



Beefing Up Blockchain

How Blockchain can
Transform the Irish Beef
Supply Chain

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Introduction

How Blockchain can Transform the Irish Beef Supply Chain

The demand for beef continues to grow with the global production of beef and veal set to reach 63 million tonnes and global exports are forecasted to increase by 5% to 10.5 million tonnes in 2018.¹ This emphasises the need for end-to-end traceability, quality and safety assurance globally. Traditional supply chains need to be transformed to meet these requirements and it is proposed that this is achieved by utilising new technologies such as Blockchain, Internet of Things, Augmented Reality and Data Analytics.

This report focuses on Blockchain and the value it can generate when applied to the beef industry. The technology will equip the industry with the ability to provide market regulators and consumers with a new level of transparency and assurance in food quality and safety.

The six use cases identified for the technology, presented in this report, that can create significant value for the industry's end-to-end supply chain and more over sustainability and safety are:

01. Grass Fed Assurance
02. End-to-End Traceability
03. Trade Finance
04. Consumer Engagement
05. Consumer Feedback Loop
06. Certification

This report focuses on the beef industry in Ireland, the world's fifth largest net exporter of beef where 90% of production is exported, the benefits of Blockchain and the identified use cases that can be implemented globally. From an Irish perspective, Blockchain can align to existing initiatives such as Origin Green to increase sustainability and to position Ireland with a tangible differentiator by way of Blockchain's transparency and value chain impacts.

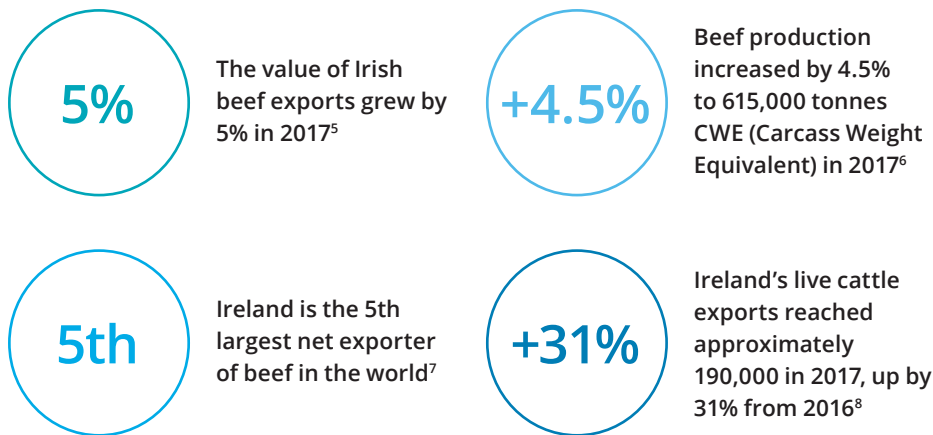
To demonstrate how Blockchain is already transforming the beef supply chain, the report showcases a case study from Wyoming Beef Producers who are in the process of implementing "Beefchain™". This allows the rancher to receive a premium price for beef and provides consumers with greater confidence in beef they consume.

Finally the paper concludes with next steps for participants within the beef value chain on how to progress a Blockchain initiative.

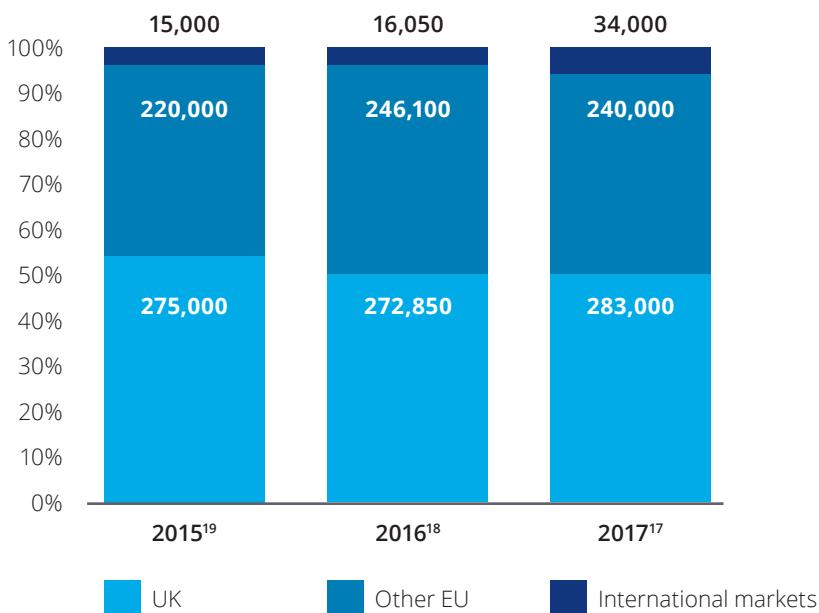


The Importance of the Beef Industry to Ireland

Beef production is widespread across Ireland. Last year the national suckler cowherd stood at 870,567.² In 2017, the industry accounted for a fifth of Ireland's €12.6 billion food and drink exports³. Despite weakening sterling due to Brexit uncertainties, the UK remains the primary destination for Irish beef.⁴ Post-Brexit, expanding Ireland's international presence outside the UK and Europe will be key to this sector's sustainability. However, international growth is not guaranteed. Large beef exporting nations such as the US, Brazil, Argentina and Australia are also competing and vying for their position in the so-called "luxury beef markets" of Singapore, Hong Kong, China, South Korea and the UAE. Rising competition will drive Ireland's need to differentiate.



Irish Beef Exports (Tonnes, CWE)



International Market

Current

In 2017, Irish beef exports performed strongly in international markets increasing by 4% overall (tonnes CWE). International exports experienced an increase of 37% (tonnes CWE) and accounted for 6% of the total beef exports.⁹

Future

During 2015–2050 the world's population is expected to grow from 7.3 to 9.7 billion, with global income per capita almost doubling.¹⁰ The majority of this growth is expected in developing countries. Three billion consumers are expected to join the middle class over the next 20 years.¹¹ Projections suggest that the population and global income growth will increase demand for meat by almost 50% by 2050.¹² This growth is due to higher income levels and increasing urbanisation in developing countries allowing consumers to raise their protein consumption relative to starches.¹³

2050 meat consumption projections

Asia

224 million tonnes¹⁴

Africa

71 million tonnes¹⁵

China

29% of additional global meat consumption during 2016-2026¹⁶

Challenges Facing the Irish Beef Industry

Brexit

As Brexit negotiations continue, the probability of the UK leaving the single market is a growing concern for Irish farmers. It is widely anticipated that regulatory and administrative costs will rise. Trading will become more complex and there will be restrictions on the transit of goods through the UK market. A recent Bord Bia report suggests that Brexit will see trading costs between the UK and its trading partners rise by approximately 5%.²⁰

The triggering of Article 50 may lead the UK to form new international trade deals with large beef producing nations and Commonwealth countries. It may also accelerate the formation of new trade deals between the EU, other nations and trade blocs, such as Mercosur. This would result in a significant increase in competition for Irish beef within the UK & EU market on both value and quality.

Should a 'no deal' Brexit materialise, trade relationships between Ireland and the UK may revert to World Trade Organisation (WTO) rules. According to the Minister for Foreign Affairs, Trade and Brexit, Simon Coveney, a trade relationship governed by the rules of WTO would be devastating for the agri-food trade between Ireland and Northern Ireland and Ireland and the UK as a whole. Tariffs on beef under the WTO rules would be up to 60%.²¹

Regulation

Industry scandals, such as the horse meat, weak flesh and bovine spongiform encephalopathy episodes, have contributed to uncertainty about food quality. Safety is a growing concern for consumers. The ability to demonstrate continued compliance with both domestic and international food regulation standards will be essential for Irish producers seeking to penetrate international markets.

Complex Supply Chains

Bord Bia's Brexit barometer risk analysis report²² shows that the supply chain is at high risk due to uncertainty about the UK's future trading relationship with the EU. In complex supply chains, it is anticipated that lead times and costs will be negatively impacted. Low cost business models and customer relationships could also be adversely affected. 100% of beef industry respondents contacted for the Bord Bia report stated that their commercial model is moderately or highly dependent on low supply chain costs.

