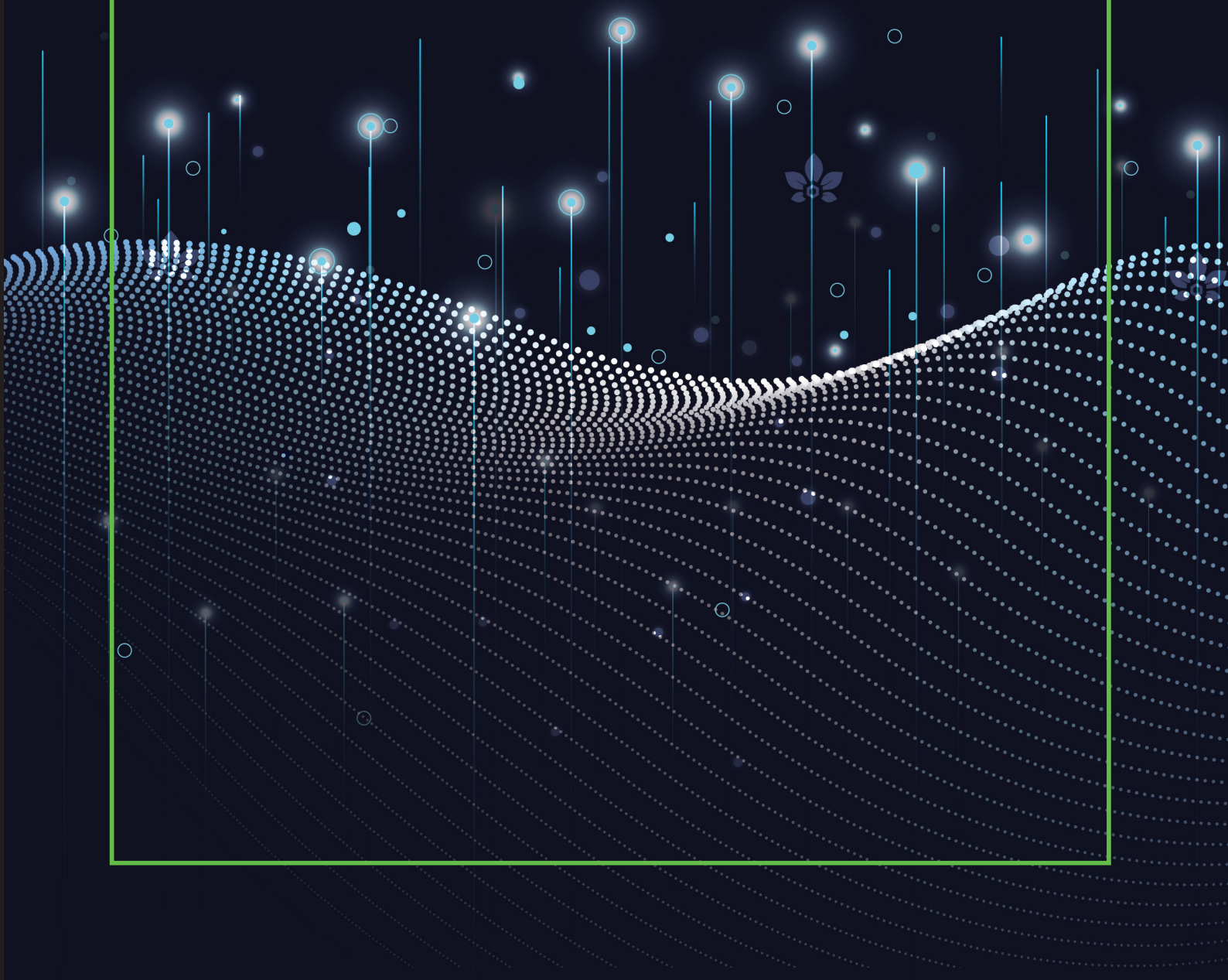
WHITE PAPER

AGRINODE



CONTENTS

Introduction	3
Benefits	4
Transperant Supply Chain	4
Fair pricing of goods	6
Expand financial options for farmers	6
Immediate payment on delivery	7
Traceability of food	8
Users	10
Overseeing Farm Inventory	10
Enhancing Agricultural Supply Chain	10
Modernizing Farm Management Software (FMS)	13
AgTech IoT Optimization	15
Fair Pricing	18
Oversight And Payment Of Agricultural Subsidies	19
Community-Sponsored Agriculture	20
Mobile Remittance for Small Farmers	20
Incentivizing Sustainable Practices	21
Greater Accountability for Multinationals	23

INTRODUCTION

Blockchain technology is a disruptive technology that changes business and supply chain models. The blockchain revolution is coming. Today, blockchain technology is not only a platform for crypto currencies, but also has many applications and advantages. Blockchain technology is a distributed ledger that shares all network transactions between members. All network transactions in the form of timestamped blocks must be approved by most members and nodes of the network before performing any activity.

Blockchain technology has many applications, including solutions to problems in agriculture, including traceability of food products, finance, insurance, and supply chain transactions. Innovation combined with advanced technologies like blockchain and artificial intelligence (AI) offer revolutionary solutions to agriculture. Blockchain technology provides users with efficient data protection, transparent and secure data exchange. A unified transparent environment for data exchange makes it possible to supply the supply chain wisely to establish contracts between suppliers,carriers,customers. Blockchain technology could manage the agricultural trade while providing guarantees in the certification procedures.

The use of data and information becomes increasingly crucial for the agriculture sector to improve productivity and sustainability. Information and Communication Technology (ICT) substantially increases the effectiveness and efficiency of collecting, storing, analyzing and using data in agriculture.

