MEAT & LIVESTOCK AUSTRALIA

WHITE PAPER

The future of red meat distribution could be about to change forever

Adapting the focus from a chilled supply chain to emerging innovative ambient solutions could create a competitive advantage.

Executive summary

Since the early shipments of chilled red meat to European markets, the Australian meat industry has become both a major employer and a significant exporter of protein. Undoubtedly, a high proportion of the growth has been achievable through investment in strict hygiene interventions, improved chill capabilities and packaging innovation. Understanding that maintaining rigorous temperature control and minimising temperature fluctuations maximises product life has driven rigour and focus. Accessing and maintaining these complex chilled supply chains is expensive, and whilst a cost that all exporting countries must absorb to serve high growth markets, a change in the competitive landscape could be close. A first to market opportunity for early adopters or those involved in commercialising the technology could establish a significant advantage through a reduction in the cost to serve valuable export markets.

'Historically, industry has focused on maintaining the chill chain to maximise product life rather than investing in innovative solutions to provide access to new markets.'

However, the supply chain as it is today could be about to change forever, as several exciting start-ups focus on the ability to distribute meat at ambient temperature. Chilled supply chains would be replaced by supply chain solutions that are easier to access, cheaper to serve, and deliver a powerful sustainability message with important energy savings.

Introduction

Global meat markets are becoming increasingly price sensitive and in numerous cases built on transactional relationships rather than long term strategic partnerships. Briefly consider a country that has a distinct advantage with its red meat supply chain, longer life products and significantly lower distribution costs whilst delivering an industry-leading message focused on helping the environment and reducing food waste. Well-supported financially emerging technology focused on developing applications for ambient storage of foods has the potential to deliver these advantages and are potentially close to commercialisation. The way we distribute meat could change forever in the next decade. First to market adoption will ensure a competitive advantage and transform export trade.

Within this white paper we consider three international revolutionising technologies that have to date raised over $20m Australian dollars and if not operating commercially are getting ever closer. They are examples of academia and entrepreneurs listening to the changing dynamics within the global food market and committing resources that benefit the environment whilst also having the potential to remove significant cost from international supply chains.

Since the early shipments of chilled Australian beef to the UK in the 1930s, the Australian red meat sector and its global competitors have become heavily reliant on a temperature-controlled supply chain to maintain markets, access new markets and maximise product life. An intense focus on hygiene, temperature management, worlds best practice and interventions are all focused on gaining the maximum amount of life possible, likened to the search in the world of Formula 1 for hundredths of a second in that quest to win. Whilst these efforts have helped deliver strong commercial growth since the 1930s, is now the time to refocus some of that energy, expertise and investment to see what lies outside a chilled supply chain?

'Is the focus on chilled chain compliance limiting our growth potential?'

Three exciting technologies leading the way

In five years, over AUD $20m has been raised by three companies leading this area of development.

- One has been sold to the TATA Industries and is operating commercially across four sites globally.
- The second is producing French fries commercially in the USA for the QSR sector.
- The third, a Hong Kong based company, is undergoing a significant capital raise at present to commercialise the technology.

1. Farther Farms, USA (fartherfarms.com)

Farther Farms are applying Supercritical fluids under a patented process to preserve foods and utilises carbon dioxide operating above its critical point. A Supercritical fluid (SCF) is any substance at a temperature and pressure above its critical point where distinct liquid and gas phases do not exist, but below the pressure required to compress it into a solid. It can effuse through porous solids like a gas, overcoming the mass transfer limitations that slow liquid can transport through such materials. SCF are much superior to gasses in their ability to dissolve materials like liquids or solids. In addition, close to the critical point, small changes in pressure or temperature result in large changes in density, allowing many properties of a Supercritical fluid to be 'fine-tuned'.

The company initially focusing its resources and R&D on the global French fries market and is now producing French fries that are distributed and stored at ambient, exporting to five countries and delivering over 50,000 portions of finished products to consumers via QSRs.