The World Health Organisation have called for greater collaboration between governments, producers and consumers to help ensure food safety given the cross border nature and complexity of food supply chains.²³

Safety and Traceability

The Food Wise 2025 outlook report²⁴ states that Ireland's recognised world standards for food quality, safety and traceability will need to be maintained and enhanced to ensure continued growth across international markets. Currently, over 90% of Irish food and drink exports originate from verified Origin Green members.²⁵

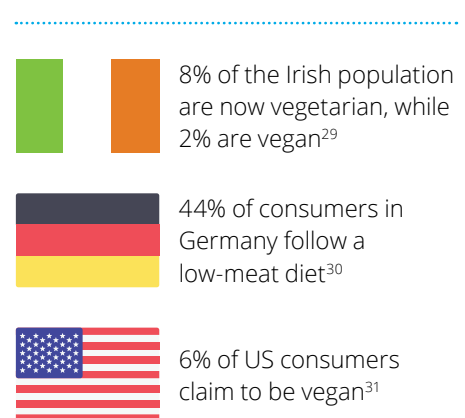
Communicating Ireland's commitment to food quality and safety, as well as its 'Green' image and grass diet, will be essential for future international growth. As Minister for Agriculture Michael Creed recently stated, "Food safety is a really important issue. We have to be best in

class in quality, safety, nutritional value, recall capacity and sustainable production which are all important to the consumer now."²⁶

The Food Wise 2025 outlook report²⁷ claims food scandals across the world have had a negative impact on consumer trust towards producers and increased an awareness of the dangers of complex supply chains. Rebuilding trust will require demonstrable quality, value, transparency and traceability. The report also argues that an increased focus on consumer demands must be central to future investment in research and innovation.

Consumer Trends

Consumer needs and expectations continue to evolve. In recent years, consumers have become more health conscious and interested in the ingredients that make up the foods they consume. In line with this trend, diets are becoming more diverse with a gradual shift towards healthier foods. According to Just Eat (the world's leading online takeaway ordering service) plant-based food options will continue to expand in response to demand from image and health conscious, social media savvy consumers. In 2017, Just Eat recorded an increase of 987% in demand for vegetarian foods and 33% of the company's restaurant partners now provide dedicated vegan and vegetarian options.²⁸



“Food safety is a really important issue. We have to be best in class in quality, safety, nutritional value, recall capacity and sustainable production which are all important to the consumer now.”

- Michael Creed, Minister for Agriculture, Food and the Marine

Dietary Transition

The dietary transition is primarily impacted by consumer awareness. Consumers have become more concerned about ethical production, the environment, animal wellbeing and the potential health effects of animal products. Social media, influencers and other channels of communication are significantly influencing this. Netflix for example has a streaming subscriber base of over 120 million people

and the publication of health-focused documentaries such as 'What the Health' and 'Cowspiracy' are increasing consumer awareness and focusing consumers to re-evaluate their dietary choices.

The Irish Farmers Journal recently highlighted key messages from the World Meat Congress 2018, quoting Roxi Beck from the Center of Food Integrity. Beck stated that 65% of the general public want

to know more about their food and where it comes from, including information about animal welfare standards, disease history and rearing systems. Beck also pointed out that the food industry needs this data for tomorrow's consumer.³²

Consumer value drivers relating to purchase decisions³³



- **Traditional value drivers**
49% of consumers said they weighed traditional value drivers more heavily
- **Evolving value drivers**
51% of consumers said they weighed evolving value drivers more heavily in their purchasing decisions

Consumer demand for transparency is shaping the food industry³⁴



37% of consumers would be willing to switch brands if another brand shared more detailed product information



75% of consumers do not trust the accuracy of food labels



71% of consumers consider whether they have access to the full list of ingredient information for a product when making food purchase decisions

66

Commissioner Phil Hogan, European Commissioner for Agriculture and Rural Development :

"We are currently witnessing major developments in technology with agriculture benefitting from advancements in enhanced data analytics, robotics and with scope for further exploration in artificial intelligence and Blockchain. These technologies can help our agri-food sector to maintain the highest levels of efficiency, quality, safety and sustainability, thereby supporting continued growth and competitiveness."

Sustainable Farming

Ireland produces some of the highest quality food in the world and is committed to leading the way in food safety, traceability and sustainability standards. There is a unique opportunity to build on the extensive work already completed in the sector to gain increased market share and command premium prices by showcasing and verifying the sustainable credentials of the Irish beef industry.

Quality and Traceability

Irish Cattle Breeding Federation (ICBF) was set up to benefit Irish farmers, the agri-food industry and wider communities through genetic gain. The ICBF provides a sustainable improvement in genetics, meaning parents of the next generation are genetically superior to their counterparts. The ICBF database holds information on the majority of animals registered nationally.³⁵ The beef database is the largest genotype database in the world. It enables Ireland to conduct genetic analysis of newly reported genetic traits and defects as well as the ability to reduce genetic disease risk and provide greater clarity into the genomics of fertility and feed efficiency.³⁶ These vast data sets enable Ireland to have a major impact on food sustainability, farmer livelihood, and environmental impact.³⁷

Bord Bia (The Irish Food Board) manage the Sustainable Beef and Lamb Assurance Scheme (SBLAS) which provides assurance that meat is produced sustainably on farms that are certified members of an accredited Quality Assurance Scheme. The scheme provides a uniform mechanism for recording and monitoring quality assurance criteria, and sustainability criteria for beef and sheep farms. The Standard (and the Scheme based on the Standard) is accredited to the International Standard for Product Certification ISO 17065:20122 by the Irish National Accreditation Board. Each farm is audited by an independent auditor every 18 months and is assessed for compliance against the criteria outlined within the respective standard.³⁸

Environmental and Social Sustainability

In 2012, Ireland launched Origin Green, the world's first food and drink sustainability programme operating on a national scale, uniting the Government, the private sector, farmers and food processors.³⁹ Manufacturers, retailers and foodservice members of Origin Green commit to personalised sustainability objectives for a 3-5 year time period. The process for farmers involves independent farm audits and Bord Bia's Sustainable Assurance Schemes and Quality Assurance Schemes.⁴⁰ Origin Green's 2016 report outlines significant potential for emissions reduction within beef (7%) and dairy (14%), based on successful achievement of the individual improvement targets by the cohort of participating farmers.⁴¹

Carbon Emissions

Although Ireland has the 5th lowest carbon footprint for beef in the EU⁴², agriculture remains the largest contributor to Ireland's Greenhouse gas emissions accounting for 33.1% of the total.⁴³ This reflects the fact that agriculture represents a much larger proportion of our economy than other European countries. The European Union has set Ireland a challenging target for greenhouse gas emissions reduction; 20% reduction on 2005 emissions levels by 2020.⁴⁴ Emission projections by the Environmental Protection Agency (EPA) suggest that, by 2020, less than 1% of the target will be achieved.⁴⁵ In fact, in comparison to 2016 levels, agriculture emissions are predicted to increase by between 3.3% and 4.4% by 2020 due to increased milk production.⁴⁶

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Alyce Butler, Senior Manager & Agri-Food SME in Deloitte Netherlands:

"Blockchain represents an opportunity to contribute to major challenges facing food production: transparency, trust, ecosystem connectivity, and simplicity in an evolving and increasingly complex landscape."

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Seán Farrell, Head of Agriculture, Bank of Ireland Business Banking:

"Fundamentally, if the use of Blockchain drives efficiency for farmers in the execution of contracts and payments, adds visibility and confidence in traceability without layering on an extra administrative burden then the sector should absolutely be embracing this technology. However its use must see a greater benefit to the business in the form of returns from the market or by removing costs that increase overall margins. These increased margins would need to be shared between the retailers, processors and farmers. Deciding who gets what percentage of the increased margin will be where the debate might get interesting!"

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Andrew Gibbs, Partner and Beef Industry SME in Deloitte New Zealand:

"Blockchain has the potential to provide an opportunity for Farmers and consumers to re-establish a trusted direct connected relationship."

