Blockchain: The Trigger for Disruption in the Food Value Chain

It’s Time to Take Note

Summary
Blockchain technology is likely to change how participants in the food value chain interact. The three benefits blockchain brings are: lower costs, increased transparency, and new business opportunities. The changes that these benefits bring about are a new way of financing assets—both floating and fixed—and increased value chain efficiency, with smaller companies gaining competitive strength vis-à-vis bigger players. Finally, the increased availability of data creates new intelligence, making it easier to identify opportunities for new products and services. However, two prerequisites have to be met in order for blockchain to become successful. First, processes within companies, and between companies, have to become digitalised and standardised. Second, a broad participation of stakeholders along the value chain is required; otherwise the value of blockchain is lost.

Introduction
Traditionally, valuable digital information is stored in a protected database. The integrity of the information is safeguarded by an authority, which can be a government, a bank, or a company in the food chain. Blockchain technology has the characteristic that owners of information share valuable digital information with participants in the value chain. Information cannot be altered, but users can add to the existing information—once all participants accept the addition. This so-called distributed (shared) ledger technology guarantees the integrity of the information. All participants in the blockchain can easily access the information if the owner grants permission, and there is no need for an authority to guarantee the integrity of the information. Because the digital information in a blockchain is trustworthy, it can be the basis for money transfer without the need for (expensive) validation of the information.

The potential benefits
Blockchain brings three potential benefits to the food value chain. The first benefit is that of lower costs due to higher operational efficiency. Transaction costs decline, as the need for verification decreases in a blockchain. For example, the need to manually check documents, certificates, counterparties, etc. disappears because the information in the blockchain is reliable and is sufficient to trigger a payment. As a result, the execution of payments can be automated. With the emergence of Internet of Things (IoT) technology—machines producing information and sharing it with others via the internet—transactions based on automatically generated information become an option. The conditions for making payments have been set out prior to the event in a so-called smart contract. The result of all of this is: faster processes enabling shorter lead times, faster turnaround, and therefore lower working capital needs.

The second major benefit blockchain can bring to the food value chain is increased transparency. Traditionally, stakeholders in a food value chain are required to manually pass on data associated
with the physical product. The shared nature of the blockchain technology means that, once data is entered within the blockchain, it can be viewed by all participants. Thus, stakeholders in the blockchain are better informed about what’s happening along the value chain, based on the information entered into the blockchain. As a result, they can better anticipate changes in either the upstream or downstream part of the value chain. Furthermore, the information that accompanies products can be used to increase the value of end products. And, not to forget: In the case of a food safety issue, product recalls will be much simpler to execute, as tracking and tracing information is accessible in the blockchain.

The third benefit is the creation of new business opportunities—for example, asset-based financing across the value chain, new risk management services, data-driven predictive modelling, and new trading platforms for smaller companies.

**Figure 1: The food value chain is increasingly data-driven**

![Figure 1](image)

Source: Rabobank 2017

**Four possible impacts**

The abovementioned benefits provide a basis for a possible transformation of the value chain by way of four impact routes.

**Financing to change**

First, the financing of floating and fixed assets can be expected to change. If information about the location and quality of rolling stock is added to the blockchain on a regular basis, financing of rolling stock can become much easier, as performance risks will be lower and better known. Instead of financing rolling stock through a working capital facility, it can be financed under an asset-based finance scheme. The risk changes from a counterparty risk to an asset risk. In the case of goods that can be sold into liquid markets, the risks—and therefore credit costs—are lower. But also for goods that are less ‘liquid’, certainty about the sale of the good to the end-user increases with enriched information about end-market dynamics, therefore lowering financing risks. Fixed-asset finance could change too. When the assets produce regular, reliable information about their use, which can be used to gain an insight into the wear and tear of fixed assets, a pay-per-use model for fixed assets becomes an option. This reduces the capital needs for fixed assets for those who want to use them.
Possible examples of new financing models in dairy

Bringing blockchain technology to the dairy supply chain might create new financing models that can be summarised as a shift from company financing to asset-based financing.

