



# Can Blockchain Fly the Silver Fern?

## Exploring the Opportunity in New Zealand's Primary Industries

Mahmudul Hasan  and Johnny Chan 

University of Auckland, Auckland, New Zealand  
{mahmudul.hasan, jh.chan}@auckland.ac.nz

**Abstract.** Blockchain is an emerging technology perceived as ground-breaking. Yet, technology service providers are not realising the untapped market potential as quick as it was predicted. New Zealand is not any different. Currently, the number of blockchain-based solutions available in the country is rather limited. A clear understanding of the market of blockchain is critical for service providers to recognise the opportunities and the challenges. It has been suggested that multiple industries could utilise blockchain technology to attain numerous benefits. The primary industries of New Zealand will be one of them that remains underexplored. Therefore, in this study, we use total addressable market (TAM), a technique to estimate the market size, to explore the available economic opportunity of blockchain-based solutions in New Zealand's primary industries. Our estimation suggests that it may be close to NZ\$1.65 billion per year, including self-employed enterprises; or NZ\$496 million per year, excluding self-employed enterprises. Besides, our review of secondary sources indicates that blockchain technology could tackle some of the challenges the primary industries are facing like food fraud and foodborne illness. However, lack of strong and practical use cases, lack of streamlined practice for data management, lack of understanding of the technology and its implication to business, and lack of regulation and legislation are the major impediments to blockchain adoption.

**Keywords:** Blockchain · Total addressable market · Primary industries · New Zealand

## 1 Introduction

New Zealand has an open and competitive economy with a population of about 5 million. The primary industries (e.g. agriculture, forestry, horticulture, and seafood) play a vital role in economic growth. They consist of enterprises that produce, process and move goods domestically and internationally. Together, they contribute to more than 70% of all merchandise exports, representing NZ\$46.5 billion of annual revenue [1]. At the same time, the primary industries are facing several challenges, including food fraud and foodborne illness [2]. They pose significant risk to the safety of the goods and the reputation of New Zealand [3]. At a global level, food fraud is estimated to cost the food industry US\$49 billion (NZ\$82 billion) a year [4]. On the other hand, we have 420,000

people die every year worldwide due to food contamination [5]. The Ministry of Primary Industries estimates New Zealand to have 200,000 cases of foodborne illness per year [2]. With the addition of the ongoing COVID-19 pandemic, it is fair to assume both the local and global customers would only demand more accuracy and transparency of information from the suppliers. The traditional approach of tracking and tracing goods for quality control (e.g., recording, verifying, securing and distributing data like the provenance of ingredients, freshness and safety information) has always been costly and time-consuming. Therefore, some suppliers around the world have started to experiment and adopt various blockchain solutions to tackle these challenges.

A blockchain is a record of transactions built upon distributed ledger technologies which is secure, immutable, anonymised and decentralised. When a new transaction occurs (i.e. an event), it is timestamped and recorded chronologically in a block, which is then connected to previous blocks in the chain. Once the transaction is verified and validated, the updated ledger is copied across all participants in the peer-to-peer network [6]. That distributed ledger acts as a trusted single point of truth tracking all identity, status, ownership and authority information among the participants. It eliminates the need of intermediaries, which could massively reduce transaction costs.

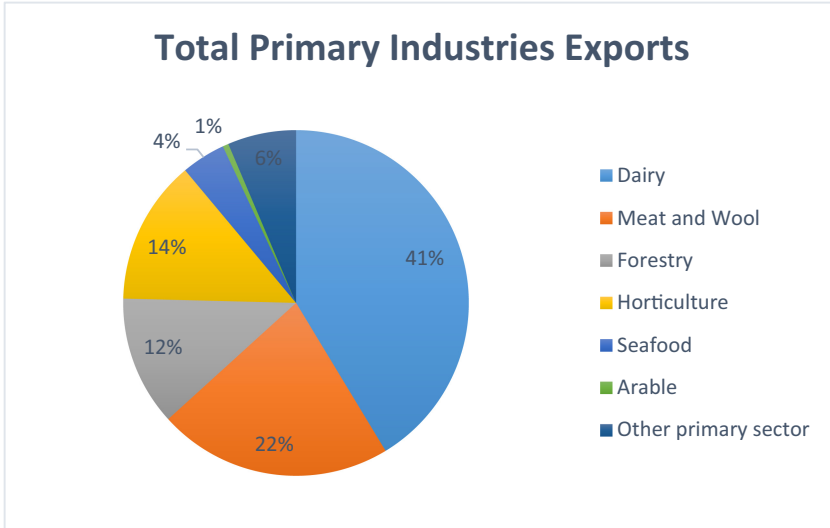
Therefore, blockchain technology is a promising innovation that enables trust through visibility among stakeholders [6, 7], and it has many user cases for incremental improvements and disruptive changes, ranging from technical, social, political, cultural and economic aspects. However, the full market potential of blockchain technology specifically in New Zealand is yet to be realised. Currently the number of blockchain-enabled products and services available in New Zealand is rather limited. We believe that the understanding of market potential of blockchain is critical to draw interests from technology service providers, because that helps them to recognise the opportunities and challenges, and they could customise their existing solution while minimising development costs and associated risks. In this paper, we use total addressable market (TAM) to explore the available opportunity for blockchain-enabled services in New Zealand. It is a technique to estimate the market size which enables a single service provider to define the holistic opportunity from their offering. Through the study, our hope is to get more blockchain service providers on board, so they could supply various solutions to the primary industries of New Zealand and enhance their capacity in providing accurate and transparent information to the customers.

