmeatcattlepartnership.org/files/Neqx4-26925-beef-consumption-consolidated-report-final-english.pdf

Farm Online. (2018). MLA teams with Alibaba for True Aussie' beef, lamb blitz in China. Retrieved from https://www.farmonline.com.au/story/5196188/alibabas-true-aussie-meat-promotion-blitz-in-china/

Fatmawati, F., Rostin, R., & Baso, J. N. (2016). Faktor-faktor yang mempengaruhi permintaan daging sapi di Indonesia (Factors affecting beef consumption in Indonesia). *Jurnal Ekonomi UHO, 1*(1).

Febrian, R. & Genesia, A. (2020, May 18). *IDC Indonesia: Smartphone Market Posts a New Record Low in Shipments Impacted by COVID-19.* IDC: Analyze the future. https://www.idc.com/getdoc.jsp?containerId=prAP46346820

Ferguson, D., & Henry D. (2016). Digital Agriculture: An Australian Red Meat Industry Perspective. CSIRO Agriculture & Food. https://www.mla.com.au/globalassets/mla-corporate/news-and-events/documents/industry-news/09-35-drew-ferguson-mla-digital-forum---ferguson-6-oct-2016.pdf

Font-i-Furnols, M., & Guerrero, L. (2014). Consumer preference, behavior and perception about meat and meat products: An overview. *Meat Science, 98*(3), 361-371. doi:https://doi.org/10.1016/j.meatsci.2014.06.025

Gillespie, J. M., Basarir, A., & Schupp, A. R. (2004). Beef producer choice in cattle marketing. *Journal of Agribusiness, 22*(2), 149-161.

Graham, M. (2019, November 10). Pick Up Your Coles Shopping at Melbourne Airport. *The Australian Frequent Flyer*. https://www.australianfrequentflyer.com.au/coles-click-collect-melbourne-airport/#

Hasanah, S., Lubis, S. N., & Khadijah, S. (2018). Faktor-faktor yang mempengaruhi konsumsi sapi di Kota Medan (Factors affecting beef consumption in Medan). *Journal on Social Economic of Agriculture and Agribusiness, 3*(3).

Henry, D. (2016). Disruption in agriculture: the real game-changers, paper presented at Digital Disruption in Agriculture Conference, Sydney, 2-3 June, 2016.

Hobbs, J. E., Boyd, S. L., & Kerr, W. A. (2003). To be or not to B-2-C: E-commerce for marketing specialized livestock products. *Journal of International Food & Agribusiness Marketing, 14*(3), 7-20. https://doi.org/10.1300/J047v14n03_02

Hootsuite. (2020). Digital 2020: Indonesia. Retrieved From https://datareportal.com/reports/digital-2020-indonesia

IGR. (2020). Global Food E-commerce Market: Consumer Behavior Analysis by Countries, Buying Pattern Analysis, Demographics, Trends Analysis, Survey Findings and Results, Leading Companies and their Market Strategies. Retrieved from https://www.infiniumglobalresearch.com/survey-reports/global-food-e-commerce-market

Informasi Pangan Jakarta. (2020). Dashboard harga (Price dashboard). Retrieved from https://infopangan.jakarta.go.id/publik/dashboard/6

iPrice. (2020). The map of e-commerce in Indonesia. Retrieved from https://iprice.co.id/insights/mapofecommerce/en/

Ipsos. (2020). The evolution of the digital wallet: Driving the next wave of growth. Retrieved from https://www.ipsos.com/sites/default/files/ct/news/documents/2020-02/ipsos_media_conference_-_e-wallet-_en_0.pdf

JP Morgan. (2020). E-commerce payment trends: Indonesia. Retrieved from https://www.jpmorgan.com/merchant-services/insights/reports/indonesia

Keller, J. L. (2006). *Beef cattle producers' perceptions and behaviors towards website credibility, e-commerce and online auctions* (Doctoral dissertation).

Klerkx, L., Jakku, E., Labarthe, P. (2019). A review of social science on digital agriculture, smart farming and agriculture 4.0: New contributions and a future research agenda. *NJAS-Wageningen Journal of Life Sciences, 90,* 100315.