Farther Farms' high-quality, shelf-stable foods reduce the reliance on cold storage infrastructure, expanding food accessibility and improving long-term supply chain sustainability. Farther Farms have an ambitious target to transform traditional supply chains for multiple food groups and see red meat as a future opportunity. Whilst recognising that their patented process has several applications offering sterilisation or pasteurisation, credibility in one existing food area makes this a fast-growing company to watch closely, or ideally forge a strategic partnership with. Early engagement providing access to industry leading red meat expertise and processing knowledge would position Meat & Livestock Australia (MLA) and the Australian red meat industry at the forefront of the future development of the technology and early adoption opportunities.

Figure 1: Farther Farms French fries

Source: Farther Farms

2. IXON Technologies, Hong Kong (ixon.com.hk)

IXON Technologies have developed ASAP, an Advanced Sous-vide Aseptic Packaging processing technology that under lab conditions claims to achieve ambient storage of meat portions for up to two years. The technology has been in development for two years and amongst its initial funders includes global players such as Tyson, Cargill, Sealed Air and Ecolab. Having studied the microbial risks of sous-vide as a university project, the two founders developed the technology and launched IXON in 2017. Patents are registered in key markets including the USA, Europe and China. The stated long-term strategy of the founders is to make the technology accessible to the market through a toll facility whilst also planning to offer end-to-end factory design solutions as part of its commercialisation. Verbal communication has confirmed that the largest pieces processed to date are ~6kg. With the limiting factor of the cost of trialing large primals rather than process capability, the technology is not currently suited to comminuted meats. Direct engagement with Sealed Air has confirmed that they are continuing to support IXON through a machinery loan agreement and external shelf-life validation.

Whilst recognising that this technology is at an early stage of its external validation, their patented technology, its focus on red meat and its potential to process portions and primals makes it one to watch closely. Continued engagement providing access to industry leading red meat expertise and processing knowledge would position MLA and the Australian red meat industry at the forefront of the future development of the technology and early adoption opportunities.

Figure 2: IXON meat

Source: IXON Technologies

3. 915 Labs (915labs.com)

915 Labs have developed MATS – Microwave Assisted Thermal Sterilisation. Developed in the USA and FDA approved, the process simultaneously immerses packaged foods in water and heats them with microwave energy at 915 megahertz. This rapidly eliminates pathogens and spoilage bacteria whilst claiming to retain valuable nutrients. As a start-up business with R&D support from global players such as Amazon, Tata industries, the Indian based conglomerate bought the business and are now operating four sites commercially around the globe, delivering their ambient ready meals. The company also offers MAPS which operates on a similar principle delivering pasteurisation instead of sterilisation.

Whilst recognising that this technology is commercially accessible, delivering ambient meals its wider potential to deliver supply chain innovation supporting the growth of red meat is of interest. Close engagement providing access to industry leading red meat expertise and processing knowledge would position MLA and the Australian red meat industry at the forefront of the future development of the technology and early adoption opportunities.