## **2 Blockchain and the Primary Industries of New Zealand**

### **2.1 Opportunities**

Being the predominant source of wealth generation for New Zealand, the primary industries are comprised of multiple enterprises from different sectors (see Fig. 1). Blockchain-enabled services can be used by the goods producers, distributors and suppliers to track and trace the goods from production to consumption (i.e. farm to plate) and be in compliance with government regulations. As an exporting nation of meat, dairy, agri-food and seafood products, blockchain-enabled services in New Zealand could boost transparency, ensure goods safety, minimise the risk of errors, and reduce potential fraud.

As a result of increased transparency, some customer behaviour towards product consumption could be improved (e.g. healthy diet). Besides, blockchain-enabled services can facilitate a more resilient and efficient supply chain solutions to face unexpected events (e.g. a pandemic).



**Fig. 1.** Total exports from primary industries by sector

New Zealand has numerous enterprises producing non-branded high-quality homogenous products, and typically they sell their products through intermediaries. Blockchain-enabled services could create more value for these enterprises specifically. For example, the domestic market of organic products is growing rapidly in New Zealand [8]. Blockchain-enabled services could enable customers who place a high premium on food to buy organic products directly from the producers rather than through the intermediaries. New Zealand is one of the very few countries exporting chilled lamb around the world. While the local and global customers are valuing fresh and quality meat products, producers are facing increasingly tight shipping deadlines [9]. As a result, maintaining the freshness of meat is often difficult due to the short shelf time on arrival to supermarket chillers. Counter-intuitively, the fresher the product the more paperwork is needed and that slows down the shipping process. Blockchain-enabled services could potentially reduce the time and cost in product verification and expedite the shipping deadlines without sacrificing the freshness and quality of the product.

## 2.2 Challenges

Although blockchain-enabled services possess numerous potential benefits, they are not without limitations. Several technical, organisational and social factors could hinder the acceptance of blockchain-enabled services in the primary industries of New Zealand.

First, typical blockchain application is not originally developed to handle massive amount of data. However, the primary industries generate a large volume of data from multiple stakeholders. For example, enterprises in the food industry need to manage multiple levels of data including purchase orders, stock keeping unit (SKU) information, details of the distributors, and more. Thus, technology service providers must understand the individual use case and employ a layered approach to data storage (e.g. integrating the blockchain solution with the traditional solution of centralised database). Still, managing such continuous integration could be costly and risky.

Second, there is a lack of streamlined practices for data entry among the enterprises in primary industries. Different enterprises from different sectors use various applications, generate multiple forms of data (including paper format), and follow a diversity of data storing methods. Technology service providers should carefully consider some smart solution to streamline the data capturing process.

Third, although many sectors in the primary industries realise the potential transformative effect of blockchain-enabled services, there is a lack of understanding of how exactly that would change their business process and practice. Polarising views and the absence of strong visible use case could be the main reasons for such barrier. Even some studies suggest that enterprises in the primary industries of New Zealand are generally quick adopters of new technology [10], such adoption never happens overnight and in most cases the adoption is incremental and dependent on existing technology. Having some strong and practical use cases of blockchain technology with linkage to the status quo could be helpful for enterprises to adopt.