Lu, L., & Reardon, T. (2018). An economic model of the evolution of food retail and supply chains from traditional shops to supermarkets to e-commerce. *American Journal of Agricultural Economics, 100*(5), 1320-1335.

Maman, U., Mahbubi, A., & Jie, F. (2018). Halal risk mitigation in the Australian–Indonesian red meat supply chain. *Journal of Islamic Marketing, 9*(1), 60-79. doi:10.1108/JIMA-12-2015-0095

Mathijs, E. (2015). Exploring future patterns of meat consumption. *Meat Science, 109*, 112-116. doi:doi.org/10.1016/j.meatsci.2015.05.007

McKinsey. (2018). The digital archipelago: How online commerce is driving Indonesia's economic development. Retrieved from https://www.mckinsey.com/featured-insights/asia-pacific/the-digital-archipelago-how-online-commerce-is-driving-indonesias-economic-development

McKinsey. (2020). Survey: Indonesian consumer sentiment during the coronavirus crisis. Retrieved from https://www.mckinsey.com/business-functions/marketing-and-sales/our-insights/survey-indonesian-consumer-sentiment-during-the-coronavirus-crisis#

MLA. (2018). E-retail in China – what it means for Australian red meat exports. Retrieved from https://www.mla.com.au/news-and-events/industry-news/e-retail-in-china-what-it-means-for-australian-red-meat-exports/

MLA. (2020a). MLA Global Snapshot - Beef. https://www.mla.com.au/globalassets/mla-corporate/prices--markets/documents/os-markets/red-meat-market-snapshots/2020/global-beef-snapshot-jan2020.pdf

MLA (2020b). Scoping study to strengthen Indonesian red meat supply chain traceability systems. https://www.mla.com.au/contentassets/fca12193ec8c48e8a1513a6bc7edb7b8/i.gnt.1901_final_report.pdf

Newzoo (2020). 2020 Global Mobile Market Report: Key Trends, Market Sizing & Forecasts, Special Focus Topics, Rankings. https://resources.newzoo.com/hubfs/Reports/2020_Free_Global_Mobile_Market_Report.pdf?utm_campaign=Global%20Mobile%20Market%20Report%202020&utm_medium=email&_hsmi=95373037&_hsenc=p2ANqtz-_gYNy7BG1QvNmdOM6KkNdnXcuWcA8JshcKyG2B_qpPQ_C_VsrbUeVZBhMAgk_A-Kn1fta15Dy5Uibtxo9cUgPcL2n0jA&utm_content=95373037&utm_source=hs_automation

Oxford Business Group. (2020). E-commerce opportunities in Indonesia's retail market. Retrieved from https://oxfordbusinessgroup.com/overview/delivered-success-market-dominated-brick-and-mortar-stores-e-commerce-proving-attractive-young-tech

Permani, R., Sahara, S., & Suprehatin, S. (2020). Brief: Agrifood E-commerce Profiles in Indonesia. Retrieved from https://sites.google.com/view/agir2020/resources

Pirog, R. S. (2004). Consumer perceptions of pasture-raised beef and dairy products: An internet consumer study. An internet consumer study.

PWC (Price Waterhouse Cooper) (2020). *Valuing the benefits of the Ceres Tag platform* [Final Report]: https://www.cerestag.com/wp-content/uploads/2020/04/PwC__Ceres-Tag-benefits.pdf

RedSeer. (2020). Report on Indonesia e-commerce: Metamorphosis in a post-covid world. Retrieved from https://redseer.com/reports/indonesia-ecommerce-metamorphosis-in-a-post-covid-world/#

Renda, A., Reynolds, N., Laurer, M., & Cohen, G. (2019). Digitising Agrifood: Pathways and Challenges. Centre for European Policy Studies and the Barilla Center for Food & Nutrition Foundation. https://www.ceps.eu/wp-content/uploads/2019/12/Digitising-Agrifood.pdf

Robertson, A., Moore, A., Henry, D., & Barry, S. (2018). Digital agriculture: what's all the fuss about. *AGRICULTURE AND FOOD, csiro. au.*

Rolfe, J., Gregor, S., & Menzies, D. (2003). Reasons why farmers in Australia adopt the Internet. *Electronic Commerce Research and Applications, 2*(1), 27-41.