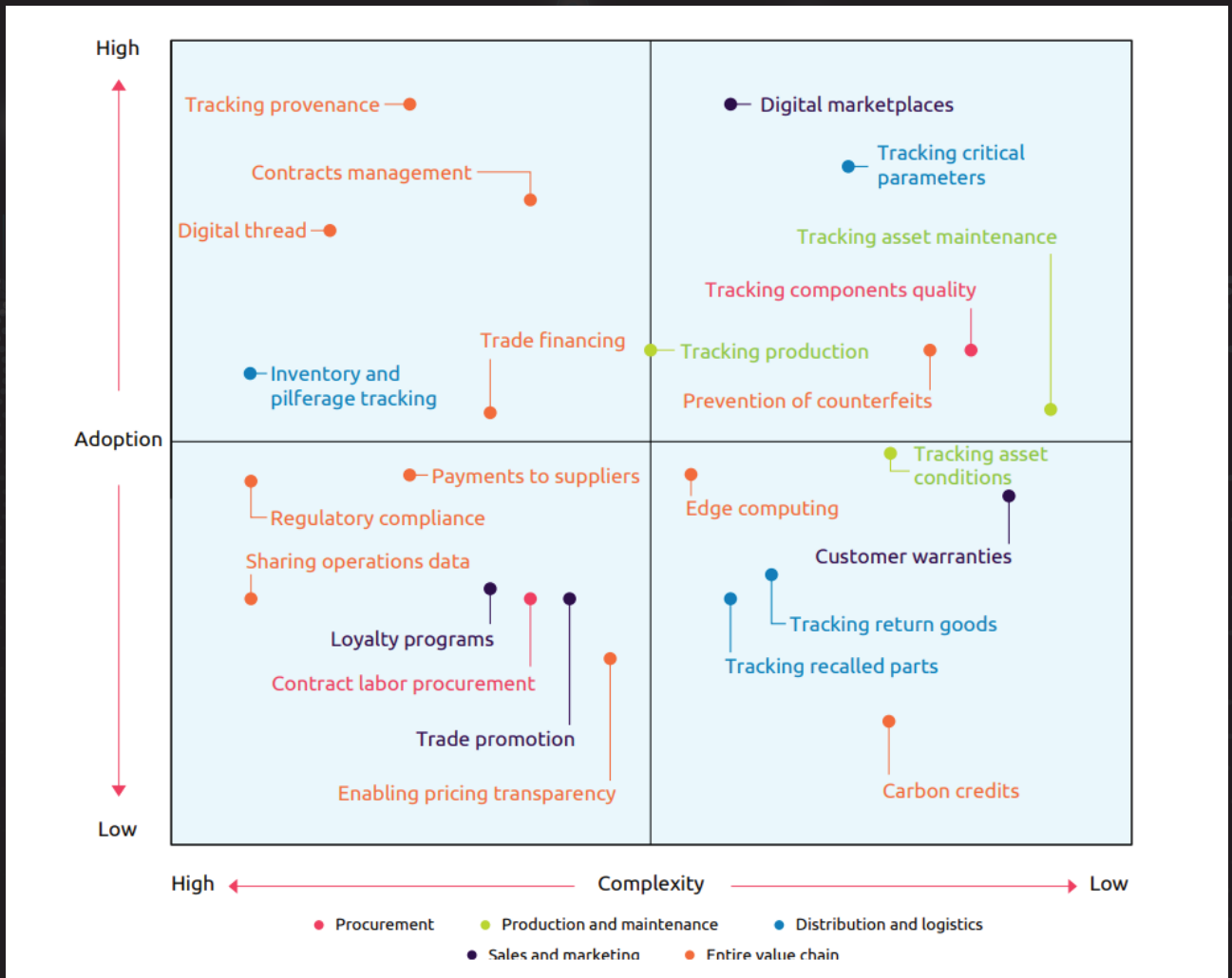
Today's supply chains have built-in blind-spots that are rectified by the block chain's unique characteristics. For example, block chain's distributed approach eliminates the lag between something happening in the supply chain and the system updating the status. Information about inventory and finances are all updated in real time, and anyone with the proper permissions can see exactly where things are. For the first time, there can be complete visibility into the transactions between retailers, suppliers, and banks.
This improves coordination and streamlines communications between parties, while block chain's inability to be tampered with improves trust. Suppliers, for example, can see when a retailer takes out a loan to restock a product. This lets them start preparing a shipment so they're ready to move as soon as the client places the order, cutting down on delays and even helping to avoid shortages by prioritizing product placement.

BENEFITS

The potential for blockchain and food is massive. There are many advantages to usage of blockchain in the agricultural field :

1. Transparent Supply Chain :

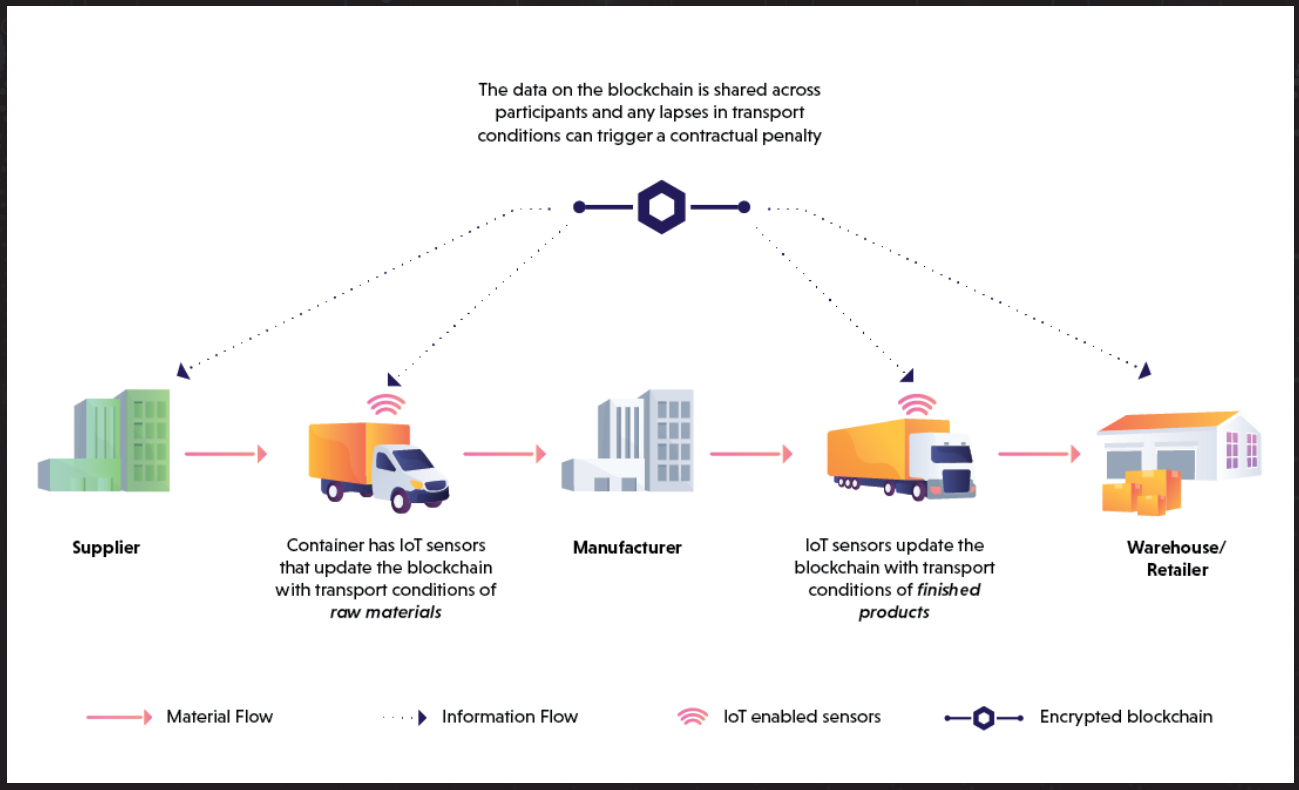
Transparency is the major problem in the agriculture industry. Consumers and farmers are not aware of the market price, demand, and availability of goods in the area. There are a lot of middlemen involved in the process of buying and selling goods. The involvement of middlemen makes the process more costly and complex. With the use of blockchain technology, it will help both consumers and farmers to connect directly without any involvement of middlemen. All the data is uploaded on the blockchain and is visible to everyone. Consumers can directly see the availability of goods in the area. This will help in prevention of food fraud, false labeling, and chain of middlemen.



