BLOCKCHAIN IN AGRICULTURE – ENHANCING FOOD TRACEABILITY

Implementation of Smart Contract Deployment using Solidity, MetaMask and Ganache

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D17B / 2

Problem Statement

- Traditional agricultural supply chains rely on centralized records, which are:
- Prone to tampering, loss, or human error
- Lack of transparency for consumers
- Delay identification of contamination sources or fraud
- No unified platform exists for tracing the journey of food products from farm to consumer.

PROPOSED SOLUTION

Implement a Blockchain-based Food Traceability System that:

- Records every step of the food journey (harvest, transport, storage, sale)
- Uses Smart Contracts to automate registration and tracking
- Ensures immutability, transparency, and trust among stakeholders.

SIGNIFICANCE OF BLOCKCHAIN

Transparency

Everyone in the supply chain can verify data in real-time.

Immutability

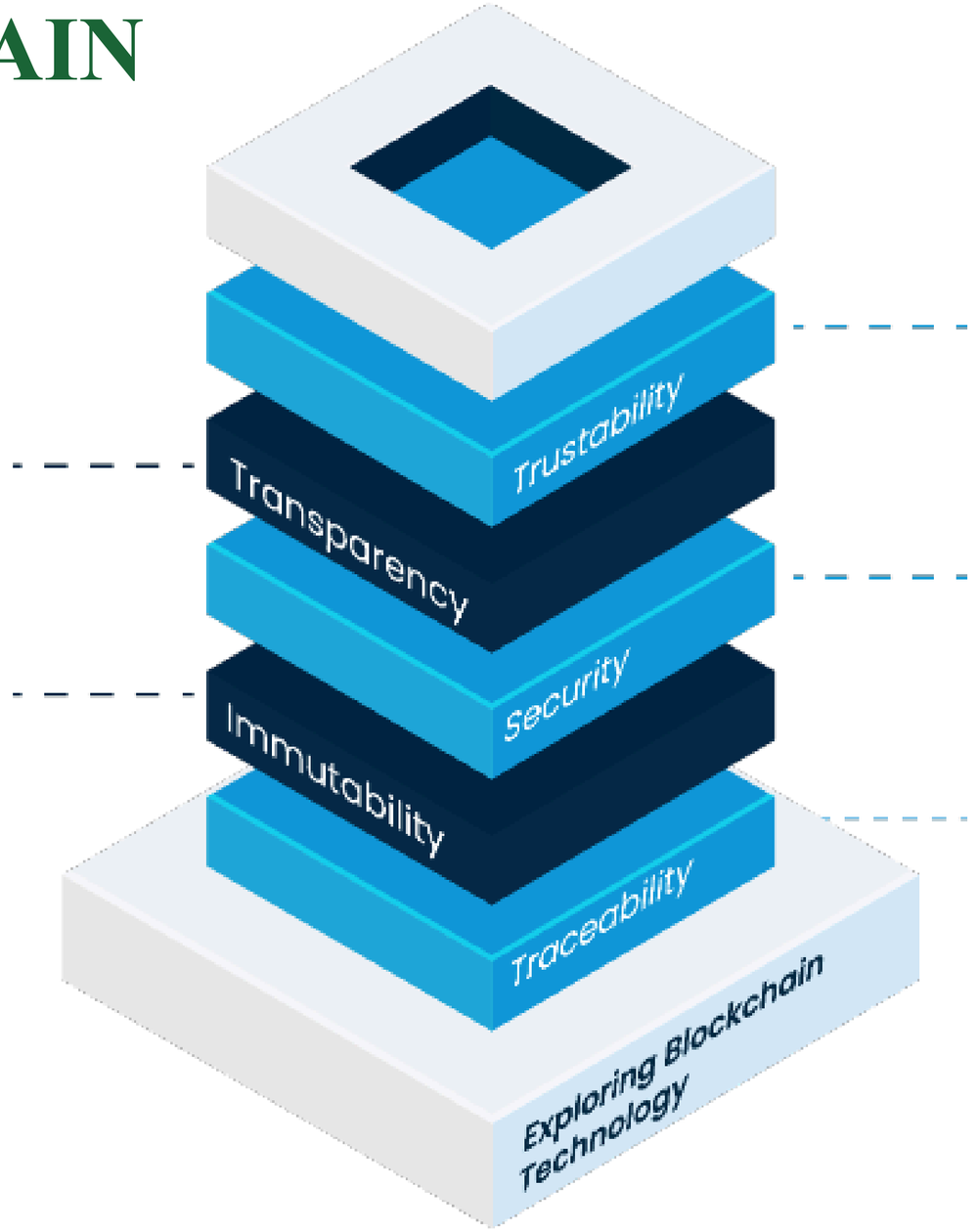
Once recorded, data cannot be altered.