Salin, V. (1998). Information technology in agri-food supply chains. *The International Food and Agribusiness Management Review*, *1*(3), 329-334.

Scheiffer, G. (2004). New technologies and their impact on the agri-food sector: An economist's view. *Computers and Electronics in Agriculture, 43*(2):163-172. doi: 10.1016/j.compag.2003.12.002

Semtech (2020). *Disrupting Cold Chain Refrigeration and improving Food Quality by taking a Fresh Approach to Asset Quality Management* [White Paper]. www.https://info.semtech.com/hubfs/Smart-Axino-Whitepaper-web-v2.pdf?hsLang=en-us

Shaklett, M. (2017). How Technology is Transforming the Food Supply Chain, Food Logistics, https://www.foodlogistics.com/technology/article/12344804/how-technology-is-transforming-the-food-supply-chain

SIRCLO. (2020). The State of Indonesia's E-Commerce within COVID-19 & Rise of Social Commerce: An Overview. Retrieved from https://insight.sirclo.com/blog/2020/08/indonesias-e-commerce-landscape-within-covid-19-pandemic--rise-of-social-commerce

Skantzos, K. (2020, October 9). Woolworths launches automated eStore in Melbourne. Retrieved from https://www.news.com.au/finance/business/retail/woolworths-launches-automated-estore-in-melbourne/news-story/74da1ca7f786ca041082b103ae58d23c

Statista. (2020). Digital Market Outlook: Indonesia. Retrieved from https://www.statista.com/outlook/243/120/ecommerce/indonesia

Susanti, E. N., Rindayati, W., & Sahara, S. (2014). Permintaan pangan hewani rumah tangga di Provinsi Jawa Barat (Household demand for animal-based food in West Java). *Jurnal Ekonomi dan Kebijakan Pembangunan, 3*(1), 42-63. doi: https://doi.org/10.29244/jekp.3.1.42-63

WEF (World Economic Forum). (2016). Global Information Technology Report (2016). https://reports.weforum.org/global-information-technology-report-2016/

WEF (World Economic Form). (2019, January). Innovation with a Purpose: Improving Traceability in Food Value Chains through Technology Innovations. http://www3.weforum.org/docs/WEF_Traceability_in_food_value_chains_Digital.pdf

Whelan, E., Teigland, R., Donnellan, B., & Golden, W. (2010). How Internet technologies impact information flows in R&D: reconsidering the technological gatekeeper. *R&d Management, 40*(4), 400-413.

Wihardja, M. M. (2020). *Impacts on Digital Merchants: Insights from the Bukalapak-World Bank Survey* [Brief]. World Bank Group. https://openknowledge.worldbank.org/handle/10986/34743

Zulkarnain, Z., Asmawati, A., & Sofyan, S. (2017). Analisis konsumsi daging sapi pada tingkat rumah tangga di Provinsi Aceh (Analysis of beef consumption at the household level in Aceh). *Jurnal Agrisep, 18*(1), 1-12.

Appendices

Appendix 1: Table of companies involved in digital technologies with webpage links