Blockchain helps solve the problem now consumers can buy food from anywhere by knowing the exact time of harvesting and where it comes from.The chains of food value are intended to increase its competitive advantage by collaborating on a project bringing together producers, processors, marketing specialists, food service companies, retailers and support groups, such as shippers, research groups and suppliers.

A value chain is a strategic partnership between interdependent firms that maintain collaborative relationships to gradually add value to end consumers, which translates into a collective competitive advantage. A value chain is characterized by a collaborative, market-oriented: different commercial companies work together to develop and bring to market products and services effectively and efficiently. They allow companies to meet the needs of the market by the production, processing and marketing in line with consumer demand.

Supply chain management is just one of the use cases where blockchain is being recognized as a new and powerful solution. As total visibility and verifiable authenticity become increasingly valuable commodities in the modern world, blockchain will continue to grow in its role as a ledger of indisputable truth. The Blockchain offers up a host of unique capabilities that make it a perfect fit for supply chain management. It offers the capability to record every transaction with absolute certainty, and it provides accurate, real-time tracking for every item in your entire supply inventory. Most importantly, it creates a level of trust and transparency that simply could not exist previously in supply chain management.



2. Fair pricing of goods :

The income of farmers is highly volatile and depends mainly on the weather conditions, market demand and the variable market rates. The market rates are highly volatile and totally in control of the store holders. There is a big chain of middlemen between the consumers and the producers. The farmers get a meager price for their goods and all the profits are made by the middlemen. Blockchain will remove the middlemen chain and will provide fair prices to farmers according to their quality. There are validators who are not controlled or influenced by anyone that will verify the data provided by the farmers and upload it to the blockchain.

Blockchain based smart contracts work by triggering payments automatically as soon as a specific, previously-specified condition has been fulfilled, and without charging excessive transaction fees. It means that farmers could theoretically receive payment for their goods as soon as they are delivered, without a significant portion of their income being taken away from them in the process. Many farmers also experience difficulty when they try to sell their products in the market at a fair price. Intermediaries enjoy most of the profits while doing a minimal amount of work in comparison.

The entire suite of technologies rests on a consensus-driven blockchain network. Farmers can use integrated platforms with no intermediaries and more transparency to create an international trade union and increase their profit margin. For developing countries, where a significant part of the population is engaged in agriculture, this will be a huge plus, which will save many people from starvation. An example is such a country as Uganda, where in the 90s of the last century nine out of ten people lived in the countryside.

Smart contracts would eliminate the requirement of intermediaries, as it would allow farmers to connect directly with retailers. Therefore, they'd be able to receive a fairer price for their goods. Blockchain technology can act as a reliable source of truth about the state of farms, inventories and contracts in agriculture. Blockchain technologies, such as those hosted on the Ethereum blockchain offer the possibility of improving the land registration process and ensuring tenure rights. Blockchain technology has also been recommended as a way of improving food security by ensuring increased transparency and improving efficiency.

3. Expand financial options for farmers :

In the case of developing economies, farmers have limited access to financial resources. With the help of blockchain technology, farmers can show what they have harvested and use it for verification, funding for crop insurance. If a farmer manages to apply for crop insurance and at the same time uses blockchain technology to track weather conditions, an insurance company can directly

request the blockchain to obtain the necessary information using smart contracts. When the claim is approved, farmers will automatically receive compensation on their wallets.

Blockchain will help farmers by providing them with quicker access towards verification and to be financially viable in developing economies. Etherisc, a Germany-based company, works exactly like this. The firm provides decentralized crop insurance based on blockchain. They offer farmers to select crop types and field locations first, and then farmers receive automatic payments based on weather information. Farmers receive money in DIP (Decentralized Insurance Protocol) tokens – Etherisc's own cryptocurrency. The solution is built on Etherisc's "Generic Insurance Framework" on Ethereum. It utilizes local weather parameters, and in extreme weather conditions, insurance policies are automatically activated by incoming data, resulting in fair, timely, and transparent payments that insurers can't tamper with or change.

Agricultural insurance is a risk management tool to help stabilize farm income and investment in the event of losses, due to natural disasters or low market prices. These tools cushion the shock of income losses to help farmers initiate crop production after a bad agricultural year and spread the losses over time to enable continued investments in agriculture. Agricultural insurance products are often unavailable in developing countries and in particular for smallholder farmers. Digital technologies provide the possibility to address some of these challenges by enhancing actuarial estimates and reducing the cost of delivering and monitoring insurance products. In the case of weather-indexed crop insurance, for instance, mobile phones allow consumers to be geotagged, which (in combination with automated weather stations and satellite imaging) eliminates the need for insurance providers to conduct in-field loss assessments.

4. Immediate payment on delivery :

Blockchain technology enables real time payment on delivery and settlement process for farmers. Farmers are paid immediately without any delay. Farmers are ensured of transparency, trust with the use of blockchain technology. Blockchain intervention can also help expedite financial settlements and farmers no longer have to wait for payments endlessly, which often leaves them distressed. Smart contracts are written in code form and when all the criteria are met, payments are released automatically.

This means farmers fulfill the required prerequisites like digital identification, etc., they supply their commodities and shall receive money into their accounts almost immediately within hours. There are no intermediaries or additional costs involved. In fact, blockchain-based apps can easily provide reliable, secure and instant peer-to-peer fund transfers.

Other types of financial services, like payment services, insurance and credit, also play an important

role in helping agricultural supply chain actors to reduce risk, improve crop yields, manage liquidity and maximize returns. DLTs have the potential to reduce friction costs and increase access to agricultural value chain finance particularly for smallholders andMSMEs.

With multiple parties involved in a single transaction, including farmer, buyer, broker and bank, transmitting the proper information and ensuring contractual agreements are adhered to about product quality and price can further prevent the flow of capital. Blockchain's ability to promote trust, efficiency and accuracy in B2B payments and trade finance through the use of tools like smart contracts and digital tokens means farmers, buyers and Financial Institutions can mitigate risk.

5. Traceability of food :

Blockchain food traceability is gaining momentum in the global agrifood sector.Foods and products that we eat will travel a lot before making their place in our stomach. The goods are transported to the stores from the farmer's lands and then delivered to the small retail seller. The transportation process is time-consuming and costly. If the transportation process is uploaded on blockchain then it is effortless to track it by anyone. The consumers can track the supply of the goods in the market and the price will become fairer.