Automation

Smart contracts execute predefined rules without intermediaries.

Trustless System

Removes need for central authority or manual verification.



KEY STAKEHOLDERS INVOLVED

Farmer

Producer

Registers product details (name, harvest date, location) via FoodRegistration.sol

Distributor

Transporter

Updates product movement and logistics via FoodTraceability.sol .

Retailer

Seller

Updates storage and quality details via FoodTraceability.sol .

Consumer

End-user

Can verify authenticity, source, and product journey by reading blockchain data.

SMART CONTRACTS INVOLVED

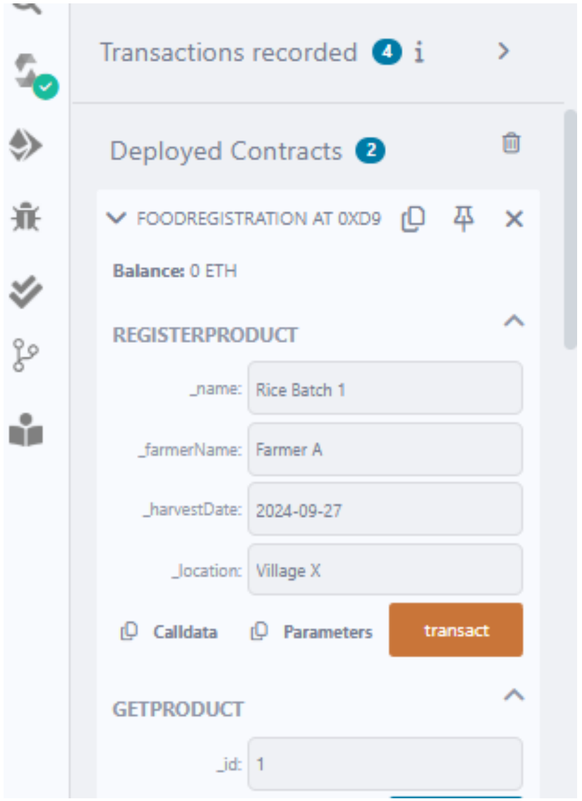
FoodRegistration.sol

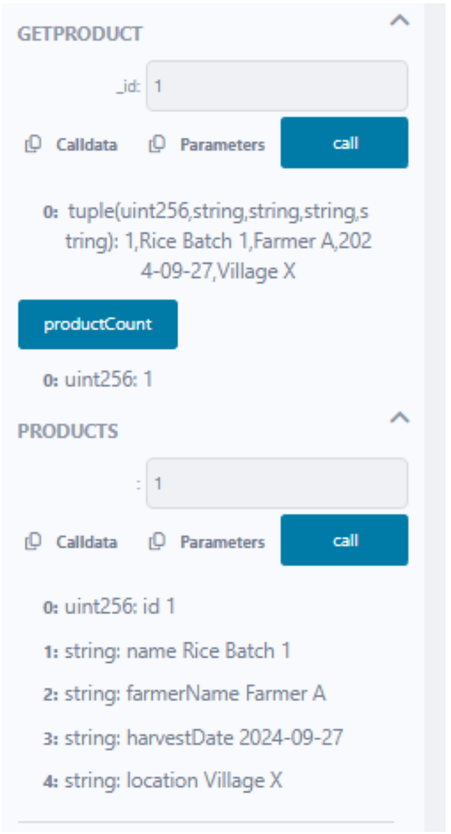
- Purpose: Register products by farmers.
- Key Functions: registerProduct(), getProduct()
- Data Stored: Product ID, Name, Farmer, Harvest Date, Location