The Beef Data and Genomics Programme (BDGP) is a six year programme launched in 2015 under Ireland's Rural Development Plan. The plan aims to deliver genetic improvement in the beef herd and reduce carbon emissions and increase profitability.⁴⁷

The smart farming, a voluntary initiative led by the IFA in conjunction with the EPA⁴⁸, aims to reduce costs for farmers and increase savings by focusing on eight key areas, which have been identified as having the highest costs on farms.⁴⁹

Sustainability of the beef industry will require a sustained commitment to the existing sustainability programmes as well as continued endeavours to revolutionise current practices to achieve continued growth within the industry. Consolidated data capture, supply chain collaboration and capacity building will be a key enabler of growth and sustainability.

“

Professor Robert Banks, Director of Animal Genetics and Breeding Unit (AGBU) at the University of New England:

“Genetic improvement is completely dependent on data, and the data needed should be collected from various points in the value chain. Facilitating the collection and sharing of the data will add considerable value, but is only likely to happen efficiently when there is good tracking of sources, which Blockchain can deliver. Increasingly, value chain partners who share data will want to monitor closely the costs of data collection and the way that returns from its use are distributed, and these goals too will be assisted by Blockchain technology. Genetic improvement of livestock will increasingly depend on these abilities to collect and monitor use of data from multiple sources through the value chain – and these dependencies will grow rapidly, at least in those value chains that seek to maximise consumer value and acceptance of the production system.”

“

Professor Banks, Elly Ana Navajas (MSc, PhD), National Institute of Agricultural Research of Uruguay:

“In modern animal breeding and selection, information is power given that decisions leading to genetic (and economic) gains are based on estimates of breeding values. This information, which is key for the decision making process at the producer and breeder level, is the result of merging and processing different types and sources of data. Nowadays, the genomic era provides new opportunities to deliver more and better information, with the challenge of collecting and merging larger databases from different origins, even countries, to successfully exploit its potential.”



What is Blockchain?

Blockchain is a distributed ledger technology which records that a transaction happened, when it happened and that it happened correctly. It is a decentralised network based on cryptography that uses peer-to-peer consensus to validate transactions. Data on the Blockchain is stored in time-stamped blocks which are chronologically linked by cryptographic hashes. Records on the Blockchain are immutable which means that after-the-point manipulation of data is prevented. Accuracy, traceability and trust are key Blockchain advantages.

Blockchain also offers an adaptable smart contract feature. This has the potential to enhance the trade process within the beef industry. Smart contracts are digitally coded contracts that self-execute when contract conditions are satisfied. In essence, they use an 'If-This-Then-That' function. They are structured in a way that

can reduce time-to-market by eliminating manual processes and the use of paper documents. Having all parties connected to the Blockchain creates transparency and enables faster decision making. The ability of smart contracts to automatically execute payments removes the need for trusted intermediaries to verify transactions. This allows two parties to transact directly with each other.

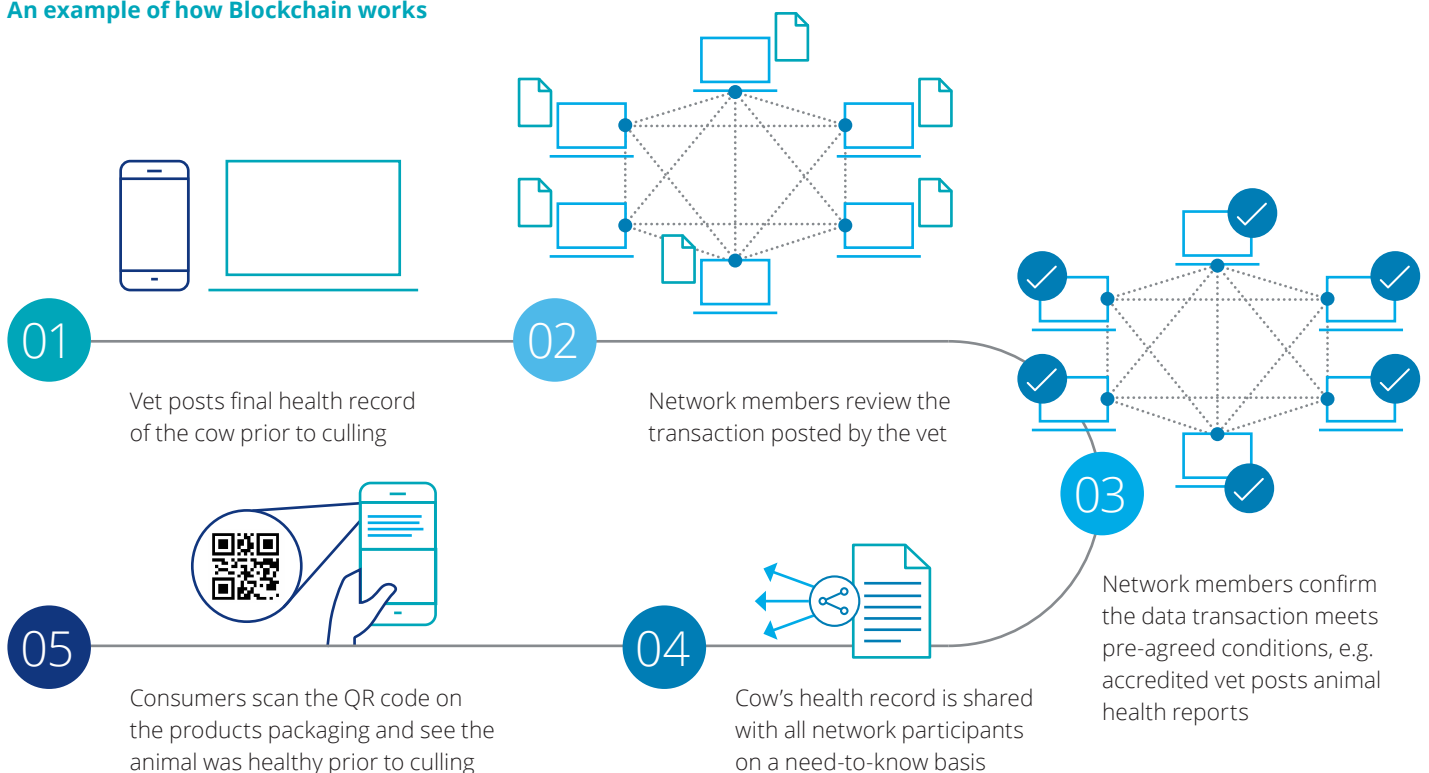
Information stored on the Blockchain can be made public or can be broadcast within a permissioned network where each participant has read and/or write access to some or all of the data on the Blockchain. Adopting Blockchain does not mean replacing systems that are already in place and effective. Instead, Blockchain sits on top of these systems and is connected through an Application Programming Interface (API). Blockchain is an exponential technology that can

revolutionise competitiveness without significantly altering effective internal ways of working. It will enable the storage and sharing of information, the removal of manual processes and digitalisation of documents.

Blockchain's Role in the Beef Industry

Currently, the challenges facing the beef industry are managed using traditional communication methods. However, the industry is becoming increasingly competitive and consumers are more demanding. Technology is advancing at a rapid pace causing transformational changes. Blockchain has the ability to radically change the way businesses interact with consumers (and each other) and can provide differentiation and competitive advantage for organisations and industries.