Fourth, there is a lack of regulation and legislation to recognise blockchain application like digital currency in New Zealand [11], which may undermine the confidence of enterprises to adopt blockchain technology. For example, how should goods and services tax (GST) be collected if some enterprises accept digital currency for business transaction? The exchange rates among popular digital currencies in the world have not been as stable as most fiat money from developed countries.

### **3 Economic Opportunity of Blockchain in New Zealand**

Blockchain has been forecasted to generate an annual business value of over US\$175 billion (NZ\$293 billion) globally by 2025 [12]. In the Asia-Pacific region, blockchain technology market is expected to grow and earn an annual revenue of US\$4.59 billion (NZ\$7.68 billion) by 2023 [13]. It has the potential to contribute to the rising digital economies in Australia and New Zealand, which are worth AU\$139 billion (NZ\$149 billion) combined [14]. According to the Ministry of Business, Innovation and Employment (MBIE) in New Zealand, if all businesses are more digitally engaged, they could generate 20% more revenue and collectively lift the national GDP by NZ\$34 billion per year [2]. Gartner predicts that spending on technology products and services in New Zealand will reach NZ\$13.9 billion [15]. Although these statistics show the high-level potential of blockchain technology, they may not be adequate for technology service providers to jump into the bandwagon. Recent report also warns that 90% of blockchain-based initiatives will suffer 'blockchain fatigue' by 2023 due to a lack of strong use cases [16]. Therefore, technology service providers must understand the prospective market before launching their blockchain-enabled services.

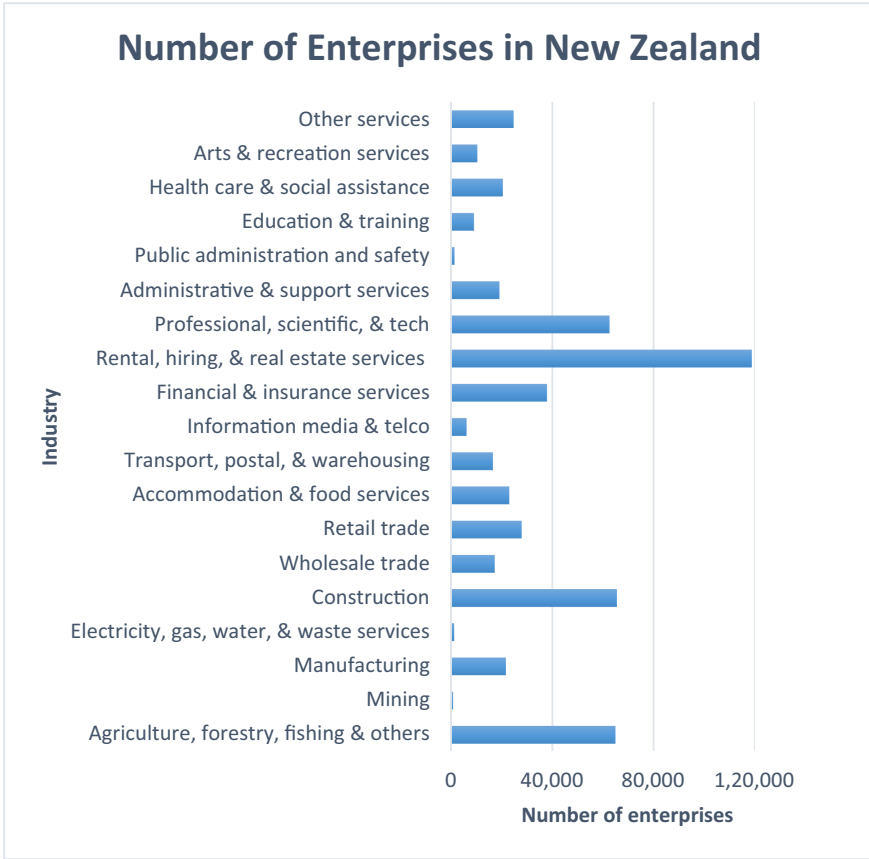
## 4 Total Addressable Market for Primary Industries in New Zealand

Total addressable market (TAM) is a market size metric representing the potential revenue opportunity for a single service provider, assuming the full market is being captured by their service [17]. For example, if the food industry is the subject of our study, then every food producer is assumed to use blockchain-enabled services to support their daily transactions. The TAM of blockchain-based services in this case will be a cumulative value of operations in the food industry as if the total demand from the market could be fulfilled by blockchain-enabled services. TAM could also be used to eliminate potential blockers and irrelevant industries.

