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Blockchain: Change is Coming to Agricultural Supply Chains

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Inside...

Summary	1
What is Blockchain?	2
Applying Blockchain Technology to Agriculture	3
Regulating an Emerging Technology	4
Outlook	4
References	5

Key Points:

- Agribusiness interest in blockchain, an emerging technology that permanently records transactions on a shared digital ledger, is rapidly growing.
- For the agricultural supply chain, blockchain technology promises increased efficiencies through enhanced data management, lower transaction costs, optimized logistics, more robust traceability, and enhanced food safety protocols.
- Prominent technology companies are creating partnerships with global logistics companies and retailers to develop blockchain applications that can be used for the efficient tracking and delivery of agricultural products.
- Blockchain will accelerate the industry's movement toward greater transparency and traceability from field to fork. This will bring opportunity for growers and a tool for the rest of the supply chain to combat food fraud and offer verified products to consumers.
- Demands for increased traceability will also create challenges. Agricultural producers could face greater scrutiny, and co-ops and elevators will need to adjust as identity preservation becomes more important.

Summary

Agribusiness interest in blockchain technology is rapidly growing. Increasingly, companies are recognizing how the emerging technology's enhanced data management capabilities can create supply chain efficiencies and reduce friction in transactions. The agriculture sector stands to benefit from the technology's potential to lower transaction costs, optimize logistics, increase traceability, and enhance food safety protocols.

Agriculture joins a variety of industries that are using and developing blockchain applications to improve business transactions. Prominent technology companies such as IBM and Microsoft are creating partnerships with global logistics companies and retailers to develop blockchain applications that more closely align links in the supply chain. Amazon, through its web services arm AWS, just released a set of blockchain templates with network access control to increase blockchain usage without users worrying about the actual manual setup of a blockchain network.

EXHIBIT 1:



Source: CoBank

French commodity merchandiser Louis Dreyfus Co. cooperated with three European banks in facilitating a soybean trade with a Chinese soybean processor via blockchain to significantly reduce transaction time and cost. Coffee companies are beginning to use it to track the source of their beans, and organic dairy and meat producers are looking to develop blockchain partnerships that verify the authenticity of organic feed.

But blockchain technology is still in its early stages. Market volatility of cryptocurrencies (such as bitcoin, which utilizes blockchain technology) and a lack of clear regulatory oversight are major hurdles to mainstream adoption of this emerging technology.

What is Blockchain?

Blockchain is a unique information storage technology that allows all members to record transactions in a digitized, decentralized data log maintained on a network of computers, rather than a physical ledger or a single database. It allows for peer-to-peer transactions of currency, commodities, or any other thing of value to occur transparently. (See Exhibit 1.)

The technology was created in 2008 as an accounting method for Bitcoin, the oldest and most recognized digital currency, also known as cryptocurrency. Since then, more than 1,000 additional cryptocurrencies have been created, all chasing unique use cases and the promise of tackling real world business issues.

During a typical blockchain transaction:

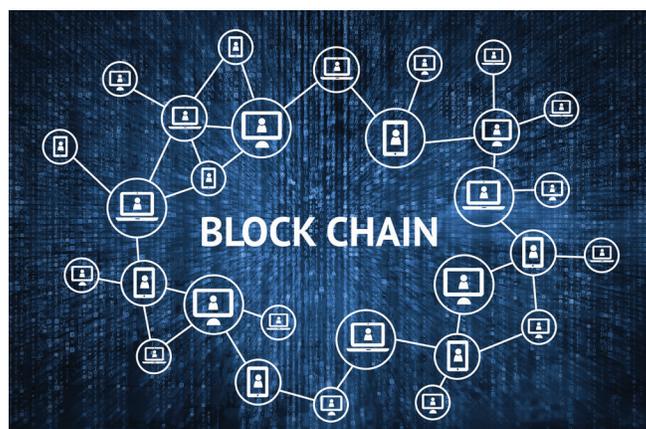
- Users create a **permanent, unchangeable record of a transaction** (a “block” of information) via what is known as distributed ledger technology (DLT).
- The record is **encrypted and stored on a network of computers** that includes all the participants in the transaction.
- An identical copy of the transaction history, or ledger, is **shared among participants**, which eliminates the need for a third-party verification of the transaction’s accuracy.
- Each new transaction is permanently recorded to the ledger through **verification by the network**, creating a “chain” of information.

Agricultural supply chains can transact business using a public or private blockchain. The ability of the user to record transactions and access historical information recorded on the distributed ledger is the primary difference between the two options. A public blockchain is often referred to as “permissionless” because the software is open source and the user base is not restricted. A private blockchain, referred to as “permissioned,” is restricted, and access to information may be limited to certain users.

Applying Blockchain Technology to Agriculture

Through research and testing, businesses are beginning to identify ways that blockchain applications can improve agricultural supply chains. Some of the applications include:

Food traceability – A multinational partnership that is applying blockchain technology to food traceability could revolutionize agricultural supply chains. The Blockchain Food Safety Alliance is a collaboration of IBM, Walmart, Chinese retailer JD.com, and Tsinghua University National Engineering Laboratory for E-Commerce Technologies. Formed in late 2017, the collaboration is aimed at improving food tracking and safety.¹ During pilot studies, perishable meat and produce items, such as pork and mangoes, were tracked using blockchain technology.



The studies found that the technology allowed food to be traced from farm to store in just a few seconds. This is dramatically faster than the days or weeks typically required by existing food tracking systems. With food recall time significantly shortened, risk of further incidences of food poisoning among consumers would be greatly reduced.