An example of how Blockchain works



Benefits of Blockchain for the Beef Industry



International Trade

- **Lower supply chain cost** — By sharing consistent information with all supply chain participants, Blockchain can reduce duplication and incompatibilities across communication points and manual processes which delay the shipment of goods
- **Quality assurance and differentiation of beef from lower cost competitors** — Blockchain disrupts the current methods used to convey food quality and safety adherence and will differentiate by enhancing traceability and trust
- **Streamlined import and export processes** — Blockchain provides full transparency in the end-to-end order and delivery process by removing third party participants



Regulation

- **Immutable time-stamped, signed, auditable record** — Blockchain prevents after-the-point manipulation of data and provides a single source of truth
- **Adherence guarantees** — Blockchain is a decentralised technology as all data is reviewed and validated by the network, ensuring validity and accuracy of data
- **End-to-end traceability** — To be effective, Blockchain technology requires multiple party participation, which can often include a regulator



Cost & Performance

- **Internal administration cost savings** — Blockchain reduces the requirement for manual processes and paper usage
- **Reduced time-to-market and better, faster decision making** — Accurate, up-to-date information is available to all participants
- **End-to-end supply chain visibility** — Blockchain enables each supply chain participant to post handling information to the network



Safety and Traceability

- **Transparency of all supply chain nodes** — Blockchain's innate transparency helps ensure all members conduct business according to agreed standards and procedures
- **Adherence to policies, processes and procedures** — Blockchain's immutable store of data improves audit processes by reducing manual processes and documentation
- **Food safety guarantees through accurate, up-to-date management of quality assurance certificates** — Accurate, up-to-date quality assurance certificates can be stored on the Blockchain and shared with need-to-know parties



Trends and Assurance

- **Enables the Irish beef industry to fit into hi-tech and evolving food service sectors** — Blockchain is an emerging technology today, but could become a mandatory platform for traceability within the food services sector. It has the potential to create new opportunities for consumer interaction as well as a means to gather market intelligence
- **Enhanced shopping experience** — Blockchain could enhance the shopping experience for consumers by providing them with end-to-end supply chain information through an augmented reality experience
- **Assists in addressing the threat posed by the meat-free sectors** — Paired with augmented reality, Blockchain can enhance the communication of sustainable and ethical farming practices, and convey the health benefits of meat consumption to consumers in a trustworthy and engaging manner



Sustainable Farming

- **Best Practice Farming** — Blockchain combined with advanced data analytics will enable farmers to obtain an insight into their own farm performance metrics
- **Facilitate full end-to-end visibility** — Blockchain will provide full farm to fork visibility which will enable the collection of data to assist beef farming practices
- **Assist Ireland in meeting its agri carbon emissions target** — The capturing of data and facilitation of information sharing can assist in reducing agri carbon emissions

Blockchain on the Farm

The application of Blockchain technology at a farm level must be seamless. Existing farming practices should not be disrupted in order to enable adoption nor should farmers be hit with large financial burdens.

The technology will provide farmers with greater transparency across the food chain giving them access to valuable Information.

How will farmers use Blockchain?

Farmers will interact with the technology without realising.

Blockchain is the underlined technology that the ecosystem will exist on similar to the way the Google search engine operates on the internet. Farmers will use smart phone devices and personal computers to interact with the Blockchain. User interfaces (the on screen display) will be created to ensure ease of use for all levels of technical literacy.



President Joe Healy, Irish Farmers Association:

“Farmers are dedicated to producing the highest quality food. We are the foundation of the food chain and anything that helps us produce our beef more efficiently through speeding up transactional and regulatory elements of the supply chain is welcomed. Another benefit of Blockchain that we can see is that it now gives consumers new ways to understand how we farm to the highest standards, the quality assurance schemes we adhere to and how committed we are to producing best-in-world beef.”

Benefits for Farmers



Food chain visibility

An end-to-end Blockchain solution will afford farmers the opportunity to obtain visibility outside the farm gate, right through to the end consumer. Farmers will finally have permission to obtain unfiltered consumer feedback and gain a better understanding of the handling points across the food chain.



Seamless interactions

Farmers will be able to trade cattle securely between each other and through intermediaries such as cattle dealers and marts seamlessly. Farmers will have access to legitimate animal records prior to making purchase decisions enhancing trust and assurance. Blockchain will keep a store of all transactions ensuring regulatory requirements are obeyed.



Best practice knowledge sharing

Blockchain combined with advanced data analytics will enable farmers to obtain an insight into their own farm performance metrics. Analytics will enable best in class practices to be shared with farmers across the network enabling greater education and adoption of efficient farming practices nationwide.



Improved document management and loan approval

Blockchain allows for the digitisation of assets and storage of data eliminating the need for paper work at farm level. The capturing of farm data will enable performance benchmarking of farmers. This can potentially act as an input for the sustainable development of the farmers operation as well as enhance finance applications.



Blockchain Use Case

Grass Fed Assurance

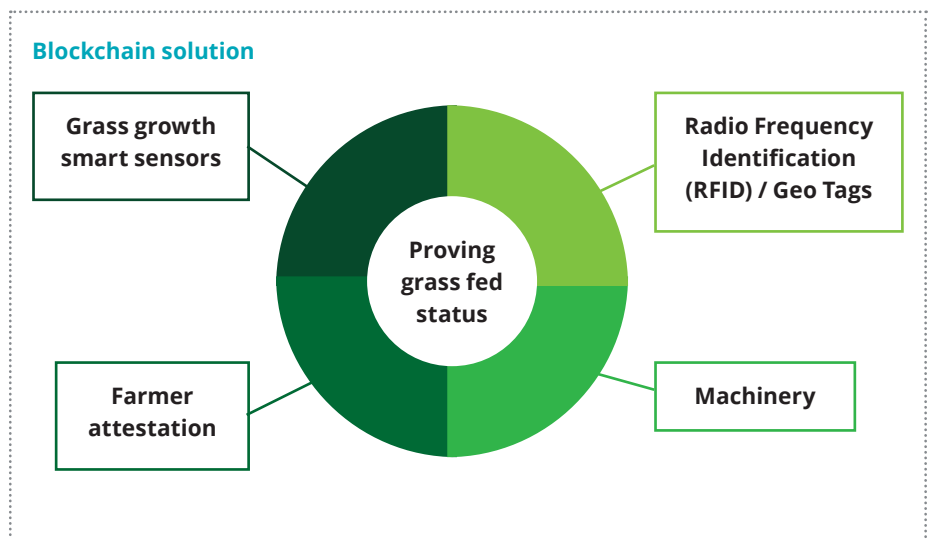
Blockchain technology has the ability to prove with confidence to market regulators, retailers and consumers that Irish cattle are predominantly grass fed and graze on open pastures for the majority of the year.

Current Model

- The diet plan of Irish cows is predominately comprised of grass consumption supplemented on occasion by grains
- No clear classification of what “Grass Fed” means
- Lacks the ability to prove cows are “Grass Fed”
- Can be misinterpreted and cause confusion for consumers

Blockchain Model

- Blockchain can communicate with existing smart farming devices such as smart feeding machinery and cow collars which will give clarity on the cows diet
- Unaltered information extracted directly from smart farming devices and posted to the Blockchain
- Provides an immutable audit trail of the animals diet throughout its life
- Ability to prove to consumers and regulators cows follow a grass based diet



Why Blockchain for Grass Fed Assurance

- Blockchain can pair with existing Internet of Things (IoT) devices
- Enables the sharing of data amongst Blockchain participants
- Blockchain enhances the audit process as it stores an immutable history of transactions
- Acts as a single source of truth