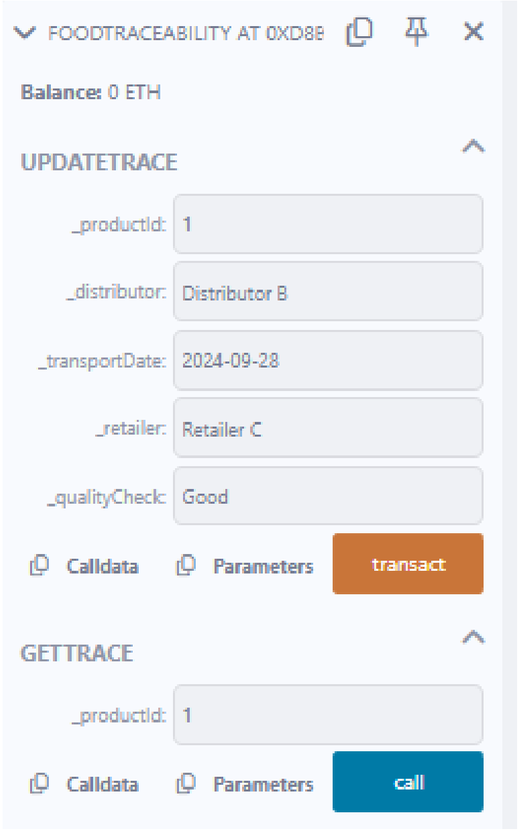
FoodTraceability.sol

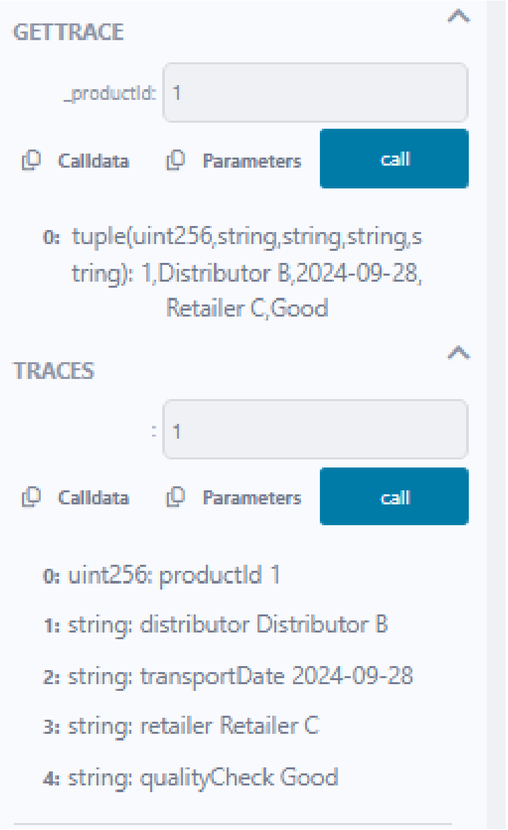
- Purpose: Track product journey after registration.
- Key Functions: updateTrace(), getTrace()
- Data Stored: Product ID, Distributor, Transport Date, Retailer, Quality Check