No	Company	Donation / qurban	Marketing	Investment	App / equipment provider	Education	Information System	Website	App	Web link	Accessibility
1	Smarternak by Dycodex		v		v	v		v		https://dycodex.com/smarternak/	high
2	Julaternak.com		v	v		v		v	v	https://jualternak.com/	high
3	Kandang.in			v				v	v	https://kandang.in/	high
4	Ternaknesia	v	v	v				v	v	https://ternaknesia.com/	high
5	Angon.id		v					v	v	http://angon.id/	high
6	VestiFarm			v				v		https://vestifarm.com/	high
7	Bantuternak.com			v				v	v	https://bantuternak.com/	high
8	VetWays						v		v	Google Play Store	low
9	iSIKHNAS (Gov)						v	v	v	https://www.isikhnas.com/	medium
10	Aflah-Indonesia			v				v	v	http://www.aflah-indonesia.com/	high
11	ePakan		v					v	v	http://epakan.id/	high
12	KandangKambing	v	v	v				v	v	https://kandangkambing.id/web/	high
13	Kitku		v						v	Google Play Store	low
14	Smart Feed Agrinak (Gov)					v	v	v	v	http://balitnak.litbang.pertanian.go.id/	medium
15	SIMPONI Ternak (Gov)						v	v	v	https://simponiternak.pertanian.go.id/	high
16	SIUPin (Gov)						v	v		http://siupin.pertanian.go.id/	low
17	DILAN KESMAVET (Gov)							v		http://dilankesmavet.pertanian.go.id/	low
18	Tips Ternak/Budidaya ikan lengkap					v	v		v	Google Play Store	low
19	*Shopee*		v					v	v	https://shopee.co.id/	high
20	*Tokopedia*		v					v	v	https://www.tokopedia.com/	high
21	*Jd.id*		v					v	v	https://www.jd.id/	high
22	*Blibli.com*		v					v	v	https://www.blibli.com/	high
23	*Bukalapak*		v					v	v	https://www.bukalapak.com/	high
24	*Olx*		v					v	v	https://www.olx.co.id/	high
25	*GrabFood*		v					v	v	https://www.grab.com/id/merchant/food/	high
26	*GoFood*		v					v	v	https://www.gojek.com/gofood/	high

Appendix 2: Indonesian Beef SC Technology Audit

Indonesian Beef SC Technology Audit - Company

(Adapted from Bryceson 2010 "Lean Chain and EReadiness in Business Audit"

- Strategy
  - What technology strategy is being used currently?
- Production Process
  - Product/products?
  - What production technologies are employed?
  - What cool chain processes are being used currently? (internal/external)
- Technology/Infrastructure Audit
  - What transport infrastructure is used?
  - Is transport infrastructure appropriate?
  - What IT platform (type of computers, operating system, and network) is used?
  - Can current technology be upgraded to achieve the desired results?
  - Is it necessary to purchase new equipment to achieve the desired results?
  - Does the equipment need to meet a specification already defined within the value chain, i.e. is it to be integrated with other value chain partners' systems?
  - (What refrigeration technology is used? – If interested in Cold Chain)
- Data/Information Audit
  - What data/information are collected?
  - What data/information are needed?
  - Is all required data/information readily available?
  - Are all data/information of sufficiently high quality and accuracy?
  - Where and how are data/information collected?
  - How is data recorded?
  - How are data/information transmitted?
  - Where are data/information stored?
  - What applications use the data/info and how are these applications related as an overall system?
  - Are current information flows sufficiently speedy and timely?
- Application Architecture Audit
  - Are the software applications needed available off-the-shelf?
  - If applications are not available, is expertise readily available to develop them?
- Infrastructure Competencies Audit
  - Is the know-how to efficiently operate any required equipment available in-house?
  - Are there areas of re-skilling required? How to do this?
- Relationship with Business needs (generally and for cold chain)
  - What are the business systems' needs?
  - Production systems
  - Stock Control

- Inventory Management (What system? Do you use Smart Packaging?)
- Food Safety compliance (what and how)
- Governance (what and Who)
- Supply Chain partners (do they have the same technologies? Are they ready to become “E” enabled?)

