

Usage of Smart Contract in SAP ACM & Agri. Business

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Abstract Smart contracts, powered by blockchain technology, present a transformative opportunity for the agribusiness sector by enhancing transparency, efficiency, and security in transactions and operations. In agriculture, where multiple stakeholders—ranging from farmers and suppliers to distributors and retailers—are involved, traditional processes often suffer from inefficiencies, high costs, and a lack of trust and transparency. Smart contracts can automate agreements, streamline supply chains, and reduce dependency on intermediaries by executing predefined conditions without human intervention. They ensure secure and prompt payments, reduce fraud by providing tamper-proof records, and enable real-time data sharing, which enhances decision-making across the value chain. By integrating smart contracts, agribusinesses can reduce transaction costs, accelerate trade, improve traceability, and foster trust among participants, ultimately leading to a more sustainable and efficient agricultural ecosystem. This paper explores the potential applications, benefits, and challenges of implementing smart contracts in agribusiness, aiming to highlight their critical role in modernizing the industry.

Keywords SAP ACM, Smart Contract

1. Introduction

1.1. Background

Smart contracts are digital contracts that automatically execute and enforce the terms of an agreement when predefined conditions are met. In SAP ACM [Agricultural Contract Management] they offer a range of benefits, streamlining processes, increasing transparency, and reducing the need for intermediaries. Here's how smart contracts can be applied in ACM.

1.2. Problem Statement

- The absence of smart contracts in agribusiness and SAP ACM severely hampers the sector's ability to manage contracts efficiently, ensure transparency, automate payments, and enforce compliance. This results in significant operational inefficiencies, increased risks, and diminished competitiveness in a rapidly evolving global market.
- There is an urgent need to integrate smart contracts to transform agribusiness operations, enhance SAP ACM's capabilities, and secure a sustainable and resilient future for the industry.
- The global agribusiness market is increasingly competitive, with a growing demand for transparency, sustainability, and efficiency. Companies that fail to adopt smart contracts risk falling behind in this

dynamic environment, facing higher operational costs, reduced market share, and diminished trust among consumers and partners.

- SAP ACM is designed to manage agricultural contracts, but without smart contracts, its potential is limited. The lack of integration with blockchain technology means that contract execution, data sharing, and payment processing within SAP ACM are still reliant on traditional, less efficient methods. This gap results in slower processes, higher costs, and less reliable data management.
- The agribusiness supply chain lacks transparency, making it difficult to track the origin and movement of products. This lack of traceability can lead to issues such as fraud, counterfeit goods, and non-compliance with safety and quality standards. Smart contracts could provide a transparent, immutable record of transactions and product movements, but their absence perpetuates these risks.

2. Methodology

2.1. Supply Chain Transparency

- **Traceability** - Smart contracts can record every step in the ACM, from planting to harvesting to distribution. This ensures that all parties involved in transaction, including farmers, distributors, and consumers, have transparent access to the origin and handling of agricultural products.
- **Quality Control:** Conditions related to product quality, such as GMO / Non-GMO [organic certification or pesticide] use, can be embedded in the contract.

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Payment can be automatically triggered when the product meets these predefined standards set by the buyer.

GMO – Genetically Modified; Non-GMO – Non-Genetically Modified.

2.2. Automated Payments

Conditional Payments: Payments can be automatically processed once certain conditions are met, such as the payment method, payment type including delivery of a crop or the achievement of a specific quality standard. This reduces delays and ensures timely compensation for farmers.

Insurance Claims: - In the event of crop failure due to weather conditions, smart contracts linked to weather data can automatically trigger insurance payouts, reducing the time and effort required for claim processing.

2.3. Contract Risk Management

Weather Derivatives: Farmers can use smart contracts for weather-related financial instruments, such as crop insurance or weather derivatives. The smart contract can automatically execute based on weather data, compensating the farmer if adverse conditions are met thereby giving price protection against the market vulnerability.

Input Supply: Smart contracts can manage the supply of inputs like seeds, fertilizers, and equipment. For example, delivery of inputs can be linked to payment, ensuring that farmers receive what they need on time and suppliers are paid promptly.

2.4. Contract Terms Enforcement

Dispute Resolution: Smart contracts minimize the need for intermediaries by enforcing the terms of the contract automatically. This reduces the likelihood of disputes and the costs associated with resolving them.

Data-Driven Compliance - Contracts can include clauses that enforce compliance based on data inputs, such as GPS data for land use or satellite imagery to confirm crop planting areas to gauge overall crop yield & productivity.

2.5. Logistics and Inventory Management

Automated Tracking: Smart contracts can manage logistics by tracking the movement of goods through the supply chain. This ensures that products are delivered on time and in the correct quantities, with payments released accordingly.