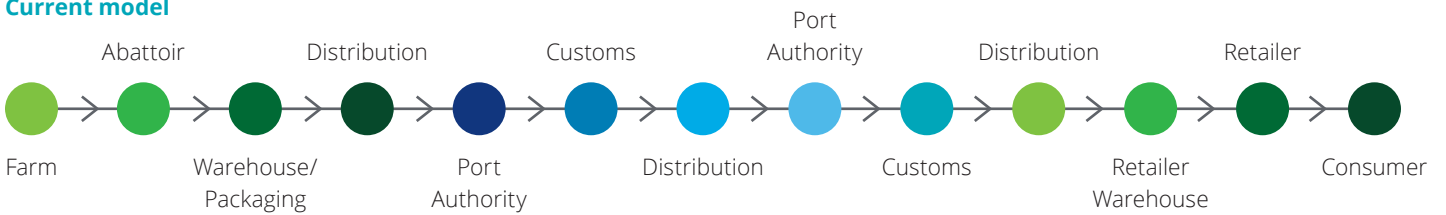


Blockchain Use Case

End to End Traceability

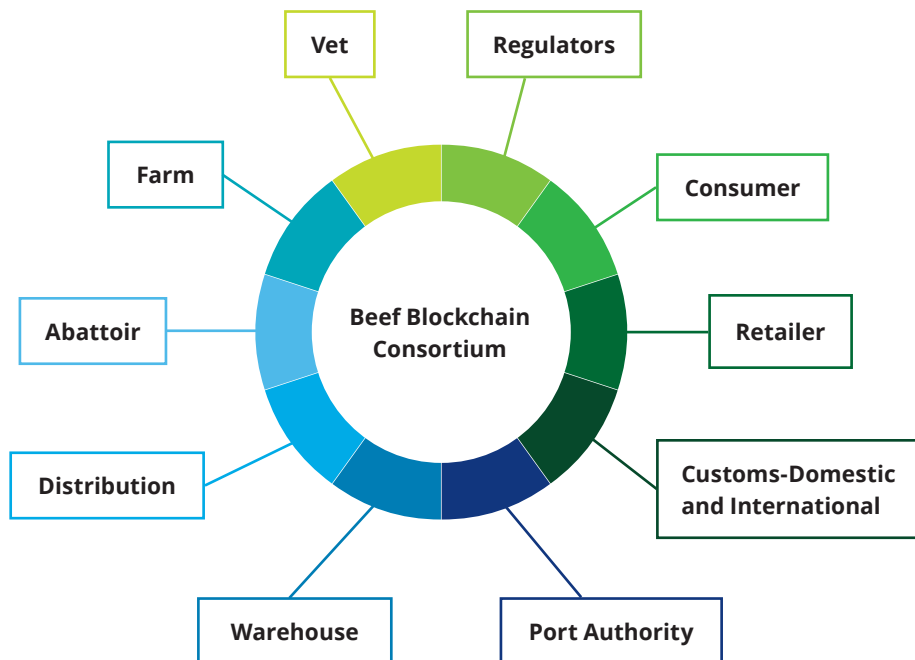
Blockchain solutions can be used to clearly identify when Irish beef products change hands. This improves transparency and demonstrates Ireland's commitment to beef quality and safety.

Current model



Blockchain Model Example

Data from all nodes is posted to the Blockchain and can be seen by the Blockchain network. Other members can be added and additional data can be collected as required. Sensitive data can be made private to ensure business competitive practices are not exposed.



Blockchain Model Example

Vet

- Date of visits
- Nature of visits
- Animal's health report
Vaccination/treatment history

Farm

- Animal's birth/arrival date
- Farmer's registered name
- Farmer's quality assurance certificates
- Animal's health and dietary plan

Abattoir

- Animal arrival date
- Farmer's name
- Animal's health status
- Date of slaughter
- Expiry date of beef
- Cuts made

Distribution

- Hauliers details
- Driver details
- Consignment details
- Consignment condition
- Date of departure
- Date of delivery
- Bill of lading
- Export documents

Warehouse

- Beef arrival date
- Consignment condition on arrival
- Date of departure
- Export documents

Port Authority

- Container clearance status
- Date of arrival/departure

Customs-Domestic & International

- Consignment details
- Export documents
- Sign off details

Retailer

- Date of delivery
- Sign off details

Consumer

- View the product's life cycle from farm to shelf
- Option to write product reviews

Regulators

- Auditing for domestic and international regulators is simplified as all information is stored digitally
- Share up-to-date records of all quality and safety certifications issued



Why Blockchain for end-to-end traceability

- Creates an open, interconnected supply chain network with consistent real-time information available to all participants
- Allows permissions to be set for read, write, audit and other actions
- Provides full visibility of all supply chain handling points
- Provides a single source of truth across the supply chain
- Enables better supply chain flexibility, transparency, conformance and stakeholder engagement
- Strengthens Ireland's commitment to food safety and quality by providing full supply chain disclosure
- Highlights non-compliant behaviours within the supply chain



Blockchain Use Case

Trade Finance

Deloitte has re-imagined how trade finance can leverage a Blockchain based infrastructure to drive efficiencies and reduce the exporting cost base.

Trade finance pain points



Manual Contract Creation

The import bank manually reviews the financial agreement provided by the importer and sends financials to the correspondent bank



Multiple platforms

Since each party across countries operates on different platforms, miscommunication is common and the propensity for fraud is high



Invoice Factoring

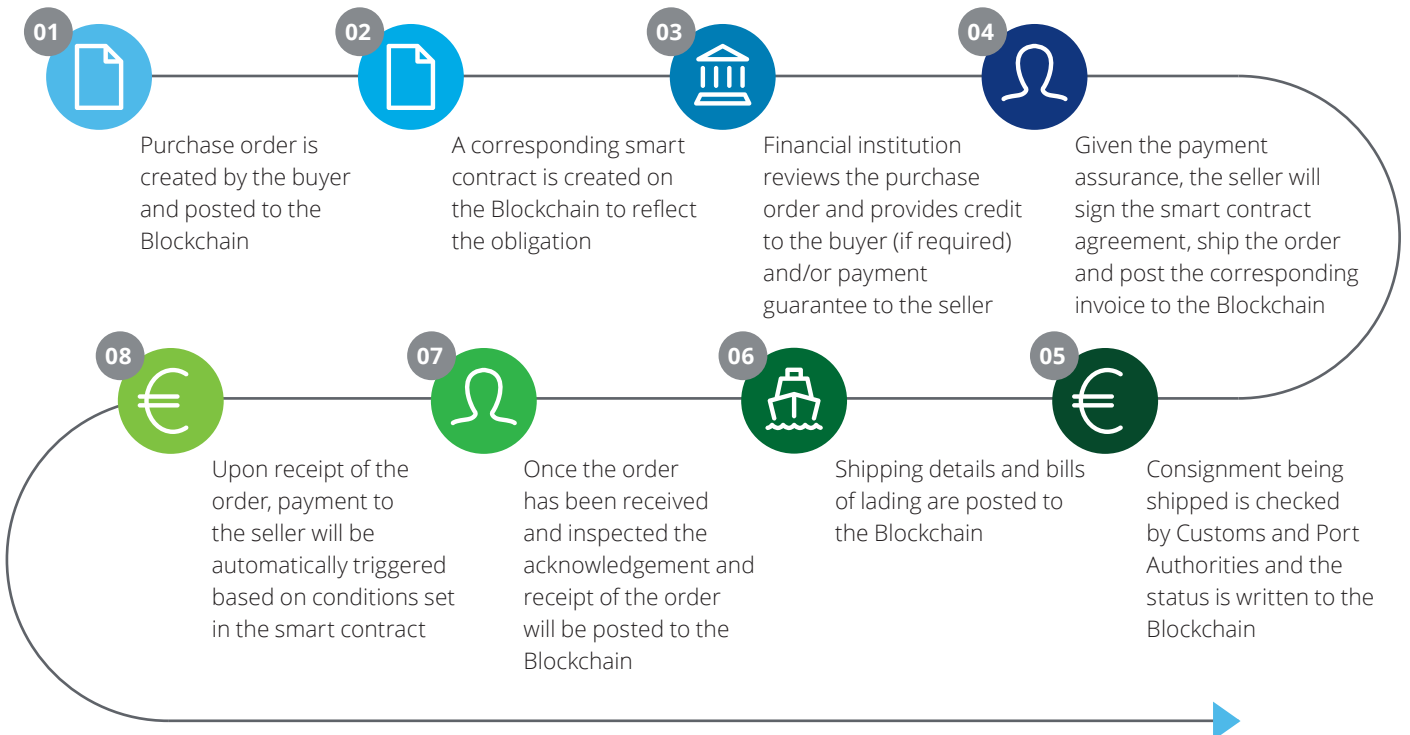
Exporters use invoices to achieve short-term financing from multiple banks, adding additional risk if the delivery of goods fail



Delayed Timeline

The shipment of goods is delayed due to multiple checks by intermediaries and numerous communication points

Blockchain Trade Finance Journey



Why Blockchain for Trade Finance

- Removal of correspondent banks
- Automatic contract settlement once contract conditions are met
- Full transparency in the delivery and ownership of the order
- Real time review and approval of documents
- Full transparency of the end-to-end order to delivery process
- Consistent information available to all participants
- Reduction in manual processes and paper usage