Appendix 3: Characteristics of respondents in the consumer survey

Characteristics		% of Respondent
Gender	Male	10%
	Female	90%
Age	20-35	43%
	36-50	37%
	>50	20%
Marital Status	Married	73%
	No	27%
Educational Level	No Formal Schooling	0%
	Primary School	10%
	Middle School	0%
	High School	20%
	Diploma	17%
	Bachelor	53%
	Master	0%
	PhD	0%
Working Status	Employed full-time	30%
	Employed part-time	7%
	Self-employed	17%
	Student/university student	17%
	Non-working housewives	27%
	Seeking opportunities	3%
Household Income Level	<Rp 5 million	7%
	Rp 5 million-Rp 10 million	43%
	Rp 10 million-Rp 20 million	27%
	Rp 20 million-Rp 40 million	17%
	> Rp 40 million	7%
Household Expenditure Level	< Rp 5 million	17%
	Rp 5 million-Rp 10 million	57%
	Rp 10 million-Rp 20 million	23%
	Rp 20 million-Rp 40 million	3%
	> Rp 40 million	0%
Houseold Member	1 to 3	40%
	4 to 6	43%
	> 7	17%

Appendix 4. A review of beef consumption and online marketing

Trends in beef consumption

Global beef consumption increased by more than 40 per cent over the 20 years to 2019 to reach 70 million tonnes, driven by both population growth as well as per person consumption growth.

The growth of per capita beef consumption has been relatively modest with Australians on average consuming 18kg of beef per person, well above the world average and that of developing countries such as Indonesia at 2kg per person.

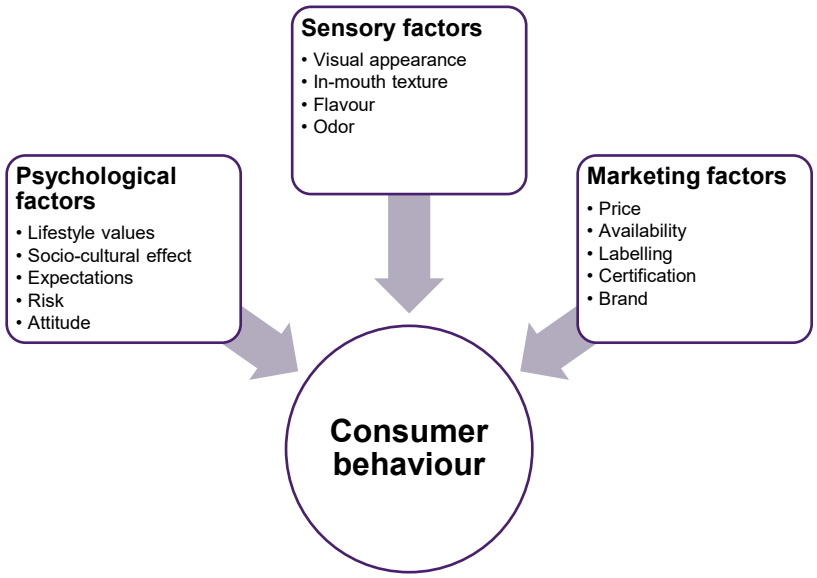
While Australia's domestic beef consumption per capita has declined over the past two decades, its main export markets in Asia such as China and Korea experience increased per capita beef consumption. These varying levels of beef consumption support an earlier finding on the inverted U-shape between meat consumption and per capita GDP. At an early stage of development, increased income is associated with increased per capita beef consumption but only up to a point before high income countries entering the so-called "second nutrition transition" (Mathijs, 2015).

Beef consumer behaviours and e-commerce use

Beef consumer behaviours

Various determinants have influenced consumer behaviour toward meat products including beef, which are summarised in **Figure A**. One way to classify determinants of beef consumption behaviour is to consider sensory as well as psychological factors in addition to marketing factors such as price, availability, labelling, certification and branding (Font-i-Furnols & Guerrero, 2014).

Figure A: Factors affecting meat consumption



Source: Adapted from Font-i-Furnols and Guerrero (2014)

The significance and the extent to which the above factors influence consumer preference is an empirical matter. For instance, a recent report by MLA summarises different key motivators to purchase beef across Australian export destination markets (MLA, 2020, **Table A**). Factors such as food safety and Halal certification seem to serve as 'entry requirements' for Australian beef exports getting into those markets. For markets such as Japan, China, and Saudi Arabia, of interest is country of origin.

