

Digital Cows

Tokenising Interests in Australian Cattle

by

Scott Chamberlain, Richard Holland, and Michael Darby

21 June 2021

1. The Situation

- 1.1 The world's projected population by 2050 is 10 billion.¹ We cannot sustain that population increase, or our future prosperity, without more animal protein. One key to improving animal protein production is better livestock markets. Good markets efficiently allocate capital and risk, spur innovation, and reward innovative producers.

2. Why Australia Cares About Cattle Markets

- 2.1 Australia is a relatively small producer of cattle and beef, but the second largest exporter of beef, behind Brazil. Our small population means we export most of what we produce. Australia runs ~26 million head of cattle. Annually, it slaughters ~8.0 million, producing ~2.2 million tons (CWE) of beef. It exports roughly half of the beef it produces, and exports ~1 million live cattle annually.
- 2.2 Cattle and Beef are Australia's largest agricultural industry. Exports of beef and veal are worth around AU\$8 billion. Live exports add a further AU\$1.1 billion, for a total annual revenue of ~AU\$9.1 billion.²
- 2.3 Cattle farms are also important employers in remote and regional communities. Two out of every three Australian farms raise cattle (~48,000 farms of a total 68,000). The industry directly employs ~192,000 people, mostly in regional and remote areas.³
- 2.4 So, properly functioning cattle markets are very important to Australia, especially regional and remote Australian communities.

3. The Problem

- 3.1 Existing livestock markets function sub-optimally, especially compared to other agricultural commodities such as cereal crops. Livestock trade relies on physical markets where custody of the animals is physically exchanged. Such markets are sub-optimal in several ways:
 - (a) **Higher Operational Costs:** They are costly and logistically challenging, meaning lost value, high transaction costs, and sub-optimal allocation of

¹ <https://www.un.org/development/desa/en/news/population/world-population-prospects-2017.html>

² <http://www.agriculture.gov.au/abares/research-topics/agricultural-commodities/agricultural-commodities-trade-data#agricultural-commodities>

³ https://www.mla.com.au/globalassets/mla-corporate/prices--markets/documents/trends--analysis/fast-facts--maps/mla_beef-fast-facts-2018.pdf

capital from people not selling or buying when they should.

- (b) **Lower Quality Meat:** They are more stressful for livestock, meaning weight loss, poorer quality meat, and lower prices.
 - (c) **Less Working Capital:** They force financiers to own whole cows, meaning less capacity to manage and share risk through part-ownership, and greater farm debt as bank loans become almost the sole means of capitalising farming operations.
 - (d) **More Market Risk:** They force meat processors to use daily physical markets to supply long term contracts with retailers, but with few instruments available to trade risk or hedge prices. There are also fewer options for forward buying and selling.
 - (e) **Less Product Options:** Paper-based, physical markets make it hard to capture, verify, store, and share in real-time the information and attestations a globalised supply chain needs to satisfy the mandatory requirements of regulators (vaccinations etc) and the consumption preferences of customers ("free-range", "grain-fed" etc).
 - (f) **Lower Production Flexibility:** The difficulty in capturing a range of attestations leads to a one size fits all approach. It is easier, for example, for all meat plants to be Halal-compliant than to distinguish between packed meat that is or is not Halal.
- 3.2 In some markets, notably poultry and pork, these problems have been solved through market elimination, otherwise known as vertical integration. This supply model has propelled poultry from the least consumed meat 50 years ago to the most consumed meat now. Cattle, for various historical, cultural, and structural reasons, probably cannot deploy this solution.

4. The Blockchain Solution for Cattle

- 4.1 We think we can solve these problems using blockchain technology and we aim to demonstrate this through a working proof of concept. Australia already has a comprehensive paper-based quality control system that aims to track cows from birth to slaughter. Essentially, we would be looking at "tokenising" and therefore "scaling" the trust that system provides to deliver a near-instant and near-costless buying and selling part-ownership rights to cattle 24/7/365.
- 4.2 We aim for a system where everyone can see, in near-real-time, who owns each cow, where that cow is located, and what attributes or attestations that cow possesses. If this information can be reliably rendered and shared, we can then create and trade tokens representing ownership, investment, and slaughter rights in particular cows or herds of cows.
- 4.3 Such a system would facilitate better capital management strategies for farmers, more sophisticated instruments for investing in cattle, and better instruments for managing risk throughout the livestock value-chain. The economic benefits to Australia and the world would be significant. Beef is Australia's largest agricultural export and Australia is the world second largest beef exporter behind Brazil.