Inventory Control: Farmers and distributors can use smart contracts to automatically manage inventory levels, triggering orders or deliveries when stock reaches a certain level.

2.6. Sustainability and Compliance

Sustainability Tracking: Smart contracts can enforce sustainability practices by ensuring that payments are only made if certain environmental standards are met, such as reducing carbon emissions or maintaining biodiversity.

Regulatory Compliance: Contracts can be designed to automatically comply with local or international / cross border regulations, reducing the burden on farmers to manage complex legal requirements.

3. Other Approaches

Smart contracts are self-executing contracts with the terms of the agreement directly written into code. In agribusiness, they offer numerous potential applications by enhancing transparency, efficiency, and reducing the need for intermediaries. Here's how smart contracts can be utilized in agribusiness.

3.1. Supply Chain Management

Traceability	Smart contracts can be used to track the movement of agricultural products from farm to table. Every step, from harvesting to processing to delivery, can be recorded on the blockchain, ensuring that consumers know the origin of their food and verifying the authenticity of organic or fair-trade claims.
Quality Control	By embedding quality checks into smart contracts, products that do not meet certain standards can automatically trigger alerts or prevent further processing or shipping

3.2. Payments and Transactions

Automated Payments	Smart contracts can automate payments to farmers, suppliers, and distributors once predefined conditions are met (e.g., delivery of goods). This reduces the risk of non-payment and ensures timely transactions.
Microloans	Farmers can receive microloans through smart contracts that automatically disburse funds when certain milestones are achieved (e.g., planting, harvesting), and repayment can be linked to sales of the crop.

3.3. Crop Insurance

Parametric Insurance	Smart contracts can be used to create insurance policies that automatically trigger payouts based on predefined parameters like weather conditions (e.g., rainfall below a certain threshold) without the need for a claim process.
Dispute Resolution	Smart contracts can handle disputes between farmers and insurance companies more efficiently by relying on verifiable data inputs (e.g., satellite images, weather data).

3.4. Marketplaces and Trading

Decentralized Marketplaces	Smart contracts can enable peer-to-peer trading platforms where farmers can sell directly to consumers or retailers, reducing the need for intermediaries and ensuring fair prices.
Futures Contracts	Farmers and buyers can enter into futures contracts through smart contracts that automatically settle based on market prices or production yields.

3.5. Sustainability and Compliance

Environmental Impact Tracking	Smart contracts can help track and enforce sustainability practices by linking payments or certifications to compliance with environmental standards.
Subsidy Management	Governments can use smart contracts to distribute subsidies to farmers who meet specific sustainability criteria, ensuring funds are used as intended.

3.6. Logistics and Inventory Management

Automated Inventory Management	Smart contracts can help manage inventory levels, automatically ordering supplies or products when certain thresholds are met.
Logistics Coordination	They can automate logistics processes, ensuring that transportation and storage are optimized, and that products are delivered on time.

3.7. Data Sharing and Collaboration

Data-Driven Agriculture	Farmers can share data (e.g., soil quality, crop yields) via smart contracts, which can then be used to optimize farming practices, with payments for data being handled automatically.
Collaborative Projects	Multiple stakeholders can collaborate on agricultural projects using smart contracts to automatically distribute funds, share resources, and ensure transparency.