IMPLEMENTATION OF EXP 6









FoodRegistration.sol

FoodTraceability.sol

IMPLEMENTATION OF EXP 7

Steps to get funds from RSK Testnet

1. In Metamask select, Add a new Test network
2. Add the following credentials

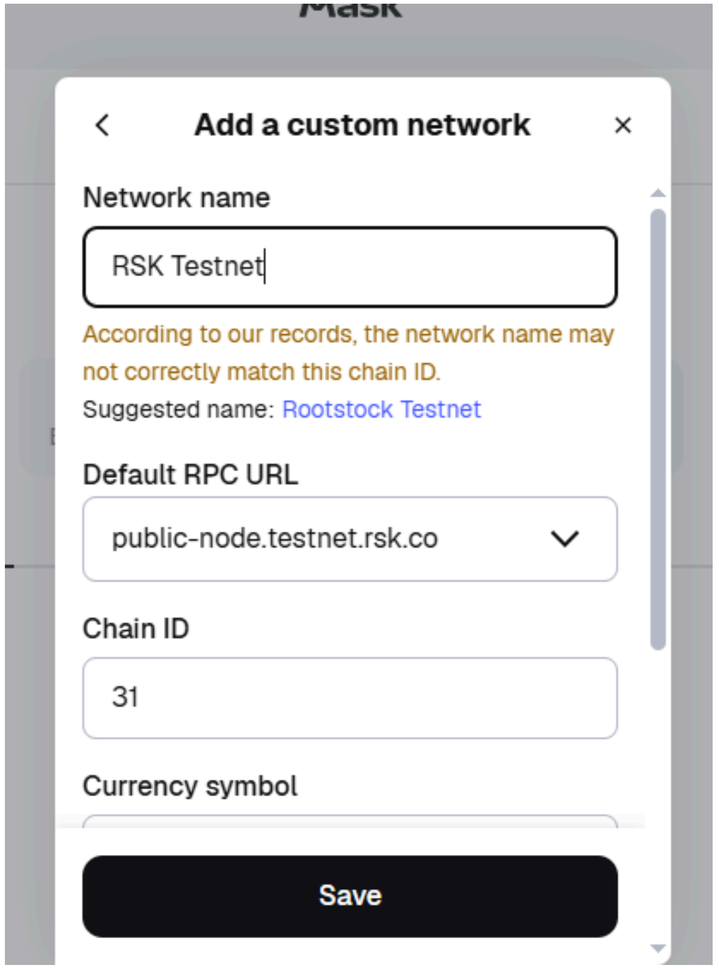
Network Name: RSK Testnet

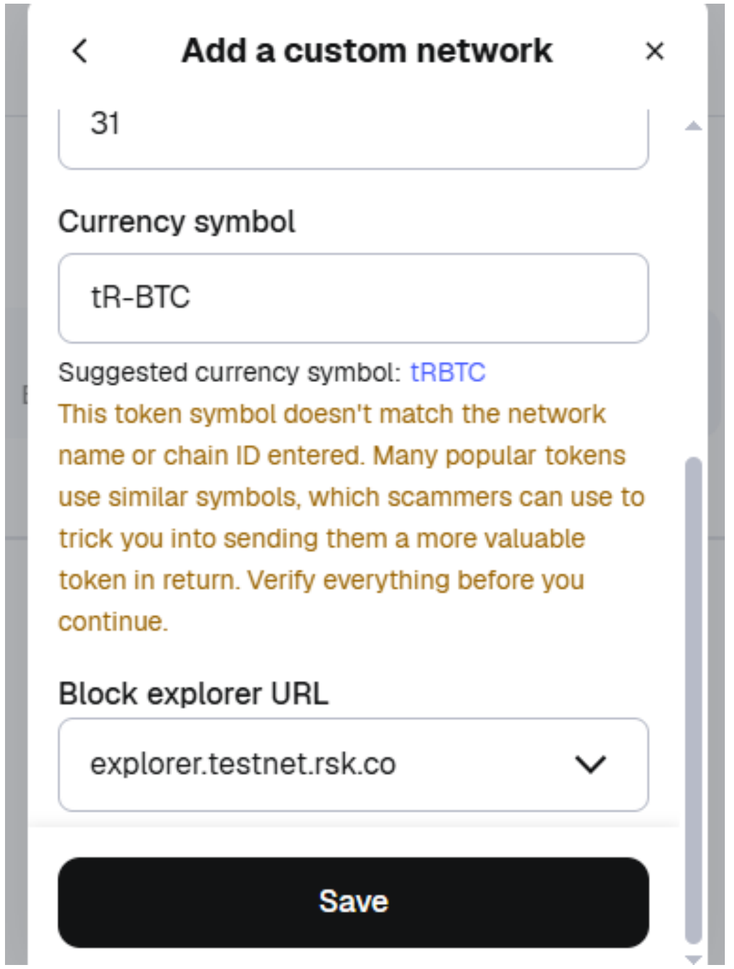
New RPC URL: https://public-node.testnet.rsk.co