Table A: Key motivators to purchase beef

Japan	Safety	Freshness	Value	Origin
Korea	Safety	Natural	Freshness	Environmental
Saudi Arabia	Halal	Safety	Natural	Origin
China	Safety	Natural	Freshness	Origin
United States	Freshness	Natural	Value	Quality
Indonesia	Halal	Freshness	Safety	Natural
Malaysia	Halal	Safety	Freshness	Natural

Source: MLA (2020)

E-commerce use in the beef industry

Among input suppliers, producers and intermediaries, the use of the internet has increasingly changed the way the beef industry functions, as shown in **Table B**. In early 2000s, there was a growing number of studies looking at the use of computers, then the internet among beef cattle producers especially in developed countries such as the US, New Zealand and Australia (Rolfe, Gregor & Menzies, 2003; Barton, 2003; Gillespie, Basarir & Schupp, 2004; Keller, 2006).

In recent years, online auction platforms have gained traction. A case in point is AuctionsPlus in Australia. Given increased investment in research and development in agricultural technology, increased competition, and most recently a push towards a 'contactless economy' put forth by the COVID-19 pandemic, it is most likely that the internet as well as e-commerce use has increased in recent years.

Table B: Factors affecting the use of internet among beef cattle farmers

Use of the internet by beef cattle producers	Information sought on the internet	Advantage in using the internet	Reasons not purchasing items from the internet
• **Email** • **Information** • **Buying goods** • **Online banking** • **Education/ training** • **Have personal website** • **Shares/ investments** • **Selling goods** • **Feedback on a product** • **Tele-working** • **Personal e.g. social/recreation**	• Weather • Farm products • Commodity prices • Machinery / equipment • Financial news • Non-farm products • Upcoming events • New technology • Latest research • Political news • Management news • Tax information • Company profiles • Non-farm employment • Hire labour	• Better information • Reduced paperwork • Improved customer service • Faster for goods in • Better inventory control • Reduced costs of operation • Differentiation of services • Improved competitive advantage	• Lack of trust in data security • Unable to see/touch the product • Unable to talk to someone before the purchase • Preference to buy from someone they know • Limited information about the company selling the product

Source: Adapted from Barton (2003), Keller (2006), and Rolfe, Gregor, and Menzies (2003).

Studies on the use of the internet among beef consumers remain limited. Similar to the concept used in the use of the internet among beef cattle producers, studies particularly those in early 2000s focused on the internet to assist consumers getting information about the products they intend to purchase, before moving on to e-commerce use (Pirog, 2004). A study in the US, for example, finds that more than 80 per cent of the surveyed consumers look for information about beef products they purchase through the company's website (Pirog, 2004).

Studies looking at the use of e-commerce for beef purchases are mostly found in developed economies such as Australia and the US, as well as China, the world's global e-commerce leader. For beef exporting countries such as Australia, the rise of e-commerce in its main export destination markets such as China means the need to recalibrate its marketing strategy. According to the MLA's 2018 Global Consumer Tracker research, while only 5 per cent of the total beef and lamb sales value in China in 2018 were e-retailers, the estimated 16 per cent annual growth rate means that e-commerce is projected to be the fastest growing channel (MLA, 2018). Large investments in cold chain storage and logistics by e-commerce companies have led to growth for fresh produce categories including beef in the channel. Factors driving online beef purchases in China are summarised in **Table C**.

Within the meat category, chilled red meat products are preferred to frozen red meat. The COVID-19 pandemic is expected to further increase online food sales including beef. It is reported that during the 2020 Chinese New Year, online fresh produce orders increased fourfold due to outing restrictions (China Skinny, 2020). Going forward, consumer confidence is seen as a key issue among Chinese consumers with emerging concerns about food fraud including those affecting Australian beef labelling. Early work is underway to look at the potential of technology such as blockchain to ensure Chinese customers' confidence in buying Australian products (ABC Landline, 2019).