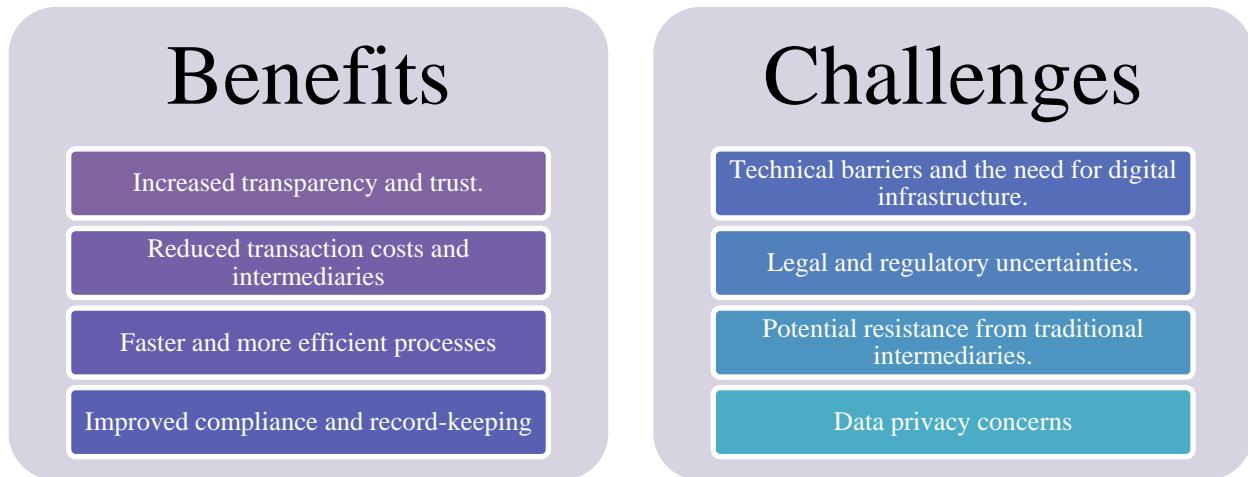
3.8. Land Ownership and Leasing

Land Registry	Smart contracts can be used to create a transparent and tamper-proof record of land ownership and leases, reducing disputes and fraud.
Automated Leasing	Smart contracts can automate the leasing of land, ensuring payments are made on time and that lease terms are adhered to.

3.9. Cooperatives and Farmer Networks

Transparent Operations	Smart contracts can manage cooperative operations, ensuring that all members have access to accurate financial records and that profits are distributed fairly.
Resource Sharing	Farmers within a network can use smart contracts to share resources (e.g., machinery, storage) efficiently, with payments and usage tracked automatically.

4. Benefits & Challenges



5. Potential for Real World

Here are some key areas where smart contracts are already being used effectively:

a) Supply Chain Management

Example: IBM Food Trust – Major companies like Walmart and Nestlé use IBM's blockchain-based Food Trust to track the journey of food products from farm to table. Smart contracts automatically trigger actions (like payments) when predefined conditions (like delivery of goods) are met, ensuring transparency and reducing the risk of fraud.

b) Finance and Banking

Example: DeFi (Decentralized Finance) Platforms – Platforms like Aave and Compound allow users to lend and borrow cryptocurrencies without intermediaries. Smart contracts automate the lending process, ensuring that loans are only issued when collateral is provided, and repayments are enforced.

c) Real Estate

Example: Propy – Propy is a real estate platform that enables the buying and selling of properties using blockchain. Smart contracts are used to automate the process of transferring property ownership, including escrow services, making transactions faster, more secure, and less prone to human error.

d) Legal Industry

Example: OpenLaw – OpenLaw leverages smart contracts to create legally binding agreements. These contracts can automate the execution of certain clauses, such as automatic payments upon delivery of goods or services, streamlining the legal process and reducing the need for manual enforcement.

e) Insurance

Example: Etherisc – Etherisc is a decentralized insurance platform that uses smart contracts to automate the claims

process. For instance, in flight delay insurance, the smart contract automatically pays out if the flight is delayed beyond a certain threshold, removing the need for a lengthy claims process.

f) Gaming and Digital Collectibles

Example: CryptoKitties – One of the earliest and most famous examples, CryptoKitties is a game where players buy, sell, and breed digital cats. Each cat is represented by a unique token, and smart contracts govern their traits and breeding possibilities.

g) Healthcare

Example: MediLedger – MediLedger is a blockchain-based network that uses smart contracts to track the provenance of pharmaceuticals, ensuring authenticity and compliance with regulatory requirements. This reduces the risk of counterfeit drugs entering the supply chain.

h) Intellectual Property and Royalties

Example: Ujo Music – Ujo Music is a platform that allows artists to publish their work and receive royalties directly through smart contracts. These contracts automatically distribute payments to artists whenever their music is purchased or streamed.

i) Voting Systems

Example: Follow My Vote – This platform uses blockchain and smart contracts to create a transparent and secure voting system. Smart contracts ensure that each vote is counted and verified, making elections more trustworthy and resistant to fraud.

j) Government and Public Sector

Example: Dubai's Smart Dubai Initiative – Dubai is leveraging smart contracts to power various government services. For instance, smart contracts are used to automate the processing of visa applications, business registrations, and payment of fines, aiming to make Dubai a fully blockchain-powered government by 2024.

k) Energy Sector

Example: Brooklyn Microgrid – This project uses smart contracts to facilitate peer-to-peer energy trading within a community. Homeowners with solar panels can sell excess energy to their neighbors, with smart contracts automating the transactions based on real-time supply and demand.

These examples illustrate how smart contracts are revolutionizing various industries by increasing efficiency, reducing costs, and minimizing the need for intermediaries.

REFERENCES

- [1] In summary, the integration of smart contracts into agribusiness can lead to more efficient, transparent, and secure operations across various aspects of the industry. However, successful implementation requires overcoming technical, legal, and cultural challenges.