Blockchain will remove the control of some people over transportation and bring transparency to all this process. The blockchain tracking tag system is different from the barcode and RFID system. Traceability tags can be installed without the need for hardware and equipment, and withoutadditional process, it is possible to install the tag on other entities.Traceability tags are stored in data-

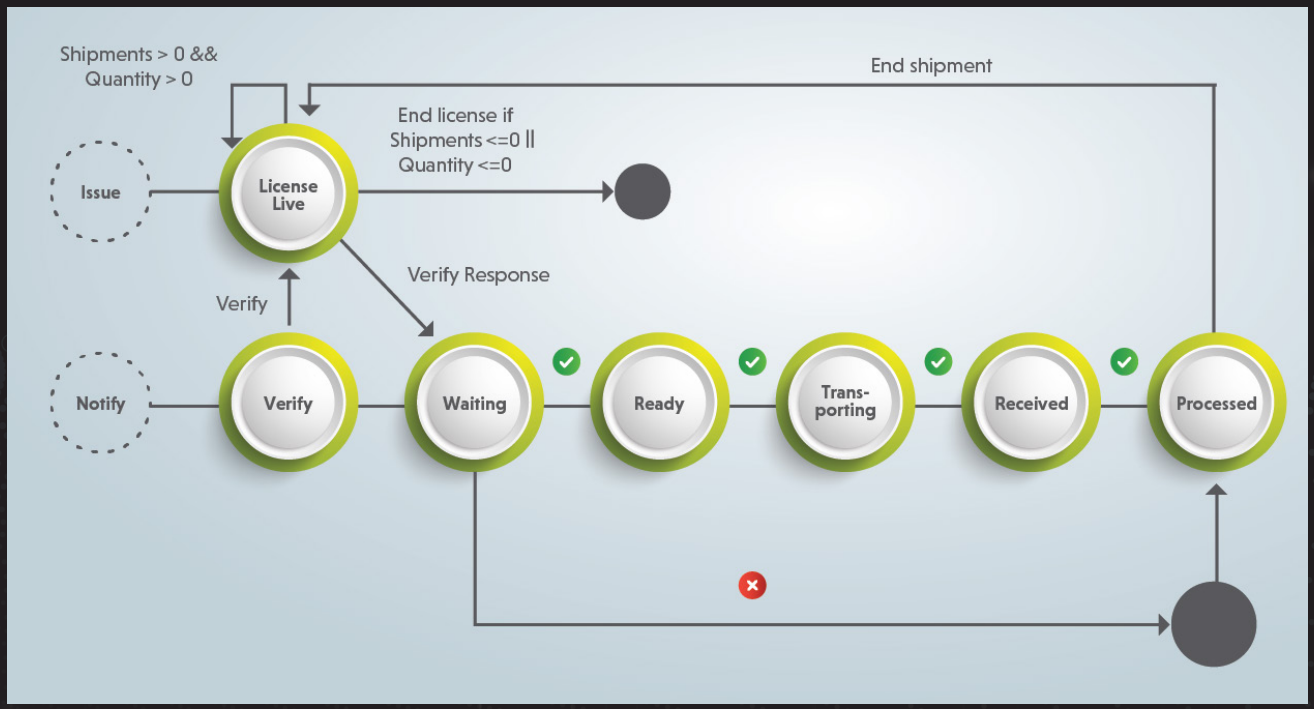
blocks and are associated with goods.When a product is sold, its ownership information changes in the traceability tag.

Blockchain technology will solve this problem by letting consumers know exactly where their food originated, who planted it, and how fresh it is. It will only require workers to scan the product at each stage in the process to update the database with information.

As the agrifood sector embraces the benefits of blockchain technology, the need to stay competitive is what will ultimately drive the migration to blockchain.

Successful Example :

Walmart Corporation is collaborating with IBM to build a blockchain agriculture supply chain.



USE CASES

1. Overseeing Farm Inventory :

Many farming organizations aren't prepared to utilize cutting edge technology to deal with their inventories. This is actually leading to waste of produce and resources. Also the losses are borne by farmers. Thus, this is a huge burden for the farmers, as they don't have the required tools to manage the issue. The use of blockchain technology here can change that situation for great. Blockchain in inventory management can help farmers by monitoring the storage climate and informing you when produce will expire. In this way, you can take legitimate measures. Farming systems need to be designed to work smarter by reduced energy use, fossil fuel elimination, optimal fertilizer usage and controlled greenhouse gas emissions that will result in it being more productive with minimized wasted effort or expense.

With IOT devices planted in farms which monitor soil temperature, soil humidity, air moisture etc, any deviation from the optimum can be tracked in real time and measures taken to prevent damage. These updates can become part of the Blockchain ledger, with every participating node receiving the update. Blockchain promises a single source of truth about the condition of the farm, inventory as well as contracts from planting to harvesting to storing. Blockchain is one such technology which can bring in immense benefits to the sector and make agriculture sustainable.

UAVs or drones are remote controlled airplanes with no human pilot. These have a tremendous potential in agribusiness in supporting proof-based arrangements and in spatial information assortment. Precise cultivation along with sensor information and imaging can improve yield through mapping spatial fluctuation in the field. Drones are also used in the agricultural insurance and assessment sector, including in insurance claims which helps in determining the accurate estimation of loss with the drone imagery.

Drones empowered with the AI examination stage could be useful in recognizing the faults in the agriculture field and crops. Drones with AI will enable quick processing and increase the quality of review. It encourages the communication between the drones itself and the individual who regulates activity and maintenance. Artificial intelligence will help the drones by assisting the activity and maintenance team for possible fault events and remedies dependent on the pre-observed information and make the work substantially clearer for mankind.

2. Enhancing Agricultural Supply Chain :

Supply chain refers to the design, engineering, production and distribution processes of goods and

services from suppliers to customers. Supply chains are typically under centralized management systems, such as enterprise resource planning systems for information flow management. Such systems are prone to error, hacking, and corruption. Blockchain technology, an emerging smart technology, can effectively manage these issues. This is a digital, decentralized and disruptive innovation in which transactions are recorded in chronological order with the aim of creating permanent and anti-monopoly records.

With increased globalization and intense competition in the market, food supply chains have become longer and more complex than ever before. There are some common problems in food supply chains such as food traceability, food safety and quality, food trust and supply chain inefficiency, which add additional risks to the entire society, economy and the health of humans. Smart agriculture is the use of technologies, such as the Internet of Things, big data, artificial intelligence and cloud computing in traditional agriculture. Blockchain technology is also used in smart agriculture. Technological advances have had a great impact on agricultural production. Blockchain technology allows goods and individuals to be tracked from their origin throughout the supply chain based on real time. The blockchain technology also gives all supply chain operators the ability to know what was done at what time and by whom. The distribution of the blockchain network promotes transparency and tracking of goods and services in a supply chain. These capabilities require accurate data collection and secure storage for reliable data tracking.

