# A Blockchain-Based Transparent Solution for Achieving Investment for Farming


**Ayushya Chitransh and Barnali Gupta Banik**

## 1 Introduction

Farmers are the backbone of any economy. They put all their time, effort, and assets into growing crops without certainty of investment return. Most of the time, they do not have enough cash flow for many things. Farmers must invest in their farming operations, including purchasing seeds, organic fertilizers, boosters, root hormones, and new equipment, modernizing their irrigation systems, investing in modern technology and data analysis tools, and expanding their operations by buying additional land or acquiring new farms [1]. Farmers may also invest in new or improved infrastructure, such as building new barns, greenhouses, or storage facilities.

Additionally, farmers may choose to invest in marketing and branding efforts to increase the value of their products and reach new customers [2]. Therefore, they need capital funding. There are several challenges that farmers may face when seeking capital funding:

Limited access to credit: Many small and medium-sized farmers may have difficulty accessing credit from traditional financial institutions due to a lack of collateral or poor credit history.

High-interest rates: Farmers may be charged higher interest rates on loans due to the perceived risk of farming as a business.

Short repayment periods: Farmers may be required to repay loans within a fleeting period, which can be challenging if the farm is not generating sufficient income.

Lack of information: Farmers may not be aware of the various funding options or may not have the necessary information to apply for funding.

A. Chitransh (✉) · B. Gupta Banik
DL Unify, DLT Labs, Hyderabad, India
e-mail: ayushyachitransh@gmail.com

B. Gupta Banik
e-mail: barnali.guptabanik@ieee.org

© The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd. 2024

J. K. Mandal et al. (eds.), *Proceedings of International Conference on Network Security and Blockchain Technology*, Lecture Notes in Networks and Systems 738,
https://doi.org/10.1007/978-981-99-4433-0_44

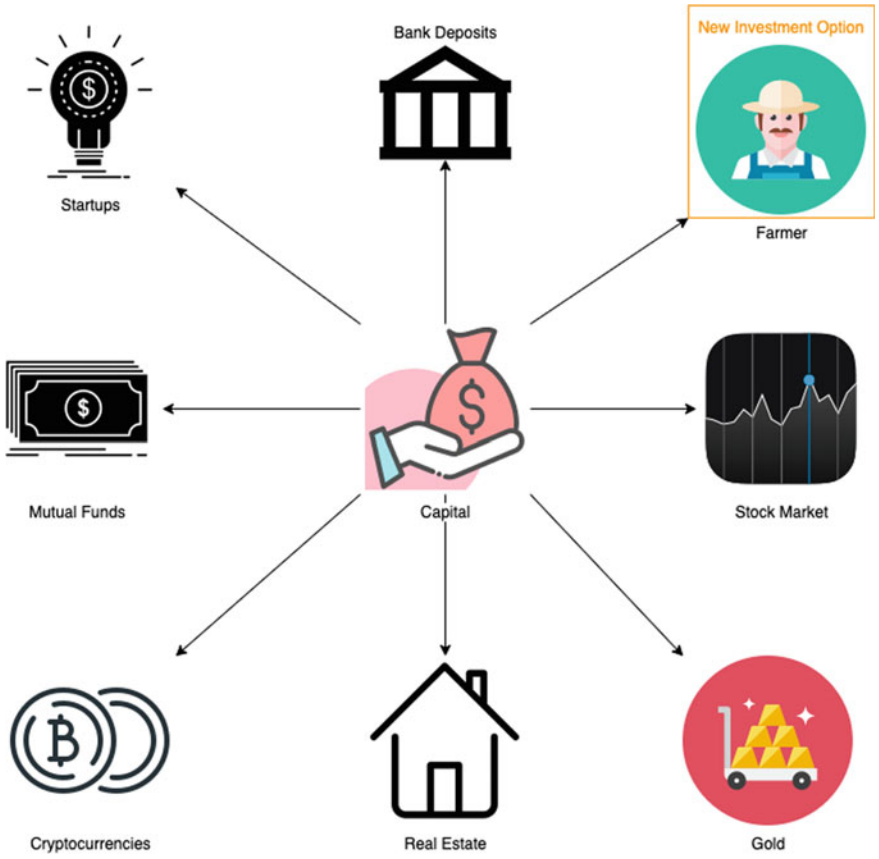


**Fig. 1** Farmers as new investment opportunity for investors

The complex application process of applying for funding can be complex and time-consuming, which can be a barrier for farmers with busy schedules.