5. Elements of the Solution

- 5.1 Our envisaged system has several key elements:

- (a) **Users:** The system would need to provide for the registration of several different users with different roles and rights:
 - (i) **Farmers:** The owners of the cattle and responsible for their husbandry.
 - (ii) **Meat Packers:** The ultimate buyers of the cattle.
 - (iii) **Carters:** The people who transport the cattle between sale yards and owners.
 - (iv) **Agents:** Who traditionally broker the physical sale of the cattle and are subject to licensing and registration regulations in their State.
 - (v) **Financiers:** large money managers looking for an exposure to beef without ever having to take physical custody.

- (b) **Compliant with Existing Regulatory Structure:** The system would piggy-back off several existing regulatory systems:
 - (i) **Property Identification Code (PIC):** Every farm in Australia has a unique PIC registered with the relevant State government regulator, so the location and owner of the cattle is readily and reliably identifiable.
 - (ii) **RFID Ear Tags:** Every cow has an RFID ear tag attached shortly after birth. It identifies the cow and the property on which it was born, so the identity of the cow is readily and reliably verifiable.
 - (iii) **Vendor Declarations:** When cattle is sold the seller must provide and sign a Vendor Declaration and Waybill. This form identifies the current owner, the cattle and makes various promises about the condition and husbandry of the cattle. It also identifies the person responsible for transporting the cattle for sale and the new owner and PIC of the cattle.

- (c) **New Digital Assets:** The system might use many new digital assets that could be secured and tracked on a public blockchain:
 - (i) **Custody Tokens:** We imagine each cow will be represented by a token with the owner of that token being the farmer responsible for husbandry of the cow on their property.
 - (ii) **Market Tokens:** We imagine farmers being able to sell a portion, maximum ~30%, of their interest in a cow. These tokens would be divisible and might be held by numerous different people.
 - (iii) **Slaughter Option Tokens:** We imagine meat packers being able to issue slaughter option tokens. These are tokens that represent a meat packer's right to call a cow in for slaughter. It is a mechanism for meat packers to manage the through-put of their abattoirs.
 - (iv) **Possibility of Bespoke Tokens:** Ideally, the system would be robust enough to allow users to issue a range of tokenised rights to the underlying cows.

- (d) **Attestations:** The system needs to allow for any number of attestations or claims to be attached to a particular cow. A minimum success criterion is that it handles all the attestations regulators require.

- (e) **Voluntary/Market-based:** We plan to design the system on the assumption that it is voluntary. It attracts users because it is useful and ensures compliance with existing laws, not because it is mandated by any government or industry body.

6. The Challenges

- 6.1 There are obvious challenges that need to be solved, common to any system that attempts to tokenise real-world assets, and all of which are complicated by dealing with live animals that can die:
 - (a) **Getting users into the system and assigning roles:** The system will need to make it easy to on-board users. Conceptually, we are talking about something like a digital currency exchange and a process like KYC. Practical custody and recovery of private keys is also important.
 - (b) **Getting cows into the system:** You need to be able show a farmer has 100 cows and not just a box of 100 ear tags. In the real world, this is confirmed via the Vendor Declaration when the cows leave one farm for another. But if a farmer wants to use the digital exchange for cows they have reared, there will need to a trusted process for confirming the ear tags are in real cows. This could be physical inspection. It might be possible to automate this process. There are now facial recognition type applications for cows, and these might be able to automate the process.
 - (c) **Policing Attestations:** Attestations are claims that the farmer promises are true about how their cows have been raised. In the real world, these attestations are open to fraud and policed through fines and criminal convictions. In a blockchain system that monetises cows, a more robust system would be needed because fraud is a greater risk since the investment tokens might be traded hundreds of times before the fraud is exposed.
 - (d) **Knowing when cows have left the system;** Cows might leave the digital system by dying or by being sold to an owner outside the digital system. In both cases, the platform will need an acceptable process for honouring or extinguishing the digital rights that have been assigned to the cow.
 - (e) **Compliant Tokens:** the digital assets must be designed and sold in ways that comply with Australian law. We need to avoid them being securities (interests in a managed investment scheme) and they must be sold in ways that comply with, or make use of, existing legislation around registered stock and station agents.
 - (f) **Dispute Resolution and Insurance/Risk Allocation:** At present, disputes are resolved in traditional, adversarial ways. Blockchain offers alternative ways. In the same way online platforms like eBay have dispute resolution and insurance mechanisms, we can develop ones specifically for cows. This may include staking, escrows, and other smart contract-like options to deter bad actors and near-instantly compensate victims.

7. Next Steps

- 7.1 We have completed a proof-of-concept using our HotPocket technology. A white paper and demo will be published shortly.
- 7.2 If a 24/7/365 blockchain-based cattle market is of interest to you, [get in touch](#).