- Floating assets at the farm (e.g. milk cows) could be financed by dairy processors. This means dairy processors are assured of their supply of milk, while modern technology enables the tracking of the cow and its health/productivity.
- Fixed assets (milking parlour/milking robot) could be financed on a pay-per-use basis by lease companies.
- Land could be financed by external investors, and land rents could be linked to productivity, as measuring volume and quality of forage production is becoming an option.
- In the domestic market value chain, dairy products can be financed by a bank from the moment they are ordered by a retailer (or a consumer on an e-retailer platform).
- In the export market value chain, (bulk) dairy products can be financed by a bank from the moment they are ordered by a local processor in an export market.

Value chain efficiency to go up

Blockchain technology will automate many traditional back office processes, significantly improving business efficiency. If information is shared in real time between value chain participants, there will be less need to buffer for unforeseen events, so stocks can go down. Losses along the value chain can be reduced by a data-driven understanding of supply and demand. Moreover, tailoring of products to meet specific market demands can increase based on sharing the information about downstream preferences with the upstream value chain. As such, the push-pull point can move upstream, with the increased availability along the value chain of what is happening downstream. This also provides opportunities to increase added value of raw materials by meeting specific wishes of consumers, such as production method (e.g. fair trade), origin, and other physical and ‘virtual’ quality attributes.

Strengthening of position for smaller companies

The lower transaction costs and more transparent value chain strengthen the position of smaller companies vis-à-vis their bigger counterparts. Smaller companies no longer have an information backlog. Using the blockchain, smaller companies gain access to information that bigger companies receive via their network and operations.

Entry barriers will be lower if financing models change from buying fixed assets to a pay-per-use model for manufacturers. The lower transaction costs and the move toward asset-based finance for rolling stocks will facilitate access to trade finance for smaller companies. For example, according to the Asian Development Bank, 57 percent of the applications for trade finance today are rejected for small and medium-sized businesses, compared to only 10 percent of requests by multinational corporations. This is because today, access to trade finance depends on the condition of the balance sheet and the uncertainty regarding the enforceability of contracts. Blockchain technology changes both in favour of smaller companies.

Also, the benefits of reputation that market leaders have will decline as the world becomes more transparent. The trust in a product will become less dependent on the trust in the supplier, but more dependent on the information available in the blockchain. This increased transparency enables smaller companies to establish premiums based on the intrinsic characteristics of the goods they supply, without necessarily having a longstanding reputation.
Opportunities for new products and services

The increased availability of data also creates opportunities for developing new intelligence, and developing products and services linked to this intelligence. For example, data can be used in predictive models to predict demand and/or success of a product by making use of new insights about correlations and causalities. As a result, business models can change from responsive to risk-based and predictive. As more data becomes available, the predictions will become more accurate.

Digitalisation and standardisation prerequisites

As can be understood from the above, it is crucial to digitalise and standardise processes in order to reap the benefits of blockchain technology. The first blockchain projects involve activities in the value chain that are, for the most part, already digitalised, such as the financial services sector, in combination with international trade. For example, the we.trade initiative in which Rabobank participates (see below).

**Case: we.trade and Rabobank**

When a small or medium-sized company trades with a similar company in a different country on an occasional basis, exchange of goods and money requires a lot of trust, as the two actions can usually not take place at exactly the same time. These risks cause some companies to limit themselves to doing business with known counterparties who are located nearby. we.trade solves the trust issue by connecting all involved parties—for example, via tablets and smartphones. Not just the buyer and the seller... the transporter and banks are also involved. As a result, transparency enables an easier and safer execution of transactions. Blockchain and smart contracts are the enabling technology for we.trade. For example, payments will be triggered through self-executing contracts when certain parameters, such as the delivery of goods, are validated by market participants. All parties on we.trade are customers of a bank, to ensure the true existence of the counterparty. Furthermore, as an additional service, banks on we.trade can offer working capital financing for transactions, or they can reduce payment risks. Buyer and seller can rate each other after the execution of a transaction. This rating information helps companies to find reliable trading partners. As such, we.trade facilitates (international) trade by tackling the trust issue in relation to (more distant) counterparties.

we.trade will be launched in 2018.