Agriculture and food supply chains are well interlinked, since the products of agriculture are almost always used as inputs in some multi-actor distributed supply chain, where the consumer is usually the final client. Blockchain in supply chain management is expected to grow at an annual growth rate of 87% and increase from $45 million in 2018 to $3,314.6 million by 2023.

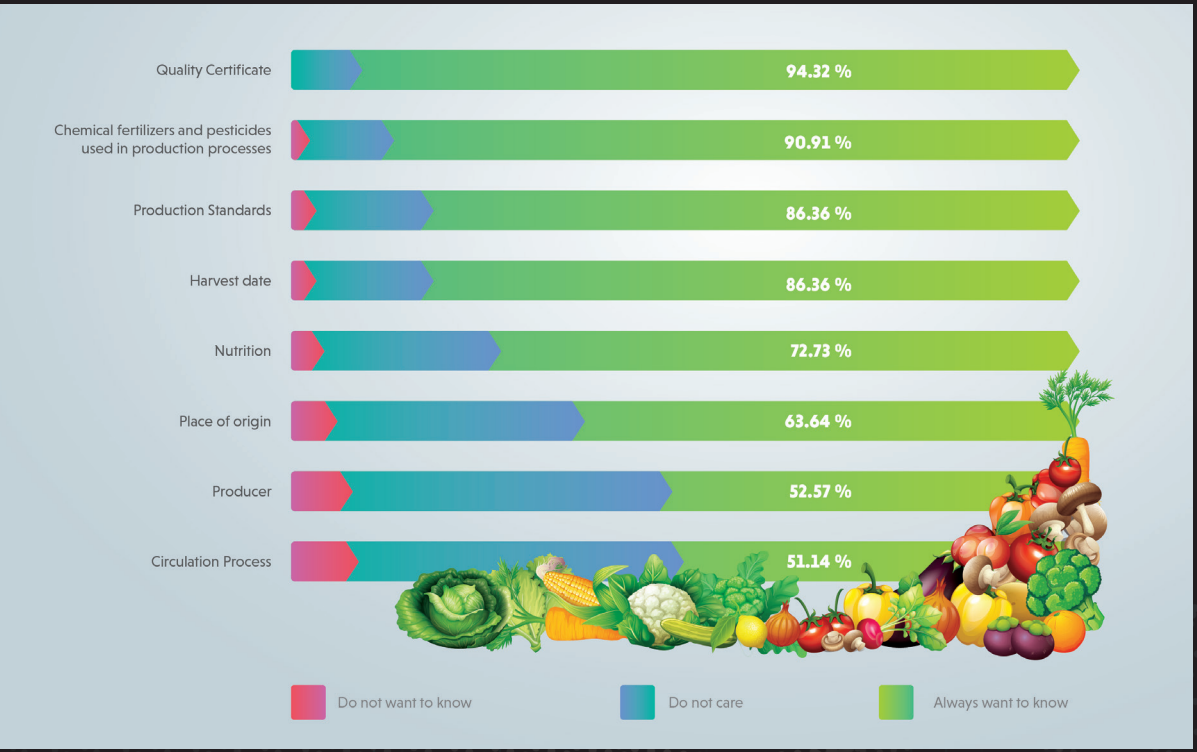
Blockchain technology allows critical information about the farming, production, transport of agri-commodities to be immutably recorded. Attaching this data to the digital asset enables it to move securely between participants along the supply chain. With the power to trace commodities and create data rich digital assets, the growing problems of food fraud and security across global agri-supply chains can be addressed with greater success.

The agricultural sector's supply chain is notoriously complex and opaque, as shipments change hands multiple times before reaching their final destination. It is difficult for farmers to know where, for what price and how much of their products are ultimately sold. The blockchain based food supply chain can help different stakeholders access information about the food's quality at every stage. As blockchain brings transparency in the food supply chain ecosystem, it will be easier to figure out when and how food has been contaminated.

Transactions in agricultural supply chains are inherently risky and complex, thus relying on a number of intermediaries while more conscious consumers have poor transparency on where their

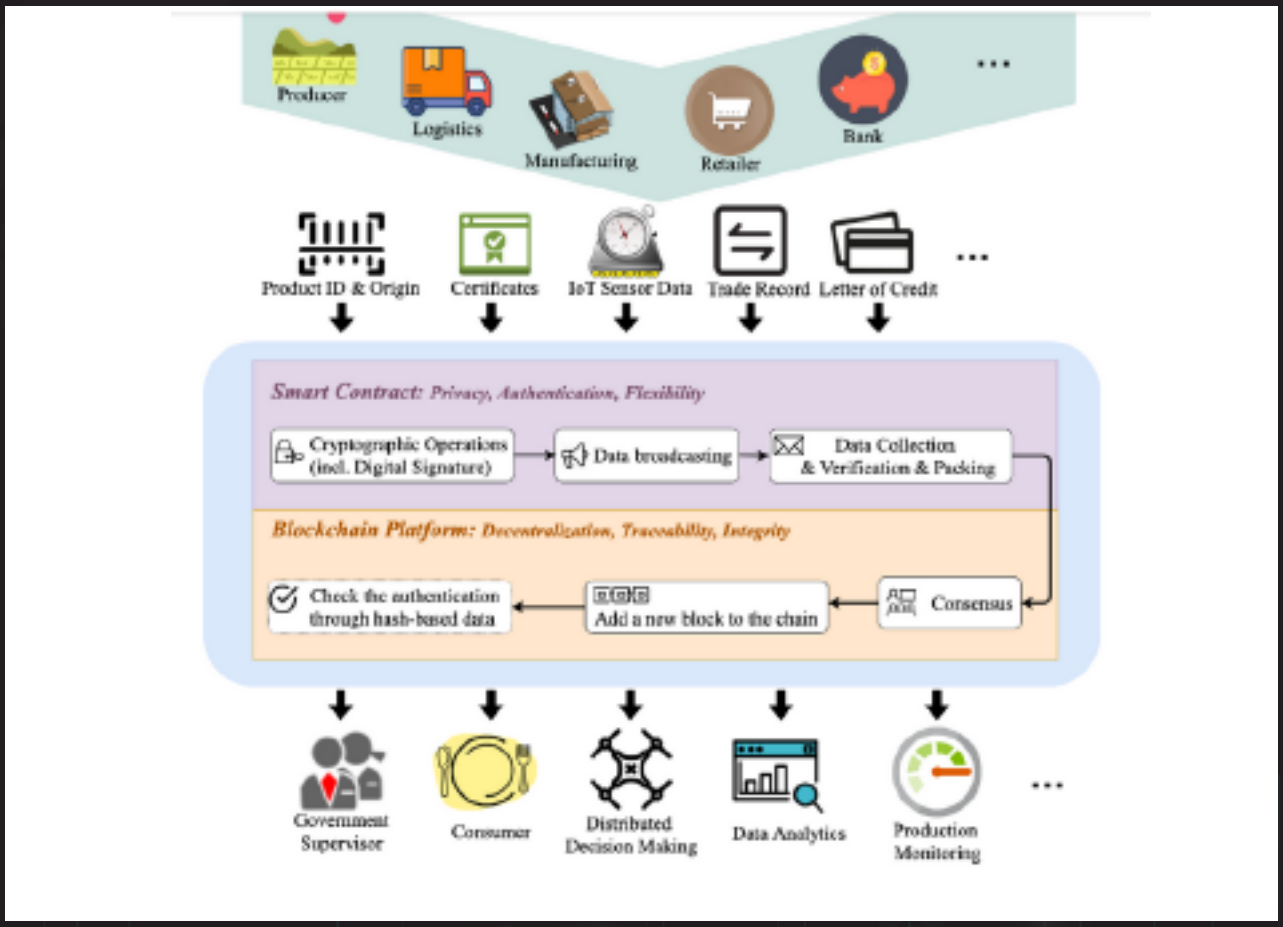
food comes from and how it is produced. The agri-food and technology industries are already exploring such applications. IBM and Walmart used blockchain-based technologies to track a package of mangoes along its exact path from retail shelf to farm in a matter of seconds.