Table C: Factors driving online beef purchase and consumer issues in China

Factors driving online beef purchase	Issues facing e-commerce consumers
• Convenience • Trusted suppliers/platforms • A large range of product choices • Accessibility for consumers living in areas where specific beef products are not available at local brick and mortar stores • More information offered at e-commerce sites than at typical 'bricks and mortar' stores	• Perceived lack of freshness • Worry about food fraud • Worry about unsafe products

Source: Authors' compilation from various sources (MLA, 2018)

The growth of Indonesian agrifood e-commerce

There is no e-commerce platform dedicated for marketing food and agriculture products included in the top 10 e-commerce list in Indonesia. This contrasts with the importance of agriculture for the Indonesian economy. In 2018, while the agriculture sector only contributed to 12.8 per cent of Indonesian total GDP, nearly one-third (29%) of its total employment worked in the agriculture sector compared to industry (22%) and services (49%). The economic importance is more evident when looking at the agriculture sector's contribution to the rural economy.

Despite their absence in the top 10 e-commerce list, there has been a positive sign towards the growth of Agrifood e-commerce in Indonesia. Various reports including those looking at the impacts of COVID-19 on online shopping behaviours highlight the increased sales in food category (See **Box A**). Motivated by inefficient supply chains in the agriculture market as indicated by many middlemen, big price fluctuation, and price asymmetry between the consumer and producer levels, several Indonesian startups introduced applications focused on the buying and selling of agriculture products through the online system. In 2015, Kecipir and Tani-Hub launched followed by other Agrifood e-commerce platforms the following year. While it is difficult to find the data related to the contribution of Agrifood e-commerce to national agrifood sales, some e-commerce platforms reported an increase in

their sales during the COVID-19 pandemic. Sales at Sayurbox and e-tanee, for example, increased by fivefold and fourfold, respectively (detikFinance, 2020).

Box A. Resources on Indonesian e-commerce markets

Overview and trends: Austrade (2018, 2020), Hootsuite (2020), McKinsey (2018), Permani, et al (2020)

Statistics: iPrice (2020), Statista (2020)

Regulatory frameworks: ASEAN Briefing (2020), Baker McKenzie (2019), Cabinet Secretariat of the Republic of Indonesia (2017), Carl & Rahimi (2020)

Digital payments: Ipsos (2020), JP Morgan (2019)

COVID-19 effects on e-commerce: McKinsey (2020), Oxford Business Group (2020), RedSeer (2020), SIRCLO (2020), Wihardja (2020)

In contrast to non-agrifood marketplaces that have served customers outside Java Island, the market areas of agrifood e-commerce are still mostly confined to the Greater Jakarta region. Only few agrifood marketplaces have operated outside Greater Jakarta with the majority of customers still concentrated in big cities in Java and Bali. For example, in 2020, the market areas of TaniHub include Greater Jakarta, West Java (Bandung and Sumedang), Central Java (i.e. Solo), Special Region of Yogyakarta, East Java (Surabaya and Malang), and Bali.

Agriculture products offered by agrifood e-commerce range from fresh products (organic and non-organic products), frozen food, herbs and spices to animal-based protein. This wide range of products seems to reflect that these agrifood platforms have adopted the concept of “one stop shop”. There are also some e-commerce companies that focus on agricultural e-commerce selling input products such as seeds and fertilisers.

Only several Agrifood e-commerce platforms sell beef products in their marketplaces including Sayurbox, Brambang, Sikumis, Brambang, Panen Fresh, E-tanee, and Agripedia. It is worth noting that leading e-commerce in Indonesia such as Shoppee, Buka Lapak and Tokopedia also sell beef. One aspect to be further investigated is whether consumers prefer to use these ‘general marketplaces’ to Agrifood-specific e-commerce platforms.

Beef consumption and its determinants

Compared to other animal-based protein (fresh fish, chicken), per capita consumption of red meat in Indonesia is relatively low. From 2007-2018, the average consumption per capita of red meat remained static, only about 0.005-0.009kg per week or equal to 260-465g per year. This is because the price per kg of red meat is more expensive compared to the price of other animal-based protein. For example, on 17 June 2020, the average price of beef in DKI Jakarta was about IDR $124,512 per kg, while the average price of chicken and egg were about IDR $37,381 per kg and IDR $24,822 per kg, respectively (Informasi Pangan Jakarta, 2020).