Blockchain Use Case

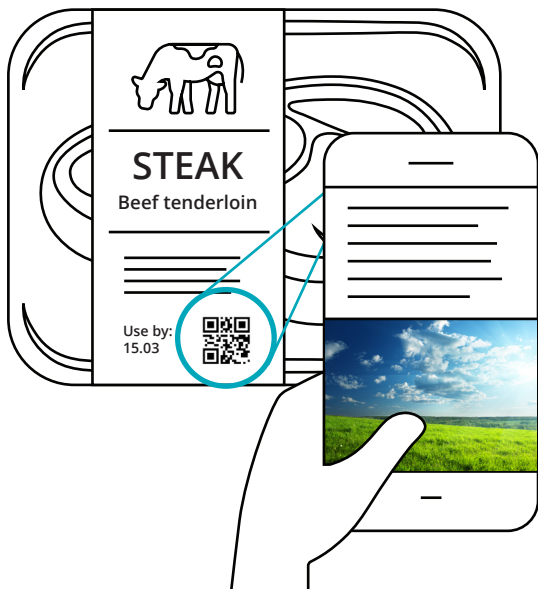
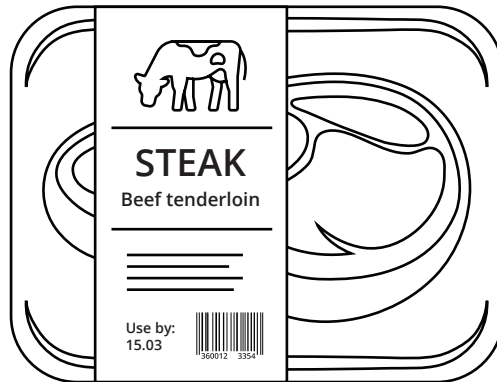
Consumer Engagement

Building a solution on a Blockchain platform empowers consumers to verify and check the authenticity of products in-store. Creating greater consumer confidence and trust.

Current Model

Current labelling practices share product information with the consumer, such as:

- Product description
- Best before dates
- Origin of the beef product
- Quality standards



Blockchain Model

QR codes located on product packaging give the consumer access to the information stored on the Blockchain through an augmented reality experience. This provides consumers with product information that aligns with evolving purchase drivers and consumer trends.

The consumer will be able to use their smart mobile device to scan a QR code which will provide them with detailed information about the product's journey to the shelf.

To align with the growth of online retail a hyperlink can be added to webpages. This will enable consumer access to the information stored on the Blockchain to enable informed purchase decisions.



Why Blockchain for Consumer Engagement

- Reassures and establishes consumer trust in Irish beef
- Provides a competitive advantage over competitors on the shop floor
- Provides retailers and market regulators with confidence in Irish beef
- Acts as a Unique Selling Point for retailers
- Aligns with evolving purchase drivers and hi-tech food service sectors



Blockchain Use Case

Consumer Feedback Loop

A Blockchain enabled consumer feedback loop will offer consumers an effortless and comfortable environment for providing product reviews. It will ensure all food chain participants have access to accurate consumer feedback received directly from the consumer.

Importance of Consumer Feedback

Having access to accurate, up-to-date consumer data is critical in ensuring brands continue to remain competitive within hypercompetitive market spaces. Market intelligence will assist in the pioneering of successful new product innovations and drive continued growth.

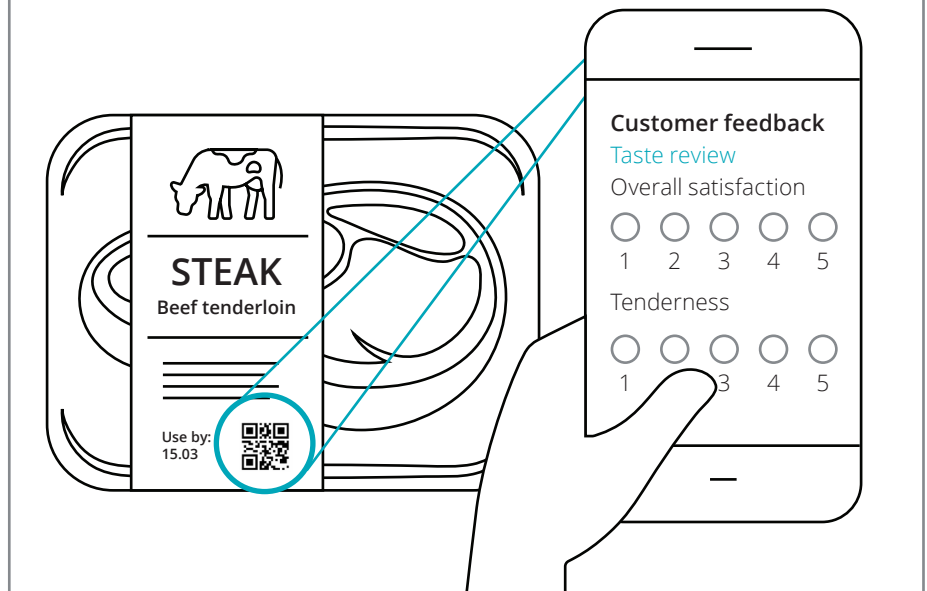
Currently feedback loops that enable consumers to provide product reviews are cumbersome and time consuming with the majority of feedback coming from disgruntled consumers. Blockchain technology will help create a new incentivised programme for providing product reviews.

Current Model

- Centralised controller of consumer feedback
- No reward programme for positive or negative feedback
- Uncomfortable environment for consumers
- No certainty that the consumer's voice has been heard
- Often requires consumers to go out of their way

Blockchain Model

- Comfortable, effortless and incentivised feedback loop which is accessed by the consumer by scanning the QR code located on the package
- Once feedback is submitted by the consumer it will be posted to the Blockchain and accessible to all network participants
- Feedback cannot be altered by any network participant once submitted by the consumer
- The consumer can potentially receive a reward to their loyalty account following a review submission



Why Blockchain for a Consumer Feedback Loop

- Ensure all food chain participants have access to unedited consumer feedback
- Provides the consumer with confidence that their voice has been heard
- Creates comfortable environment and effortless process to provide feedback
- A record of feedback



Blockchain Use Case

Certification

Blockchain technology can revolutionise how certifications are stored, managed and shared with need to know parties.

Many retailers and consumers rely on quality accreditations when assessing food quality and safety. An accurate, up-to-date repository of accredited farmers, suppliers and beef processors is of paramount importance in ensuring that standards are maintained.

Current Model

- The current process for accreditation requires regular auditing to be conducted which can be time consuming and tedious when tracing paper trails
- Details of certified bodies are stored on central databases
- Packaging of quality assured beef is stamped with the Bord Bia quality assurance mark

Blockchain's Role

Blockchain technology can assist the accrediting body when issuing and managing accreditations. Potential benefits include:

- Secured certificate issuance process
- Platform to store and share accurate, up-to-date certifications with need-to-know parties
- Tailored viewing permissions for each participant in the network
- Reduced auditing complexity as the Blockchain's auditable record allows auditors to view a digital information trail which is immutable



Why Blockchain for Certification

- Blockchain can pair with existing IoT devices
- Enables the sharing of data amongst Blockchain participants
- All data posted to the Blockchain is auditable and immutable
- Acts as a single source of truth creating greater confidence in the validity of certificates



Certification Case Study: DNV GL

Deloitte recently worked with DNV GL to develop a blockchain solution to secure the certificate issuance process in Business Assurance. DNV GL works in a variety of industries to certify companies' processes, products, facilities and supply chains to national and international standards. As part of the project we delivered a trusted and secure solution to enable DNV GL to store and share certification for their customers and their customers' customer.