Figure 3: TATA Industries

Source: TATA Industries

Table 1. FW Red Meat Application

Farther Farms	Lab 915	IXON	
TRL 1 Basic principles observed	TRL 1 Basic principles observed	TRL 1 Basic principles observed	• Identification of new concepts and its integration, expected barriers, and applications. • Identification of materials and technologies based on theory. • Evaluation of potential benefits of the new concept over existing ones.
TRL 2 Technology concept formulated	TRL 2 Technology concept formulated	TRL 2 Technology concept formulated	• Enhanced knowledge on technologies, materials and interfaces. • New concept is investigated and refined. First evaluation about the feasibility. • Initial numerical knowledge. Qualitative description of interactions between technologies. • Prototyping approach and preliminary technical specifications for laboratory test are defined.
TRL 3 Experimental proof of concept	TRL 3 Experimental proof of concept	TRL 3 Experimental proof of concept	• First laboratory scale prototype or numerical model. • Laboratory tests of the technological element, but not the whole integrated system. • Identification of key parameters characterising the technology. • Verification of the proof of concept through simulation tools and cross-validation with literature data.
TRL 4 Technology validated in lab	TRL 4 Technology validated in lab	TRL 4 Technology validated in lab	• Small-scale prototype integrated with complementing subsystems at laboratory level. • Validation of the new technology through enhanced numerical analysis (if applicable). • Measurable Key Performance Indicators. • Prototype shows stable performance (either TRL4 or TRL5, depending on the technology).
TRL 5 Technology validated in relevant environment	TRL 5 Technology validated in relevant environment	TRL 5 Technology validated in relevant environment	• Large scale prototype integrated with components of supporting elements and auxiliaries. • Robustness is proven in relevant working environments. Prototype shows stable performance. • The process is reliable, and performances live up to expectations. • Other parameters concerning scale-up, environmental, regulatory, and socio-economic issues are defined and qualitatively assessed.
TRL 6 Technology pilot demonstrated in relevant environment	TRL 6 Technology pilot demonstrated in relevant environment	TRL 6 Technology pilot demonstrated in relevant environment	• Demonstration of the technology is fine-tuned to a variety of operating conditions in relevant environment. • The process is reliable, and the performances live up to the expectations. • Demonstration of interoperability with other connected technologies. • Manufacturing approach is defined (either TRL6 or TRL7, depending on the technology). • Environmental, regulatory, and socio-economic issues are addressed.
TRL 7 System prototype demonstrated in operational environment	TRL 7 System prototype demonstrated in operational environment	TRL 7 System prototype demonstrated in operational environment	• Full scale pre-commercial system is demonstrated in an operational environment. • Compliance with relevant environment conditions, authorisation issues, local/national standards is guaranteed. • Integration of upstream and downstream technologies are verified and validated. • Manufacturing approach is defined (either TRL6 or TRL7, depending on the technology).
TRL 8 System complete and qualified	TRL 8 System complete and qualified	TRL 8 System complete and qualified	• Technology has been experimented in deployment conditions and proven its functioning in its final form. • Manufacturing process is stable enough for a lowrate production. • Training and maintenance documentation are completed. • Integration at system level is completed. Full compliance with obligations, certifications, and standards of the addressed markets.
TRL 9 System proven in operational environment	TRL 9 System proven in operational environment	TRL 9 System proven in operational environment	• Technology proven fully operational and ready to be commercialised. • Full production chain is in place and all materials are available. • System optimised for full rate production.

Adapted from: TRL scale: s3Food

Technology Readiness Levels (TRL), developed by NASA, is a scale that can be used for estimating the maturity of a given technology for market. TRL 1 is the lowest, indicating the earliest stage for development for a new technology, and TRL 9 is the highest, indicating the technology is fully implemented commercially. The scale is used across industries such as auto, biotechnology and food. There are nine levels, which each represent a stage in the development of technology, from the first thoughts to the final technology.

New technology

With the growing importance of ESG for all businesses, reducing the traditional reliance on refrigeration whilst enabling access to new markets becomes commercially compelling.

Table 2: selected start-ups to watch

	FARTHER FARMS	IXON	915 LABS
Company	Farther Farms	IXON	MATS
Country	USA	Hong Kong	India
Tech	Supercritical fluids	Sterilisation	Microwave Assisted Thermal Sterilisation
Investment	AUD $12m	Targeting AUD $12 m in current fund raise	Acquired by TATA Industries
Product lifecycle	Commercially delivering ambient French fries into QSR	External validation of lab scale processing and capital raise to commercialise	Commercially delivering ambient meals in 4 global facilities

'The focus on ambient supply chains is driven by reducing costs, waste and saving energy, ultimately accessing new markets'

Begin the journey now

Whilst we are used to seeing great innovation from academia that has the potential to unlock value through the food chain, historically many great technologies have struggled to make that transition into industry. This has been the result of several limiting factors including funding, risk appetite from industry, IP protection or ownership and limited R&D budgets in industry. The ecosphere for innovation is clearly changing with the food sector working increasingly closely with academia and entrepreneurs supported by seed funding or VC to unlock value and scale innovative solutions at pace. This changing environment with the added focus on global sustainability increases the likelihood of companies or technologies such as these being successful.

In the same way that we have seen shopping habits change from instore to online and delivery in 15 minutes, or the investment in vertical farming, each changing the way in which we see the world as consumers. Embracing and engaging the development of these disruptive technologies now would enable Australian red meat to maintain a leadership position, provide valuable access to industry expertise, influence change and potentially achieve first to market advantage. It would also support industry in accessing a lower cost supply chain, reaching new markets and gaining a clear competitive advantage versus competing exporting countries. Failure to engage or observing from the sidelines could equally put the Australian red meat industry at a significant commercial disadvantage.