Limited options: There may be limited funding options available to farmers, particularly in rural areas. These challenges can make it difficult for farmers to access the capital they need to operate and grow their businesses.

Figure 1 demonstrates many opportunities for investors to invest in traditional options, and one new option can be farming

Therefore, in this article, a blockchain-based architecture has been proposed that will bring venture capitalists and farmers on the same page with the flexibility of choosing either one as per the requirement match. Since it is built on blockchain, it brings along some of the inherent benefits of blockchain. One of them is transparency for investors. They would be more aware of their investment. It also facilitates farmers in getting a better line of credit [3, 4].

## 2 Background and Motivation

The capital market can be a source of funding for farmers, either through issuing securities such as stocks and bonds or through loans and other forms of credit. Farmers may access the capital market through intermediaries such as investment banks, brokerage firms, and lending institutions. Some farmers may also be able to access capital directly by issuing securities on a public exchange. In addition to traditional forms of capital, farmers may also be able to access alternative funding sources such as crowdfunding platforms, peer-to-peer lending platforms, and microfinance institutions.

Small-scale farmers may have difficulty providing collateral due to a lack of assets, such as land or equipment, which can be used as collateral. This can make it difficult for them to access credit and other financial services, as lenders may view them as high-risk clients. There are a few options available to small-scale farmers who are unable to provide collateral [5]:

- Microfinance institutions: These institutions specialize in providing financial services to underserved communities, including small-scale farmers. They often have more flexible lending requirements and may be more willing to provide loans without collateral.
- Government programs: Some governments have programs to provide credit and other financial services to small-scale farmers. These programs may have relaxed collateral requirements or may not require collateral at all.
- Alternative collateral: In some cases, small-scale farmers may use alternative forms of collateral, such as livestock or crops, to secure a loan.

It's important to note that while these options may be available, they may not always be the most affordable or convenient options for small-scale farmers. It's also worth considering ways to improve access to credit and financial services for small-scale farmers, such as by developing more inclusive financial systems or implementing policies that support small-scale agriculture.

Blockchain is a distributed ledger technology that allows for secure, transparent, and tamper-proof record-keeping. It is a decentralized system, meaning that any single entity does not control it. Instead, it relies on a network of computers to validate and record transactions [6].

With the use of blockchain for this purpose, we can bring the following benefits to the system:

- Immutability: Once data has been recorded on a blockchain, it cannot be altered. This means that the terms of a contract stored on a blockchain would be tamper-proof and could be relied upon as a reliable source of information.
- Decentralization: Blockchain technology is decentralized, meaning that any single entity does not control it. This could be useful for contracts between investors and farmers, as it would allow both parties equal access to and control over the contract.