Using blockchain-based platforms, supply chain participants can report emerging issues in real time. If a foodborne disease outbreak still occurs, retailers can determine where the contaminated food came from in a matter of seconds. This helps to implement quick food recalls and thereby save the health and even the lives of buyers.



This lack of information leaves them vulnerable, and at the mercy of traders who can dictate order prices and quantities. Blockchain technology can help rectify this imbalance by recording transactions in real time and providing up-to-date supply and demand information to participants. Having access to such information could allow farmers to set their own prices properly and optimize the quantities of products they put out on the market.

Due to its characteristics of transparency, security and decentralization, blockchain technology makes it possible to track the information about food quality in the entire supply chain. This helps prevent fraud in food transactions and reduce the costs of food supply chain management. All parties, including producers, consumers and government regulatory bodies, can thus be benefitted.



3. Modernizing Farm Management Software (FMS) :

Another use case of blockchain technology in agriculture is the modernization of farm management software. The farm management software will become mainstream soon in reality. The use of blockchain technology in the agri-food supply chain allows stakeholders and consumers access to reliable information. Blockchain technology also increases the ability to track goods and reduce the need for a third party to monitor the network and control information.Most of the Farm Management Systems focus on specific tasks and use their own specifications to implement the functionality provided. Agriculture is rapidly becoming a very data intensive industry where farmers need to collect and evaluate a huge amount of information from a diverse number of devices (e.g., sensors, farming machinery, meteorological sensors, etc.) in order to become more efficient in production and communicating appropriate information.

Blockchain can help farmers in controlling weather crisis - IoT sensors generating data or Farmers storing data, Distribution of grown crops to the food processing companies, Supply of Processed Food to Wholesalers and Retailers, Consumers can back trace the supply chain. Smart farming

allows sensors to generate crucial information related to the crops sown in the fields. The data captured either by using IoT sensors or manually by farmers is saved in the distributed storage platform, i.e IPFS with addresses stored in the blockchain.

The crops can be transported to the refineries via IoT-enabled vehicles, capturing temperature conditions under which they are kept and delivered. After the bid is validated through smart contracts, the crops undergo processing and companies store information captured at every step of the process on the blockchain. The information gathered from refineries can help wholesalers or retailers to confirm if the delivered food is of good quality or not. Storing data on the blockchain can also ensure if the compliance has been met at every step of the food supply chain. The blockchain supply chain offers traceability by helping food companies conduct food recalls or investigations quickly and seamlessly.

As farmers integrate RFID tags into their business (collect environmental and location data), drones, and artificial intelligence, they will begin to realize that they need an operating environment that will effectively manage all of this and ensure the security of the system and the data collected. The only contender for such an operating environment is the blockchain. Only this database architecture can provide openness and at the same time security of information storage. Openness is needed

because the new FMS will have to provide unobstructed access to data for all parties, and security because you need to be sure that the information is genuine and protected from falsification.

Farmers are increasingly turning to sensors, drones, and artificial intelligence devices. If you add blockchain to this set of technologies, you get a reliable, cyber-resistant, and secure system. FMS based on blockchain will also help reduce inventory costs and transaction costs between agricultural suppliers. At the same time, farmers will be able to monitor the state of their equipment and the process of growing crops more effectively and in real time.The global farm management software (FMS) market is expected to expand to $4.22 billion by 2025. An anticipated 50% growth in demand for agricultural products by 2050, coupled with water shortages and stagnation in methods to expand crop yields means that leaps and innovation in farm management software represents a key area of yield enhancement.

4. AgTech IoT Optimization :

IoT technology is an important platform for tracking goods. The development of IoT technology has made it possible for many objects to connect to the Internet to communicate with each other without human intervention. IoT reduces human data entry and uses a variety of sensors to collect data from the environment, allowing automated storage and processing of all data. IoT can provide important information, such as temperature, speed, and other indicators at all stages of production, transmission and supply.

IoT smart devices can collect and transmit the traceability data needed in the business process. The traceability information available can be stored in a blockchain-based traceability system. The traceability information may include farming background environment (e.g. soil, water, temperature and humidity quality), farming staff, date, time, origin and application of drug variety, irrigation, fertilizing and pesticides. Startups such as FILAMENT have used blockchain technology to broadcast information obtained from IoTs such as weather data, SMA alerts, machinery protocol and GPS positioning on the farm to support precision agriculture and improve transparency. Aside from agriculture, IoT integrated with blockchain frameworks can also support sustainable aquaculture practices by monitoring rearing conditions (temperature sensors, water level sensors, oxygen sensors, and pH sensors)for monitoring any environmental changes and actuators (water pump, pond heater, fish feeder, and lighting LED) for regulating the corresponding environment.

IoT applications support farmers during crop planting, irrigation, crop processing, harvesting and post-harvest, crop storage and transportation, and many other benefits in agricultural IoT systems. Soil moisture sensors, humidity sensors, leaf moisture sensors, solar radiation sensors, infrared light sensors, and rainfall predictors are among the field sensors used in IoT-based systems. In IoT scenarios, sensors can be installed in a variety of locations, including greenhouses, seed banks, cold

rooms, agricultural machinery, transportation systems, and livestock, and the data collected can be processed in the cloud for monitoring and control.

While IoT devices do not need geo-spatial information to function, the inclusion of geo-spatial information can both help establish agricultural commodity origins and learn more about cultivation site conditions. Incorporating geo-spatial data, especially from earth observation (EO) data can identify not only the origins of cash crops such as oil palm but also identify their spread to identify the impact on deforestation.

IoT can provide farmers with information on crop yields, soil temperature, pest infestation, and soil quality that is essential for high crop production and provides precise data that can be used to improve farming techniques. Crop tracking can be performed effectively to track crop growth and record growth information. The integration of blockchain with Internet of Things (IoT) for real-time monitoring of physical data and tracing based on the hazard analysis and critical control points system (HACCP) has recently been proposed.This is particularly critical for the maintenance of the cold-chain in the distribution logistics of spoil-able food products. As an example, ZetoChain performs environmental monitoring at every link of the cold chain, based on IoT devices.