TAM can be determined in two ways: (1) a top-down approach, and (2) a bottom-up approach. The top-down approach mainly relies on secondary research data and reports. The results of top-down approach are typically presented in the form of “according to this study, it is a \$X dollar market” and shows how a service provider could share a percentage of that market. One disadvantage of the top-down approach is the tendency of overestimation, as the secondary data source may not be framed specifically to a localised subject or case. On the contrary, the bottom-up approach is very specific, but it requires a granular look at the market to identify potential customers. When potential customers are identified within a market segment, revenue per customer is a prerequisite for estimating the TAM. In either approach, it is important to build end-user (e.g., individual or organisation) profile. Additionally, it is vital for technology service providers to carefully consider their pricing models (e.g., mixed subscription) when building the end-user profile. Below we estimate the TAM for primary industries in New Zealand.

### 4.1 Building End User Profile

We consult the latest New Zealand Business Demography Statistics (NZBDS) that shows an annual snapshot of the structure and characteristics of New Zealand enterprises to build the end-user profile (Statistics New Zealand 2019). NZBDS are limited to those enterprises with GST turnover greater than NZ\$30,000 per year. Enterprises can either be self-employed individual, company, incorporated society, local government body or central government body that is engaged in the production of goods and services in New Zealand. As shown in Fig. 2, there are a total of 546,735 enterprises in New Zealand as of 2019 financial year, among which 64,779 (11.12%) are in the primary industries. Moreover, 123,800 employees work among primary industries enterprises.



**Fig. 2.** New Zealand business demography statistics in 2019

Table 1 summarises the number of enterprises and corresponding employees involved in the primary industries of New Zealand.

**Table 1.** New Zealand business demography statistics for primary industries

Industry		Size of enterprise (Group by employee count)							Total
		0	1–5	6–9	10–19	20–49	50–99	100+	
Agriculture, forestry, fishing and others	Number of enterprises	45,258	14,925	2,301	1,362	669	171	90	64,779
	Number of employees	0	33,600	16,500	17,900	20,200	11,500	24,100	123,800

## 4.2 Calculating TAM

The general equation to calculate TAM is:

$TAM = \text{Total number of potential customer} \times \text{annual contract value per customer (ACV)}$

As abovementioned, the spending on technology products and services in New Zealand will reach NZ\$13.9 billion. Therefore, we estimate the average spending by each enterprise to be NZ\$25,424 per year (i.e.  $13,900,000,000/546,735$ ) or NZ\$2,119 per month (i.e.  $25,424/12$ ).

The estimated TAM for the primary industries is around NZ\$1.65 billion per year, assuming the total number of enterprises is 64,779 and the ACV per enterprise is NZ\$25,424 per year:

$$TAM = 64,779 \times NZ\$25,424 = NZ\$1.65 \text{ billion per year including self} \\ \text{–employed enterprises}$$

It is fair to assume that self-employed enterprises will show less interest to adopt blockchain-enabled services. Thus, if we exclude them from our calculation, the estimated TAM for primary industries is close to NZ\$496 million per year:

$$TAM = (64,779 - 45,258) \times NZ\$25,424 = NZ\$496 \text{ million per year excluding self} \\ \text{–employed enterprises}$$

We could further narrow down the TAM for primary industries by specific target group. For example, if a target group is defined as enterprise that has at least 10 employees, then the estimated TAM is NZ\$58 million per year:

$$TAM = (1,362 + 669 + 171 + 90) \times NZ\$25,424 = NZ\$58 \text{ million per year excluding} \\ \text{enterprises with less than 10 employees}$$

Technology service provider could also follow a clustered approach to estimate TAM if they have defined multiple target groups, and each of them may have a different pricing model (i.e. ACV).

## 5 Conclusion

The opportunity for blockchain technology in New Zealand is promising. Through our estimation of the total addressable market in the primary industries for blockchain-enabled services, we believe it may be close to NZ\$1.65 billion per year including self-employed enterprises, or NZ\$496 million per year excluding self-employed enterprises. Additionally, the characteristics of blockchain technology are suitable to tackle some of the challenges the primary industries are facing like food fraud and foodborne illness. The current pandemic may even further increase the demand for various blockchain solutions as the accuracy, trustworthiness and transparency of shared data is a matter of health and safety for everyone. Yet, we observe a number of potential impediments to adoption, including the lack of strong and practical use cases, the lack of streamlined practice for data management, the lack of understanding of the technology and its implication to the business, and the lack of regulation and legislation.

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