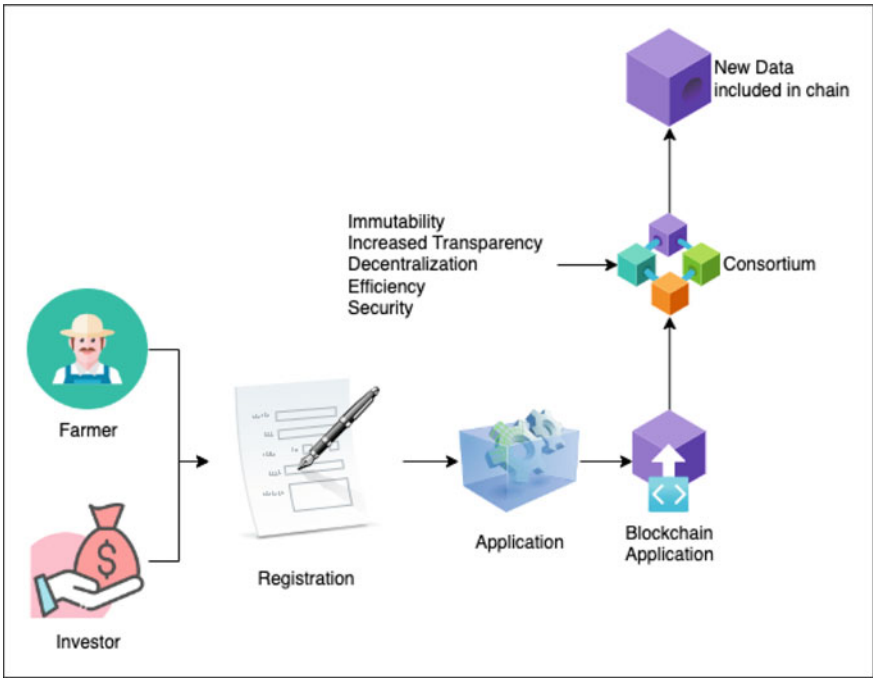


**Fig. 2** Overview of Blockchain-based solution

- Smart contracts are self-executing contracts with the terms of the agreement between buyer and seller being directly written into lines of code. The code and the agreed-upon terms are stored and replicated on a blockchain network.
- Increased transparency: Blockchain technology allows for increased transparency, as all parties have access to the same information. This could be useful for contract-making between investors and farmers, as it would give both parties a clear understanding of the terms of the agreement.
- Efficiency: The use of blockchain technology can streamline and automate various contract-related processes, making the contract-making process more efficient.
- Security: Blockchain technology is secure, using encryption to protect the recorded data. This could be useful for protecting the terms of a contract between an investor and a farmer.

Figure 2 demonstrates the use of blockchain to gain benefits of the blockchain system and bring them to the agricultural industry. This would allow the growth of farmers and bring them closer to not only technology but also to better opportunities for farmers to get initial investment for farming. It also demonstrates the use of the platform by both farmers and investors to interact with each other.

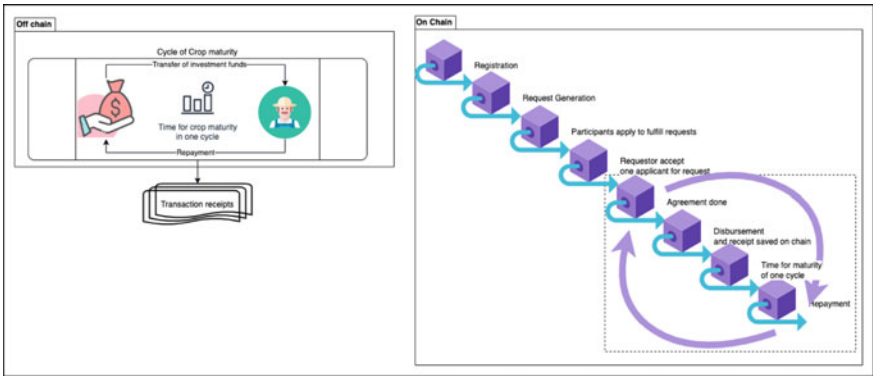


**Fig. 3** Architecture of the solution

## 3 Proposed Solution

We bring a platform where investors can invest in farming, and farmers can find investors for the planned agricultural venture. The architecture of the proposed system has been demonstrated in Fig. 3. The proposed solution brings together farmers and investors by creating a distributed application. Some parts, which are essential to promote transparency and trust, are stored on the blockchain, while other components, which involve currency, are done off-chain, and their completion details are stored on the chain. This distributed application will be accompanied by another android application, which facilitates ease in accessing the interface to the blockchain ease of fingertips.

The process which involves blockchain includes the following steps:

1. Registration
2. Request generation
3. Application submission
4. Request acceptance
5. Agreement creation
6. Disbursement of funds
7. Repayment of the fund back to investors.

### *3.1 Registration*

Registration of business entities, farmers, and investors will be done by a decentralized application (dApp). This will verify the identity of the entity. The data is private and should not be exposed to the public. Hence, proper security controls will be placed to keep the privacy of registered entities. This process is depicted in Fig. 4.

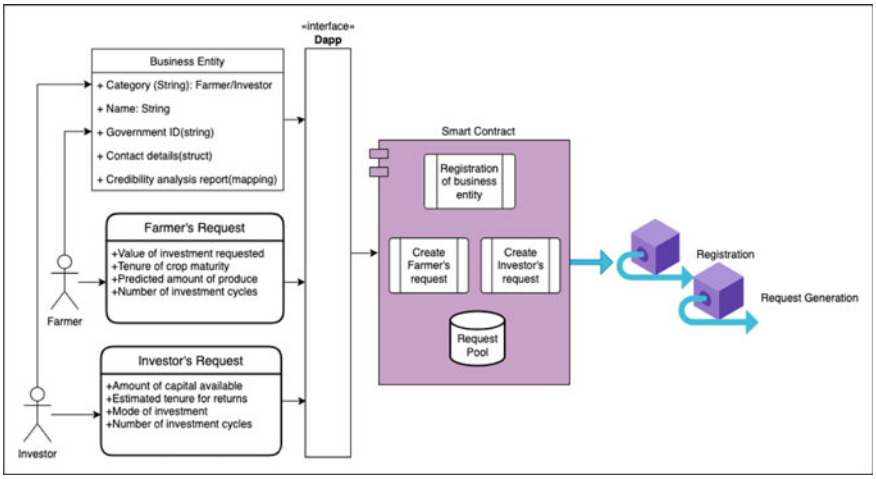


**Fig. 4** Registration and request generation

## *3.2 Request Generation*

Both business entities can generate the request. Requests generated by farmers will provide details about the crop the farmer intends to produce and the expected amount of investment the requester is looking for. The format of a farmer's request shall include the following key data items:

- Amount of investment required
- Tenure of maturity
- The Predicted amount of produce
- Number of investment cycles.

Similarly, an investor can also put forward his invitation for investment. An investor's request shall have the following key data items:

- Amount of capital available
- Expected maturity (estimated tenure of returns)
- Mode of investment-cash, online
- Number of investment cycles.

## *3.3 Application Submission*

Farmer's requests are available for investors who are looking for investment opportunities. They can review the request of farmers and apply for investment.

Similarly, investors' request for an invitation to farmers is available. Farmers can easily find available investors and submit a proposal to get investment. This ease of finding and transparency of the process is the main advantage of blockchain here.

### *3.4 Request Acceptance*

The request is subject to receiving multiple applications. The requestor, whether a farmer or investor, can understand, and study each application, review the credibility, and establish one-to-one connections to understand better and accept the application. This would lead to the finalization of terms of the agreement as per the request submitted by the requestor and as applied by the applicant.

### *3.5 Agreement*

Once the requestor accepts the request from the selected participant, the request will be noted in the smart contract as an agreement. It would contain all the terms and conditions that both parties agreed to arrive at the settlement.

Once requests are available online, interested parties can apply for those requests. The request-generating entity will review the applicants, and the applicant will be accepted based on the criteria registered during the application submission process. Once accepted, this will generate an agreement between both parties. This agreement is valid for multiple cycles of crop production. This will allow flexibility to farmers in case one of their cycles gets affected by any natural calamities leading to loss of productivity.

The process of application, acceptance, and agreement has been demonstrated in Fig. 5.

### *3.6 The First Phase of the Cycle: Disbursement*

In Fig. 6, the disbursement process is depicted. This is an offline process. The monetary transactions, though capable of being carried out on blockchain, pose the risk of market volatility and crypto laws, therefore all the processes for disbursement would be carried out off-chain, where both parties will meet physically, exchange the cash/digital disbursement of the pre-planned amount and physical receipt will be signed by both parties. The receipts would be stored on the blockchain to ensure the transactions were made, and both parties agreed to avoid the non-repudiation conflict.