Tracking commodities – Blockchain technology can also assist in the tracking of bulk commodities and reduce the overall presence of fraud. Recent food fraud scandals include blending wood pulp with cheese in the U.S., marketing horse meat as beef in Europe, and mixing melamine into infant formula in China. The UN estimates food fraud costs the world economy about \$40 billion/year in illegal trades.

Combining DNA testing with blockchain tracing capabilities, systems are being built to create a more accurate traceability system. These new systems can aid in investigating illegal diversion, tax evasion, misuse, and adulteration.² Blockchain’s ability to permanently record and share transactions across the supply chain also gives agribusinesses an opportunity to resolve distrust with consumers. Demands for more transparency at the retail level are already being answered by businesses. Coffee companies are beginning to use blockchain to track the shipment and blending of beans back to the farmer. Consumers then access the supply chain data by scanning a QR code associated with a batch of coffee.

Organic dairy, meat and egg providers are also exploring blockchain partnerships to stem the risk of fraudulent animal feed entering the supply chain. Much of the organic feed used on U.S. farms is sourced from foreign origins and the supply chains can be long and complex. Blockchain could become a highly valuable tool to protect the integrity of the organic supply chain and shore up consumer confidence in premium food products.

Grain trading – The facilitation of global grain trade is improving with the use of blockchain technology. In early 2018, a cargo of U.S. soybeans marked the first agricultural trade conducted using blockchain. Louis Dreyfus Co., Shandong Bohi Industry Co, ING, Société Générale, and ABN Amro took part in the trade where the sales contract, letter of credit, and certificates were digitized on the Easy Trading Connect (ETC) platform.³ The transaction time for the trade was cut in half and was executed in one week. Participants of this partnership pointed out that cost savings are critical in a high-volume, low-margin transaction.

Blockchain has the potential to revolutionize one of the most complex segments of the agricultural supply chain. The first freight deal to settle in the digital cryptocurrency Bitcoin was executed in early 2018. A vessel carrying wheat from Russia to Turkey was part of a pilot test by Prime Shipping Foundation, which is testing a blockchain payment system for bulk commodities. The shipping industry can be plagued with week-long delays at port, as crews wait for paperwork to be verified. Many of the leading shipping companies recognize the potential benefits and are building out blockchain capabilities.

Regulating an Emerging Technology

Though not all blockchain applications for the agricultural supply chain integrate cryptocurrency as a payment function, many do—or will in the future. Currently, a lack of clear regulatory oversight for cryptocurrencies is the single biggest barrier to mainstream adoption of blockchain technology.

Regulatory agencies worldwide are working to define and write regulations for cryptocurrencies and cryptoassets. Similarities and differences compared with existing

“*Applying blockchain technology to food traceability could revolutionize agricultural supply chains.*”

financial instruments are being carefully evaluated to legitimize the new asset class and protect investor interest, while not handicapping the technology's growth potential. Uncertainty and continual agency reviews play into the volatile price action of cryptocurrencies.

Currently in the U.S., bitcoin and virtual currencies are classified as property by the IRS and commodities by the CFTC. The SEC continues to release guidance on virtual currencies and the classification of securities. Virtual currency mining operations are considered a money service business by the U.S. Department of Justice.

Other countries, most notably Japan, have classified virtual currencies as a currency. This classification has led to greater adoption of cryptocurrencies being used as a payment for goods and services.

Cryptocurrency may very well be regulated, and since many blockchain technologies are integrated with cryptocurrency, regulators could introduce restrictions that unwittingly regulate both.

Outlook

Blockchain technology represents an exciting opportunity to increase transaction efficiencies, reduce friction, and improve traceability in the global agricultural supply chain.

Blockchain uses will continue to expand across agriculture. Tools to connect farmers to the agriculture supply chain via blockchain are already in the works. GrainChain, a blockchain-based contract for farmers and grain buyers that instantly transfers ownership of grain, is scheduled for a pilot launch in September 2018. The digital tool will be integrated into existing digital systems that manage scales and measuring instruments, contracts, and electronic tickets.

In the intermediate term, the adoption of blockchain by retailers and merchandisers up the supply chain will pressure other supply chain participants to adapt and utilize the technology. The increasing use of blockchain by large merchandisers will likely create a need for co-ops and private elevators to find ways to incorporate blockchain into their operations.

Blockchain could usher in other challenges as well, by making it advantageous for merchandisers or processors to contract directly with farmers in order to preserve farm-level traceability. The push towards identity preservation and segmentation in production agriculture could further encourage investment in on-farm storage and direct-to-farmer marketing channels.

Over the long term, blockchain could hasten the bifurcation of the agricultural industry. As blockchain technology develops and gains acceptance, supply chain participants will increasingly demand others in the supply chain to also participate. Late adopters of the technology will be at a disadvantage and could have access to fewer markets. Meanwhile, early adopters will extend their reach, become more competitive and increase their influence globally.

Blockchain is not a panacea or a quick way to solve all of agriculture's supply chain challenges. Adopters of blockchain technology will face greater scrutiny in a media-rich environment when greater transparency is offered on issues ranging from sustainability practices

to animal welfare. Blockchain will also serve to improve supply chain transparency and accountability, but bad actors will still exist and find new ways to defraud buyers.

However, even with its limitations, blockchain will further enable agribusinesses to successfully meet transparency requirements and deliver valuable information to consumers, while cutting transaction costs. And those that take advantage of blockchain's benefits are likely to reap the rewards in a world of information-hungry consumers.

Blockchain use cases in agriculture will continue to evolve, while entirely new applications will be born from innovation that may not seem conceivable today. With retailers and merchandisers already adopting blockchain to increase cost efficiency and increase value to consumers, the continued push towards integration, interoperability, and communication will broaden the technology's potential for global agribusiness applications. ■

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