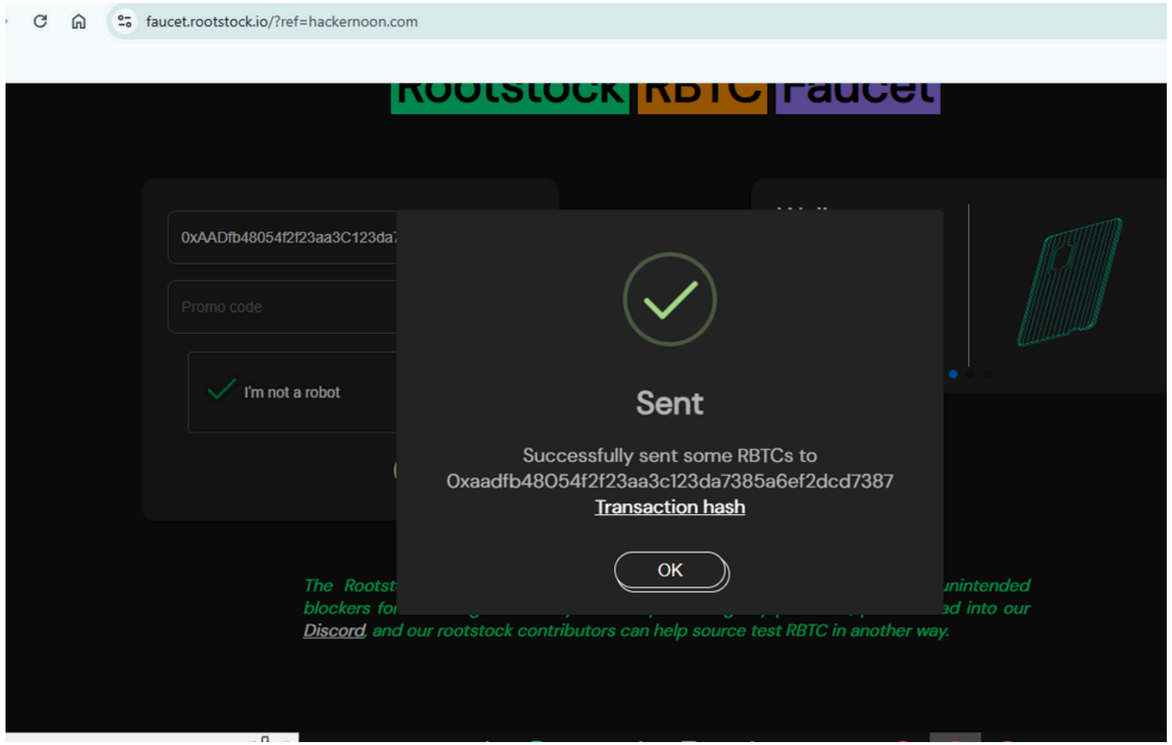
ChainID (optional): 31

Symbol (optional): tR-BTC

Block Explorer URL (optional): https://explorer.testnet.rsk.co

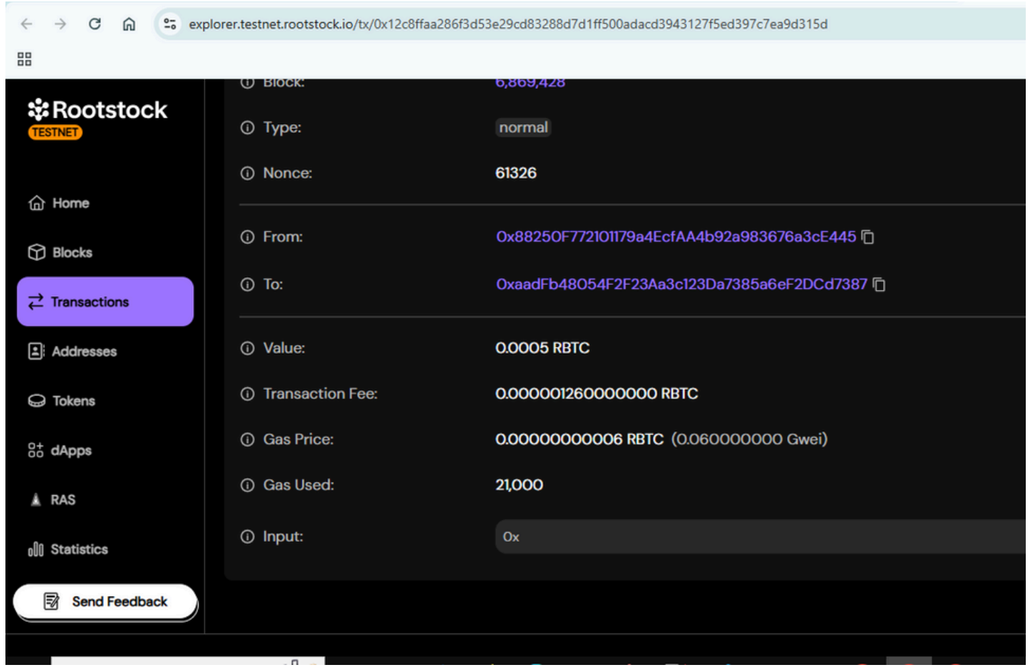


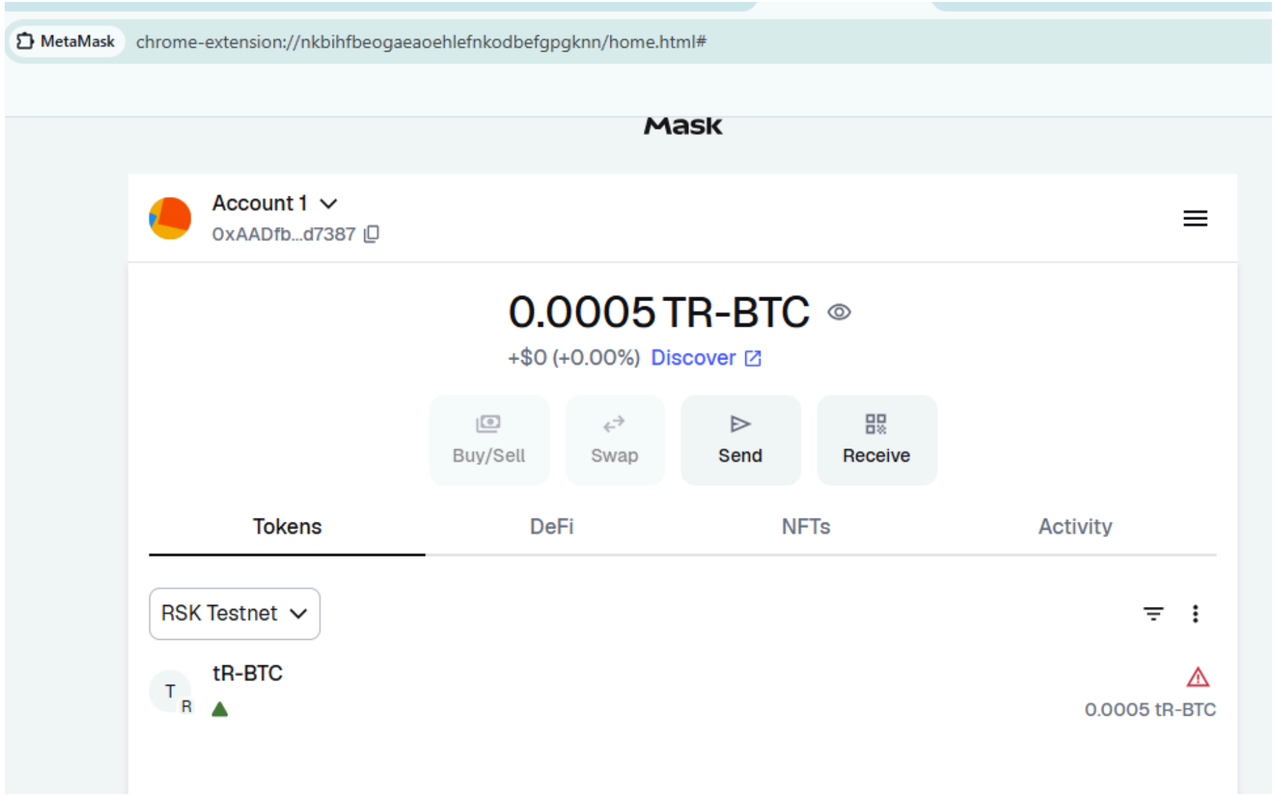




Go to the RSK Testnet : https://faucet.rsk.co/?ref=hackernoon.com and enter your account details from the Metamask to get free Ethers (only 0.05 RBTC per day)

After the successful transfer of funds, check the transaction details @ RSK Testnet Explorer