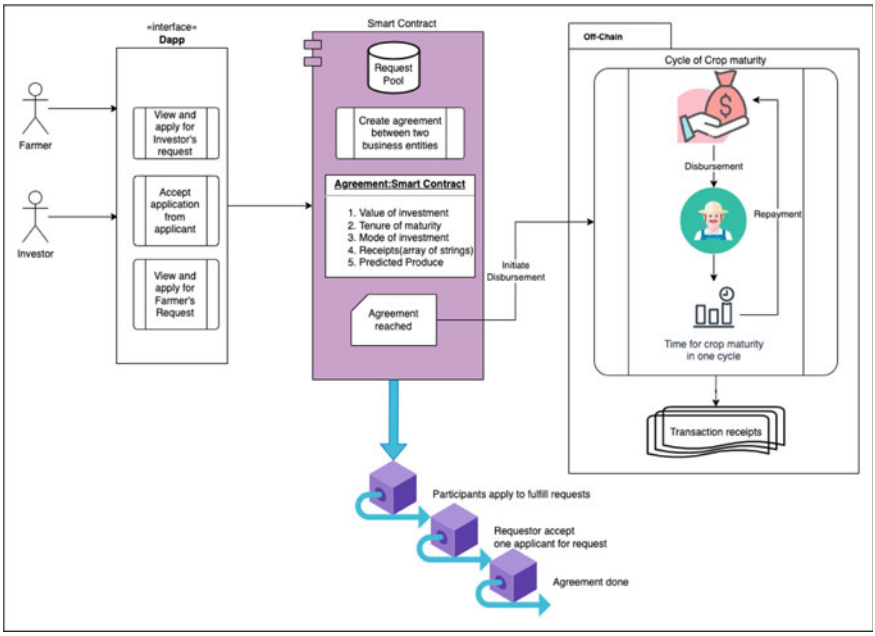


**Fig. 5** Application, acceptance, and agreement

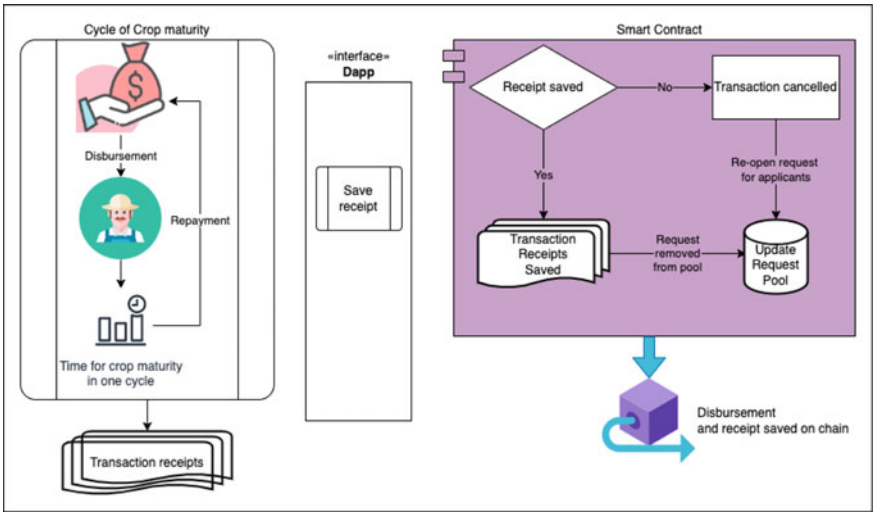


**Fig. 6** Disbursement

If the disbursement is completed, the "request" must be deleted from the "Request Pool." If not completed, the request must be re-opened and updated in the "request pool" for future acceptance by any other farmer or investors.

### *3.7 The Second Phase of the Cycle: Repayment*

This is also an offline process. In this step, farmers can return the borrowed amount to the investors. The time of repayment can be pre-decided because the agreement can be for multiple cycles of crop maturity. Once the repayment is done, the details of the transactions can be stored on the blockchain to ensure both parties agree to the transactions made. This cycle of disbursement and repayment can be repeated multiple times as agreed by both parties during the agreement.

## 4 Future Scope

This work has been ideated and demonstrated here. In future, this application will be built as a prototype and tested on agricultural entities. At that time, the following concerns also will be addressed:

- Expanding this process to other farm produce
- Farm market produce: This opens the scope for creating new markets for farmers to sell their produce, ensuring a better post-harvesting experience for farmers.

## 5 Conclusion

Blockchain technology can be used to create funding solutions for farmers. In this article, farmers can get digital identity for themselves on blockchain. This could help them to access the credit and insurance at right amount. In this proposed solution, smart contract has been used to ensure that farmers are able to receive transparent and efficient funding based on specific conditions and triggers, and it will allow the funders to disburse the funds to farmers. It involves smart contract which can ensure compliance with law and regulations, reducing risk of corruption. This proposed solution aims at increasing transparency, efficiency, accessibility, and automating processes also. In this solution, farmers can have direct transactions with the funders, reducing the transaction costs and time consumption compared to the traditional way of transactions through intermediaries.

## References

1. LEI Innovation, Risk and Information Management, et al (2017) Blockchain for agriculture and food: findings from the pilot Study. Wageningen Econ Res. https://doi.org/10.18174/426747
2. Xiong H et al (2020) Blockchain technology for agriculture: applications and rationale. Frontiers Blockchain 3:7. https://doi.org/10.3389/fbloc.2020.00007
3. Tripoli M, Schmidhuber J (2018) Emerging opportunities for the application of blockchain in the agri-food industry. FAO and ICTSD: Rome and Geneva. Licence: CC BY-NC-SA 3.0 IGO
4. Liu P et al (2022) Investment decision of blockchain-based traceability service input for a competitive agri-food supply chain. Foods 11(19):2981. https://doi.org/10.3390/foods11192981
5. Garg A, Shivam AK (2017) Funding to growing start-ups. Res J Soc Sci 10(2):22–31
6. Sathya AR, Gupta B (2020) A comprehensive study of blockchain services: future of cryptography. Int J Adv Comput Sci Appl 11(10). https://doi.org/10.14569/IJACSA.2020.0111037