DNV GL's Testimonial:

"Putting our certificates in the Blockchain is the first step towards building a new digital assurance concept. Our objective is to use Blockchain and other disruptive technologies to provide new services and continue to create value for our customers"⁵⁰



Blockchain Case Study

Beefchain™

Wyoming beef producers are world-renowned for their high standards and best-in-class product but rarely receive the premium they deserve for their commitment to quality. BeefChain's mission is to create a new "rancher-centric" supply chain utilising blockchain technology to recapture the value now realised by third-party feedlots and processors. By enabling unique animal identification and ensuring origin, BeefChain allows the rancher to receive premium pricing for premium beef and provides consumers with greater confidence in the meat they consume.

Background

The majority of cattle operations in Wyoming are traditional family-owned ranches. Each fall, the ranch sells calves to a feedlot operator that fatten the animals before selling to a meatpacking beef processor. Absent corporate backing or mineral royalties, ranchers must finance the carrying cost on the cattle – which introduces significant financial risk to everyday business risk (weather, feed/labor costs, etc.). Fundamentally, ranchers are price takers and often struggle to cover debt service.

Problem(s)

Consumers already pay a premium for what is labeled "grass-fed" beef but have no way of verifying such claims. Separately, the rancher who diligently raised a cow on the open range often receives a price similar to that of a cow raised in unknown conditions. The price premium is captured further up the supply chain when the feedlot operator/processor sells to the retail channel which passes it through as their markup. The rancher gets the lower, functionally identical price at the sale lot – two steps removed from the end customer.

Solution

BeefChain creates a model for the rancher that accomplishes two objectives. The first is to bring technology to the rancher in order to enhance traceability and prove humane handling. BeefChain's RFID tags and other IoT devices upload unique cow/calf information to the blockchain to establish immutable, auditable provenance to better capture the free range, grass-fed premium.

The second is to create an end-to-end supply chain solution we call "Rancher to Retail" through BeefChain partnerships with wholesale buyers, auction houses, feedlots and processing operations. These partnerships will allow BeefChain ranchers to offer exclusive, long-term relationships with buyers across the globe.

Blockchain adds a new value to the livestock supply chain which previously did not exist- immutable, third party-verification. Adding this new layer of trust to the supply chain will not only benefit the agriculture producers but all other participants such as wholesale distributors, retail grocers, the food service industry and most importantly the end consumer.

BeefChain is currently partnered in a pilot project with six multi-generational Wyoming ranches and has tagged over 1,600 calves and hashed them to the Ethereum blockchain. In addition to building out its technology, BeefChain will complete the USDA Process Verified application process in the third quarter of 2018. If successful these Wyoming blockchain calves will be USDA and blockchain age and source verified for processing and export to global markets. This "first-in-the-world" blockchain herd, totaling 500,000lbs of high quality Wyoming Certified Beef, will be ready for delivery in late summer of 2019.

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Rob Jennings, CEO, American Certified Brands, LLC dba BeefChain. Rob is a founding member of the Wyoming Blockchain Coalition:

"We have learned that providing a robust blockchain solution is hard. The process requires a significant amount of thought and debate surrounding decisions one has to make regarding what chain you are going to write to, your strategic partnership selections, security, etc. Trying to get all the parties together in providing one unified supply chain picture is key."

Blockchain Ownership

Who should be responsible for leading Blockchain adoption in the Beef industry?

As Blockchain is a decentralised, distributed ledger technology no one party will 'own' the Blockchain. To maximise its potential it must be adopted by a community that shares and validates information on the Blockchain. However, in order for Blockchain to be adopted, the initiative will need to be driven by one or more organisations with the aim of developing an industry or supply chain ecosystem on the platform.

Potential champions of Blockchain adoption within the Irish beef industry

We have identified three potential champions of Blockchain technology. One or all of these bodies could drive the application of the technology within the industry. Champions will not 'own' the Blockchain and will not be the sole participants within the network. Rather, they will encourage the technologies adoption within the industry, share positive messaging and encourage the participation of others. Once the proof of concept, feasibility and business case is established, others such as farmers, regulators, customs, vets, transport agencies and the Department of Agriculture, Food and Marine will have objective evidence when deciding to join the network.

First-Mover Advantage

Leading out on the application and development of a Blockchain solution for beef traceability will have significant benefits for all participants within the network. Blockchain will have the capability to revolutionise traceability standards for beef and other food and drink products. Being a successful first mover in delivering an end-to-end traceability system from "farm to fork" will deliver significant value to the network as well as Ireland's food industry as a whole.



Government

The adoption of Blockchain technology could become a regulatory requirement for all organisations within the Irish beef industry.

Why drive the adoption?

- Innovative investment in one of Ireland's most important indigenous industries reinforcing Ireland's commitment to sustainable beef production by making the supply chain more transparent to market regulators
- A unique selling point for Irish beef in international markets, building trust in the Irish brand among international consumers
- Governance and oversight which can aid international market penetration and growth
- Alignment with evolving purchase drivers and consumer trends



Retailer

The adoption of Blockchain technology could become a mandatory requirement for retail suppliers.

Why drive the adoption?

- Competitive advantage for the retailer by offering products that align with evolving purchase drivers and consumer trends
- Supply chain traceability which reduces the risk of substandard product reaching the consumer and damaging the retailer's reputation
- Accurate, up-to-date supply chain information reducing stock outs and improving time-to-market and returns processes
- Greater end-to-end visibility and stakeholder collaboration enabling faster and better decision-making



Beef Processor

The adoption of Blockchain technology could become a mandatory requirement for beef processor suppliers.

Why drive the adoption?

- Accurate, up-to-date information from each member of the supply chain
- Greater visibility of supply chain members
- Alignment with evolving purchase drivers and consumer trends
- Identify farmers that are consistently supplying high quality as well as substandard cattle. This information can be levered to ensure they receive a consistent high quality supply generating greater value in the market place

Next Steps

The global beef industry is witnessing heightened levels of competition with exporting nations vying for market share in the so-called “luxury markets” of Asia and the Middle East. Indeed it has been reported that between January and April 2018 EU beef exports shrank, although sales to Turkey and Israel rose. Meanwhile in the same period Brazil’s beef exports grew by 25% driven by demand in China, Hong Kong, Egypt, the EU and Chile.⁵¹

To win market share the EU and moreover Ireland must respond to this competition through enhanced differentiation. It appears from our initial discussions that consumers and business owners would benefit from a Blockchain enabled end-to-end traceability model.

According to Adrian Cummins, CEO Restaurants Association Ireland, *“The Restaurant Association of Ireland believe blockchain traceability is the way of the future. It gives assurance to the customer and the business owner. You can trace the ingredients of the dish right back to the animal in the field, farm to fork.”*

To drive differentiation and to continue our journey towards enhanced provenance and transparency we must leverage and strengthen our natural advantages:

- Grass fed supply with associated consumer health benefits
- Unique market infrastructure such as the genetic livestock database
- Ecosystem collaboration and industry strength
- Global footprint of Irish companies and our diaspora
- Market agility and small holder sustainability

Furthermore we can extend the use of exponential technologies to clearly demonstrate and prove the superior quality and provenance of Irish beef in comparison to other markets. Blockchain is one such technology which can confer

competitive advantages as outlined in the previous sections of this document. This raises the question as to how we develop Blockchain capability to support the Beef Industry and moreover the agri-food sector. We see the following actions to be spearheaded by Government and Industry stakeholders.

1. Establish an Industry Body

This paper aims to serve as a call-to-action for government and industry bodies to work to create a new industry-wide capability across value chain participants from Farmers to Processors to Retailers. This new body would be funded to further the review and adoption of Blockchain and moreover exponential technologies such as IoT, machine learning, big data and analytics in the agriculture sector for the advancement of industry differentiation and sustainable development. It is clear the Irish Government are committed to the funding of exponential technologies through initiatives such as the Disruptive Technologies Innovation Fund which sets aside €500 million over the period 2018-2027 consisting of an initial Exchequer allocation of €180 million to 2022. Whilst extremely positive, it may be more effective to allocate funding to a coordinated newly formed industry body as opposed to an open call for “expression of interests”, this is the case in other industries such as Banking and Insurance where the R3 and B3i consortia have been founded respectively.