Red meat is more likely to be purchased in urban areas than in rural areas. In 2018, the monthly per capita expenditure of beef in urban area was IDR $31,054, almost doubled compared to that of the rural areas (IDR $18,150). According to Susanti et al. (2018), beef can be categorised as a ‘luxurious’ product given its income elasticity that is larger than one (1.19). It is therefore expected that the expenditure per capita for beef will increase along with the increasing number of the middle-income class in Indonesia.

Indonesians consume beef mainly in two forms, unprocessed (freshly slaughtered, chilled, and frozen) and processed beef. Fresh beef is usually cooked into various popular dishes such as *rendang*, *semur*, and *soto*, while processed meat is usually consumed in forms such as sausages, meatballs, and floss. Before the COVID-19 pandemic, driven by increased household income, the number of restaurants in Indonesia also increased, which in turn increased the number of beef consumed outside of the home.

There are several factors that influence consumers to consume beef including household income and beef prices (EY Sweeney, 2018; Fatmawati, Rostin & Baso, 2016; Hasanah, Lubis & Khadijah, 2018; Zulkarnain, Asmawati & Sofyan, 2017; Susanti, Rindayati & Sahara, 2014) as well as change in family/personal circumstance, social media promotion, health perception (EY Sweeney, 2018) and the region where consumers live (Susanti, Rindayati & Sahara, 2014). The studies suggest that an increase in consumer income and reduction in beef price will increase beef consumption.

Other factors affecting beef consumption in Indonesia also include the availability of information about beef, socio-economic characteristics of the consumers and the social events. Information from social media related to recipes containing beef and nutritional content of beef can increase consumers' preferences towards beef. Socio-economic characteristics such as education and the number of household members are also determinant factors of beef consumption in Indonesia (Susanti, Rindayati & Sahara, 2014; Zulkarnain, Asmawati & Sofyan, 2017). Special celebrations, such as Eid-al Fitr celebration, the fasting month of Ramadan, Eid Qurban celebration also influence the consumption of beef. During these special celebrations, demand for beef usually increases resulting in a significant increase in the price of beef.

Besides those factors, there are also new trends of consumers to eat outside their homes. As such, the growing number of new restaurants serving meals such as Korean and Japanese restaurants containing beef plays an important role in increasing the consumption of beef meals outside the home (EY Sweeney, 2018). The frequency of eating outside the home occurs particularly among young consumers. This generation enjoy new culinary experiences and share their experiences through their social media accounts. It is important to note that Indonesian consumers prefer local beef to imported beef. Consumers perceive that compared to imported beef, local beef is fresher, better quality, cheaper, more tender, tastes better/sweeter, safer (less chance of contamination), and has lower fat content (EY Sweeney, 2018).

Online beef marketing channels

Looking at the retail segment of the beef supply chain, Indonesians buy beef from various retailers including wet markets, supermarkets, fresh-food peddlers and, now increasingly, the online market. The COVID-19 pandemic, followed by implementation of a large-scale social distancing order by the Indonesian government, has shifted shopping behaviour of Indonesian consumers from offline to online transactions.

Agrifood e-commerce operate quite distinct business models between one and another. While those business models are generally seen as shortening the farm-to-consumer supply chain, the types of intermediaries and contractual arrangements between e-commerce platforms and other chain actors differ significantly between one model and another. This highlights the importance of looking at a range of business models in a study to understand online beef marketing and consumer behaviours towards online beef purchase.

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

CREATE CHANGE

Contact us

Ms Alessia Anibaldi
Manager, International Development
The University of Queensland (UQ)

T +61 7 3365 4016
E : a.anibaldi@uq.edu.au

Authors:

Dr Dahlanuddin
University of Mataram, Indonesia

Dr Risti Permani
Deakin University, Australia

Dr Sahara
IPB University, Indonesia

Dr Kim Bryceson
University of Queensland, Australia

Dr Malcolm Wegener
University of Queensland, Australia