In primary agriculture, processes are seldom digitalised—the same applies to several other activities in the food value chain. Data is available in local computer systems, is often entered manually, and is not standardised—and therefore cannot be shared in a meaningful way. In order for a blockchain to produce reliable, trustworthy information, it will be crucial that the information it registers is true and makes sense to the other participants. Therefore, the interface between the digital and the physical world will grow in importance. People, machines, and sensors that produce information that goes into a blockchain have to be reliable (e.g. certified) and should be safe from tampering, while data has to be standardised. The development of new sensor technology linked via the Internet of Things (IoT)—drones, satellite imagery, smart ear tags, weighbridges, quality testing instrumentation—will speed up this development. Removing human data input, and increasing the number of integrated machines and digital systems allows for more reliable data entry, increasing the integrity of the blockchain.

In some situations, the farmers’ inputs suppliers or offtakers are taking the lead in digitalising the farm. For example, in China, state-owned enterprises (SOEs) are actively capturing the agronomic developments at the farm in their information systems, supporting farmers in their decision-making. The same goes for inputs suppliers, such as Monsanto and its Climate FieldView platform.
Digitalisation of processes is an increasing necessity for most companies anyway—in order for them to become more informed, make better operational decisions, and optimise increasingly complex processes.

**Broad participation required**

A second hurdle for a successful blockchain is that all relevant parties in the supply chain have to participate. We can expect the first blockchain initiatives to include only a few links in the value chain—for example, a trader and a retailer, aside from a bank and a logistical service provider (again, see the we.trade example).

But in order for goods to be traceable from farm to fork, all parties that handle the goods should be linked to the blockchain. This prevents identity switches or other unregistered manipulations that could potentially have a negative impact on the value of a good. This challenge should not be underestimated. The costs and the benefits are not, by definition, evenly distributed. For example, farmers may have to invest in technology to add much more information to the raw materials they produce, while their off-takers may collect the additional value created with the information. It is clear that farmers also have to reap benefits, otherwise they won’t bother investing, and the chances of generating additional value will be much smaller.

In the beginning, there will be many blockchain initiatives, with only a few likely to be successful in the long term. Therefore, for early adopters, it is important to remain flexible and be able to switch to other initiatives, in case the chosen platform is not able to survive in the race. Furthermore, in order to maximise the chances of success, it is best to focus on those initiatives that are sponsored by parties with a strong commitment to the industry, that are able to mobilise many players along the value chain, and that have the means to make it through a potentially prolonged difficult start-up phase.

On the other hand, once the hurdle of broad participation is taken and the benefits of a more transparent supply chain manifest themselves, laggards will be forced to join fast... or otherwise remain at a competitive disadvantage.

It’s also important to bear in mind that adopting blockchain technology is never a goal in itself. Adoption of this technology needs to be a solution to a problem or a means to reaping a benefit. In our view, blockchain only adds value if a multitude of stakeholders are involved in producing and using information. Within companies internally, and in cases where only a few companies are involved, a centralised information system is often a more efficient and cheaper solution for registering and making important information available.

**Conclusion**

Companies that want to remain successful in the future food value chain should start to explore options for participating in blockchain initiatives to help them lower costs, increase efficiencies, and explore opportunities for creating new value. Key to reaping any of these benefits is a digitalisation of internal and external processes. Furthermore, selecting the right blockchain initiatives will be challenging. Therefore, participating in more than one initiative and/or maintaining flexibility to switch to other blockchain initiatives is recommended.