Drones simplify supervision tasks for farms by being able to cover hundreds of acres in one flight, gathering, thanks to infrared technology, multi-spectral images and a wide variety of information about the condition of the land, irrigation needs, crop growth, the existence of pathogens, and, in the case of cattle, the number of animals, their weight and possible anomalies such as lameness or unusual movements.The use of drones in the agriculture industry is steadily growing as part of an effective approach to sustainable agricultural management that allows agronomists, agricultural engineers, and farmers to help streamline their operations, using robust data analytics to gain effective insights into their crops. Crop monitoring, for example, is made easier by using drone data to plan accurately and make ongoing improvements, such as the use of ditches and evolving fertilizer applications. Products can be accurately traced from farm to fork using GPS locations for every point in the journey, rather than more traditional time and labor-intensive data collection. Precision agriculture practices, which can help farmers make better informed decisions, have evolved significantly over recent years, with the global market now estimated to reach $43.4 billion by 2025. While drones, also known as unmanned aerial vehicles (UAVs), have not yet made it into the mainstream agriculture space, they are playing an increasingly important role in precision farming, helping agriculture professionals lead the way with sustainable farming practices, while also protecting and increasing profitability.

For example, DroneSeed is a startup that uses drone technology for crop planting and more. Unmanned aircrafts can also spray fields with water, fertilizers or herbicides, reducing costs, manual labor and time spent on these processes.

5. Fair Pricing :

Blockchain technology can provide lower cost and faster payment options to agri-commerce participants. In the current system, it often takes weeks for farmers to get paid for their goods, and traditional payment options such as wire transfers can be quite costly. Farming is often a feast or famine lifestyle, and the wealth of information that could be provided to farmers via a blockchain platform would help decrease the chances of famine, while helping them maximize the boom times. Blockchain can address some of these inefficiencies. In a blockchain system, a smart contract is a programmable infrastructure. All users can set up a smart contract based on their needs. All files of smart contracts are stored in the information blocks with precise details, and when there is a dispute between the parties, clear information is approved by other network operators.

Blockchain reduces the number of intermediaries, so farmers can enter into contracts directly with retailers on more favorable terms.Blockchain makes the market more transparent, which can be used to exert social pressure on parties that make excessive profits. The practice of eco-organizations has proven that this strategy is effective. Farmers can use blockchain-based platforms to create a kind of international trade union to protect their rights.

Smart contracts will eliminate the human factor in assessing insurance claims, making the claims

settlement process simpler, faster and more transparent. Smart contracts also minimize the risks of false claims and corruption among insurance companies, as no entity will be able to change insurance policies once they have been negotiated. Blockchain can provide transparency of agricultural finance transactions, credit history, and financial agreements for small farmers who want to invest in agriculture. Shared access and immutable agreements will allow smallholders to pay for raw materials and machinery in part or after delivery and guarantee fair market prices.

Smart contracts will eliminate unnecessary delays and ensure farmers get paid for their product on time. Using the blockchain-based marketplace, farmers can offer their produce to the fair purchasers and can even reach more purchasers than they could previously.

6. Oversight And Payment Of Agricultural Subsidies :

In case of the loss during a weather crisis, farmers can quickly apply for the crop insurance claim amount through the Blockchain. The transparent and immutable behavior of the Blockchain will enable insurance companies and other authorized parties to access the data provided by farmers easily. They can directly query the blockchain to fetch the required information with the help of smart contracts. After the insurance claim request is approved, farmers will automatically get the requested amount in their respective wallets. Also, during the whole process farmers can trace the activity of approval of subsidy. Thus, through Blockchain farmers can get compensation seamlessly and quickly.

Better oversight into who is being issued these subsidies, what they are being used for, and the wisdom of each payment should be available for public consumption. After all, the public is footing these bills, and like so many government records, a blockchain-linked database that embraces smart contracts and automation to provide a bigger picture of agricultural subsidies is long overdue.

Transparency and open source will allow taxpayers to control the process. In addition, the blockchain and smart contracts, reducing document flow, the number of intermediaries, unnecessary operations, etc., can help simplify these payments in terms of costs. With blockchain there is hope that at least something in the agricultural subsidies may change for the better. The public may require the creation of a blockchain platform where subsidies will automatically be distributed between those who really need them.

Agricultural subsidy management process by making it decentralized, farmer-friendly and by establishing trust and transparency. A Blockchain enabled database that embraces smart contracts and automation on several accounts would facilitate the transfer of subsidy payments in a cost-efficient manner and instantly. Blockchain can also be employed in the process of disbursing subsidies to

ensure that they benefit from subsidy programs.

7. Community-Sponsored Agriculture :

Community-supported agriculture (CSA model) or crop sharing is a system that connects the producer and consumers within the food system more closely by allowing the consumer to subscribe to the harvest of a certain farm or group of farms. It is an alternative socioeconomic model of agriculture and food distribution that allows the producer and consumer to share the risks of farming. In return for subscribing to a harvest, subscribers receive either a weekly or bi-weekly box of produce or other farm goods. This includes in-season fruits and vegetables and can expand to dried goods, eggs, milk, meat, etc.Blockchain technology has advantages in authenticating and protecting the integrity of information. Such that, consumers could track all steps in the production process quickly and reliably.

Today, a shared risk-reward arrangement is added: a community of shareholders funds the activities of a local farm before the growing season starts. In return, they receive a weekly fresh food delivery during harvest. During the growing season, the ledger provides information about the growth status of the crops. Thus the future value of the harvest can be forecasted, while profit and loss are distributed in a fair way.FarmShare in the US is an example of this new CSA model. The ultimate goal is to create new forms of property ownership, community cooperation, and local self-sufficient economies. CSA farmers are also more likely to be younger, which means that they may be more inclined to embrace blockchain technology, could it prove to be an asset to their operations. Some proposals for blockchain in CSAs include the tokenizing of shares in community farms for easier sale and the ability to reward volunteer labor directly with shares, and minimizing food waste through sensor-based crop quality tracking.

8. Mobile Remittance for Small Farmers :

Blockchain enables low-cost, quick, and secure payments that eliminate the burden on farmers.The payments can be done within a few minutes with limited transaction fees without the involvement of any middle agents like remittances or banks. The mobile payment system has opened a world of opportunities for many smallholder farmers excluded from mainstream financial services like banking and insurance. Worldwide, there are approximately 450–500 million smallholder farmers, or those who work small plots of land for subsistence and to harvest a couple of cash crops. These farmers make up roughly 85% of the world's farms, and they are the primary example of why better payment systems are needed for small-time farmers in hyper-rural areas making little to no profit from their farms. Smallholders generally possess small-scale plots of land and rely mostly on household labor for the cultivation of subsistence crops together with a single or two cash crops.