Table 3: market readiness and potential

Process	FARTHER FARMS	IXON	915 LABS
Technology			
Consumer acceptance / readiness			
Commercially available			
Market potential in five years?			

Key: High impact Low impact

A growth enabler for new markets?

Successfully developing a solution that enables access to an ambient supply chain would open new growth channels such as:

- global online channels
- global retail markets
- supply into developing countries with limited chill chain capabilities
- rations or emergency response meals
- space or sea travel
- hospitality / travel
- D2C with international reach
- meal kits or meat boxes.

Potential benefits

Adding value to the Australian red meat industry, via:

Reducing the cost via the removal of chill chain

Improved sustainability messaging through ambient distribution

Reduced food waste through extended life, less in store mark downs

Increased profitability through access to new markets lacking chill capability, i.e. India

Technology could be adopted in a staged approach, ambient chill chain, and retail display

Key considerations

Customer

Maintaining consumer confidence would be essential and as such, the initial benefits could be absorbed within the supply chain, with retail product displayed alongside traditional meat in a similar manner to plant-based milks alternating between grocery and dairy displays.

Commercial

The competitiveness of Australian red meat will be challenged by countries that access lower costs supply chains through early adoption of ambient chill technologies.

For long term growth and market competition, consider the full spectrum of opportunities.

- new technology to complement existing business
- hybrid approach to reach new markets / develop new channels whilst maintaining consumer trust

Ambient distribution of meat and extended storage could soon be a reality. Now is the time to be a forward-thinking business to adapt a leadership role embracing change and contributing to a robust operating model supporting the ongoing competitiveness of the industry.

Understanding the growth behind the development of Farther Farms, they identified a commercial opportunity based on first-hand experience. The co-founder references his time in India where not only were farmers faced with poverty and the country exposed to billions of Australian dollars in food waste, but his then business venture exporting potatoes from Western Uttar Pradesh to the Middle East found profitability significantly impacted by the need for a chilled supply chain. In the summer, the necessity to use refrigerated containers capable of carrying $2,770 AUD worth of product, cost $4,150 AUD to distribute, making a $1380 loss before the product was despatched. Shipping the same quantity in winter without the need for chilled transport costing just $132 AUD.

Additionally, looking at high interest countries such as Vietnam, where according to a recent USDA trade report current chilled capability is at 30–35% of the demand, its clearly limiting the ability for many businesses to unlock value in these markets through lack of access to chilled supply networks. It is highly likely that this demand issue will be reflected in other Asian countries whilst global logistic companies look to invest in capability and infrastructure targeting future growth. This creates an opportunity for those businesses that can take advantage of an ambient supply chain.

Taking control and driving change

In the view of the author, there is a clear opportunity to play a pivotal role in the future direction and growth of the Australian red meat sector through strategic engagement with each of the companies discussed in this paper. Providing SME for the red meat sector to support the ongoing development of this technologies with a focus on red meat applications is critical, along with access to suitable funding. If they are proven through investment and resource first to market advantage they will be powerful.

Recommendations

- Strategic engagement with each company positioning Australian red meat at the forefront.
- Commitment of funding through a gated process to support red meat trialling and validation, lead at pace and facilitate fact-based decision making, with engagement of Campden (UK) or CSIRO supporting validation design processes.
- View the technology firsthand to better understand its capabilities and potential limitations.
- Engage a strategic resource to liaise and support the development of the technology representing MLA and building the relationships.
- Deliver an industry update communicating the work delivered to date and start building interest and awareness.

Partnering with MLA Donor Company (MDC)

Interested parties are invited to discuss with MLA potential collaborative research co-funding submissions via MLA Donor Company (MDC) – see mla.com.au/about-mla/what-we-do/mla-donor-company/

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Prof. Consulting is a Melbourne-based food and grocery consulting business, with teams in the UK, Germany, and the USA. They are committed to helping businesses grow through a better understanding of technology and the changing needs of today's consumers.

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MEAT & LIVESTOCK AUSTRALIA

PO Box 1961
North Sydney NSW 2059
P: 02 9463 9333
E: info@mla.com.au

mla.com.au