2. Create a Terms of Reference Charter

The body should include a Terms of Reference Charter which clearly sets out the organisations mission, vision and goals for the deployment of exponential technologies and detail how adoption be extended to Irish Farmers in an easy and cost effective manner. The organisation, and its staff, would be responsible for identifying industry requirements, articulating a business case detailing identified value to be created (e.g. cost reduction and potentially combating margin/price erosion over the longer term)

and a proposed progression path for achieving goals over a set period of time e.g. a five year strategic plan and delivery roadmap.

3. Build a Pilot Solution

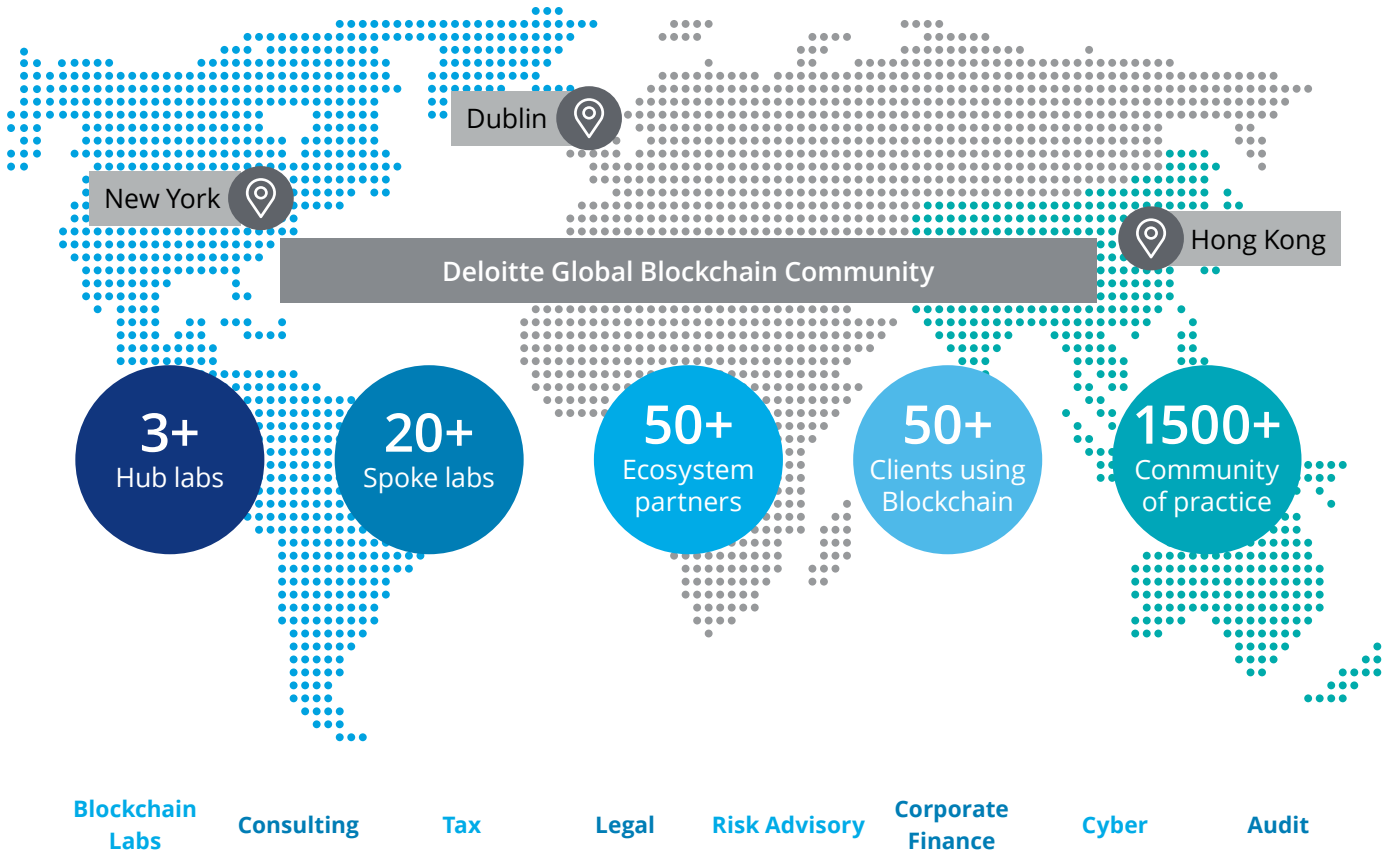
The new body would work, initially on select use cases e.g. traceability of grass fed beef, to create Pilot’s to test technology deployment and to confirm the business case for adoption at a national level. A Pilot would identify deployment challenges as well as minimum viable processes and ecosystem to ensure that new capabilities match industry requirements for the broad spectrum of stakeholders within the value chain. Once initial standards, integrations and learnings are gathered, this provides the platform for accelerating implementation of the roadmap across different areas of the beef value chain (e.g. grass fed, import/export, trade finance, soil to sewer)

4. Drive Industry Adoption

After the completion of successful Pilot’s, industry will be required to adopt solutions on a nationwide basis. To be successful it is suggested that minimal cost be placed on Farmers who will effectively serve as the master providers of data and product along the value chain. Any solution must also add benefit to all stakeholders and not just a final consumer, knowledge should be shared along the value chain for actionable insights which result in more effective decision-making for all. In addition, adoption must be supported by new standards as articulated by industry and as aligned to existing initiatives such as Bord Bia’s Origin Green programme.

To facilitate this, Deloitte is setting up a “Champions Group” in Ireland with key representatives from Government and Industry stakeholders. If you would like to participate in the champions group please email Cillian Leonowicz at cleonowicz@deloitte.ie

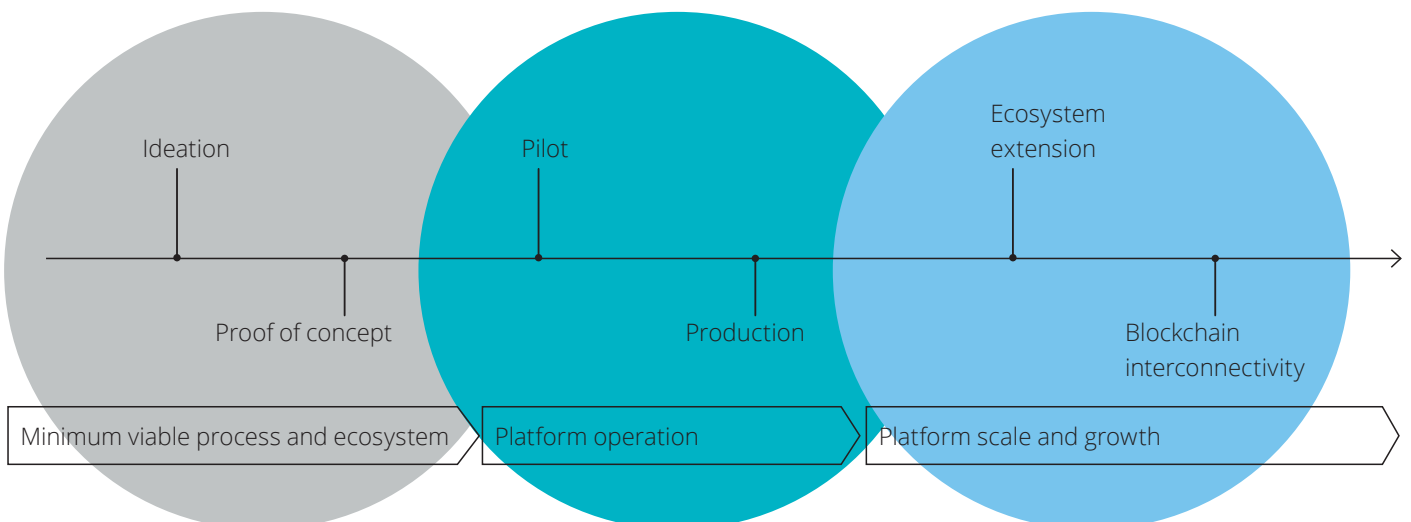
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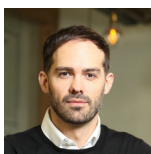
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