Farmers often have to grapple with access to agricultural inputs, how to get credit in case of emergencies and even unpredictable payment periods, which means they cannot focus on farming quality produce.

The financial services enable smallholders to:

- Invest in agriculture
- Relieve liquidity constraints

Blockchain brings fairness in the process of agricultural finance via transparency and shared control accessibility.

Blockchain technology is used in removing counterparty risk for sellers through real time payment, automating and democratizing access to supply chain financing for buyers, and guaranteeing that all consumers have access to the provenance of their commodities to make informed purchase decisions.

9. Incentivizing Sustainable Practices :

Sustainable agriculture offers a much-needed alternative to conventional input-intensive agriculture, the long-term impacts of which include degrading topsoil, declining groundwater levels and reduced biodiversity. It is vital to ensure India's nutrition security in a climate-constrained world. Growers may use methods to promote soil health, minimize water use, and lower pollution levels on the farm. Sustainability rests on the principle that we must meet the needs of the present without compromising the ability of future generations to meet their own needs.

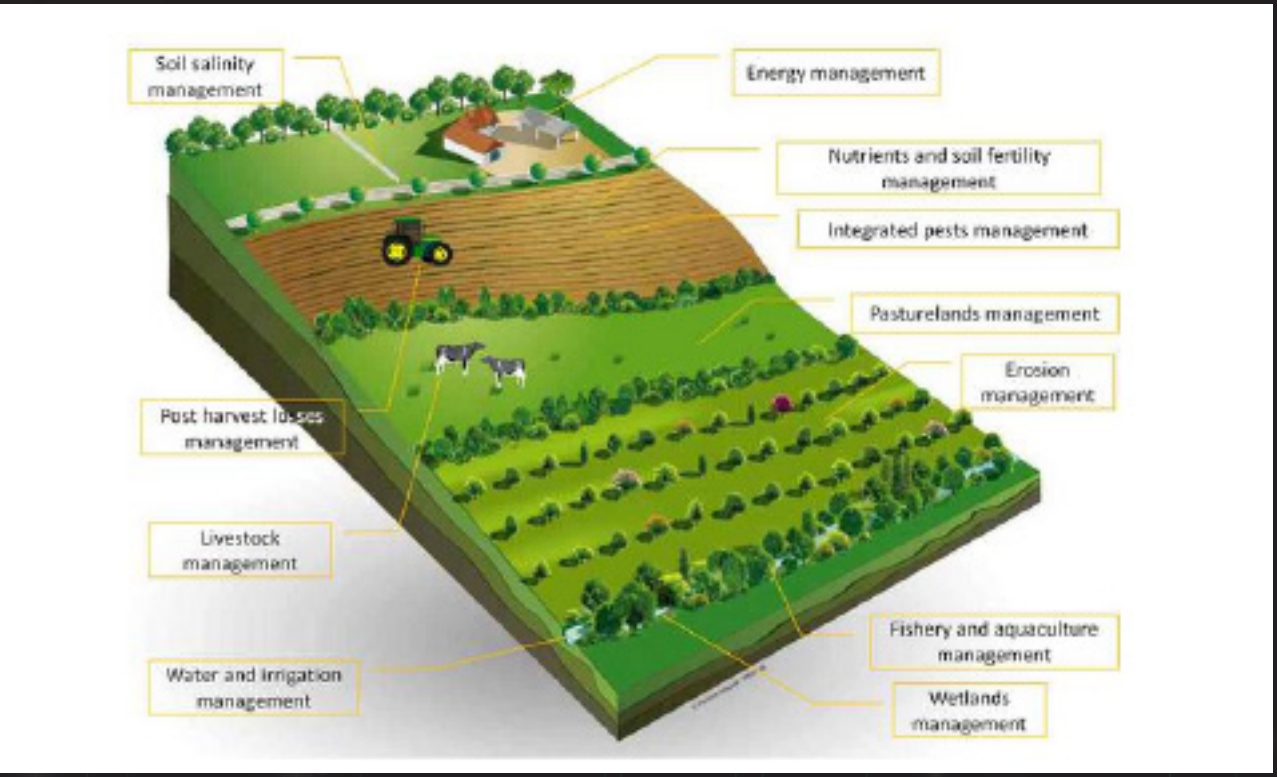
Blockchain is a disruptive technology that can facilitate traceability in agriculture supply chains through decentralized immutable public records.

Blockchain, coupled with IoT, is remodeling the food production industry. It is set to make farming a sustainable practice by using a simplified approach to optimize farming resources like:

- Water
- Labor
- Fertilizers

Blockchain combined with IoT can facilitate farmers and other stakeholders in making optimal decisions. Crop rotation can be used to suppress weeds, pathogens and insect pests.Cover crops in orchards and vineyards can buffer the system against pest infestations by increasing beneficial arthropod populations and can therefore reduce the need for chemical inputs. Using a variety of cover crops is also important in order to protect against the failure of a particular species to grow

and to attract and sustain a wide range of beneficial arthropods.



Optimum diversity may be obtained by integrating both crops and livestock in the same farming operation. A common philosophy among sustainable agriculture practitioners is that a "healthy" soil is a key component of sustainability. That is, a healthy soil will produce healthy crop plants that have optimum vigor and are less susceptible to pests. Technological advancements are today integral to attaining sustainability goals in agriculture. Satellite and GPS technologies, sensors, smart irrigation, drones, and automation, to list a few, provide the means for precision agriculture, which further aids in effective resource utilization. There are now blockchain-enabled platforms that incentivize more sustainable practices, creating more direct incentives, especially in poorer nations.

Agricultural cooperatives powered by the blockchain reward sustainable practices, encouraging farmers to establish provenance of their methods in order to attain a financial reward. Smallholder farmers cultivate crops on 12% of the world's farmlands and constitute a majority of producers in developing economies. To encourage them to produce high-quality yield, it is crucial to improve their access to financial assistance, which can aid them in investing further in farm productivity by procuring high-quality inputs, upgrading their post-harvest processes, staying informed about sustainable farming practices, and adopting better risk management practices; all of which will support their transition from subsistence farming to one that is economically and commercially viable.

10. Greater Accountability for Multinationals :

Blockchain's greatest characteristic stems from the fact that its transaction ledger for public addresses is open to viewing. In financial systems and businesses, this adds an unprecedented layer of accountability, holding each sector of the business responsible to act with integrity towards the company's growth, its community and customers. The blockchain technology offers a reliable approach of tracing transactions between anonymous participants. Fraud and malfunctions can thus be detected quickly. Blockchain technology provides value to an industry that needs more trust as it enables the storing of and access to information, which is immutable and timeless. However, data persistence is only one of the ingredients required to address shortfalls effectively. To achieve end-to-end transparency, integrity needs to be joined by interoperability and interconnectivity.

THANK YOU