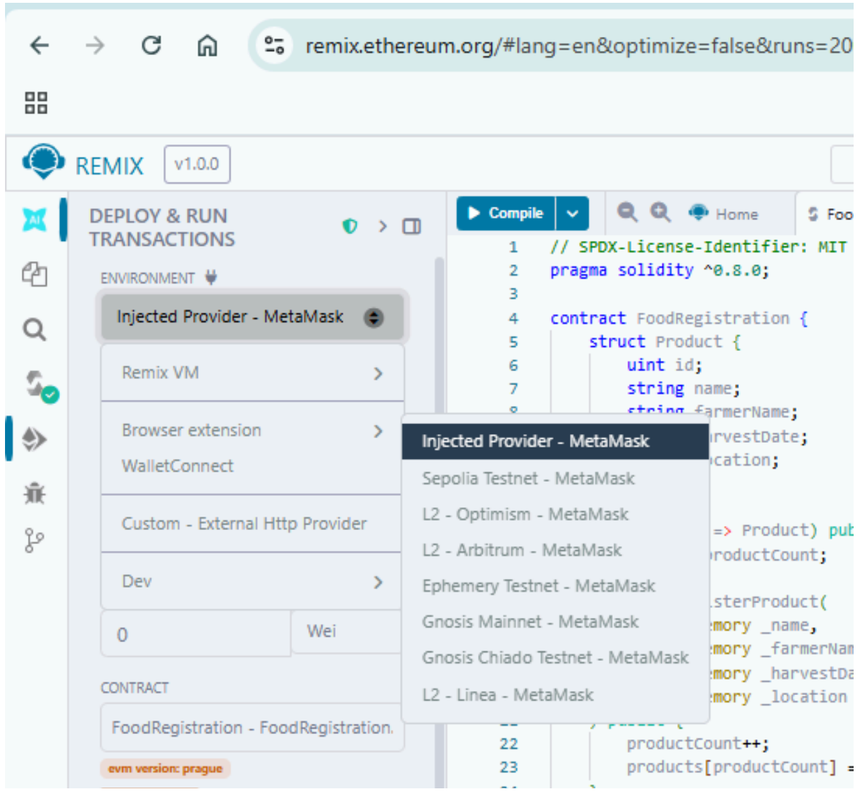


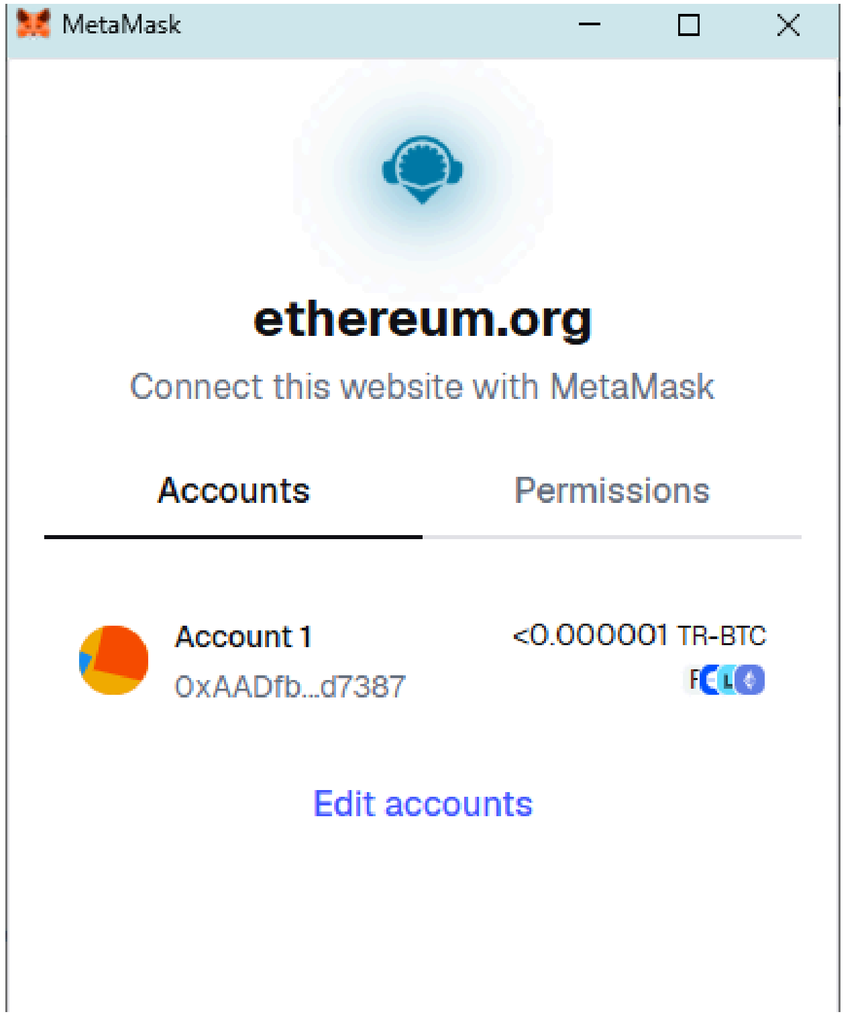


The funds are available at Metamask

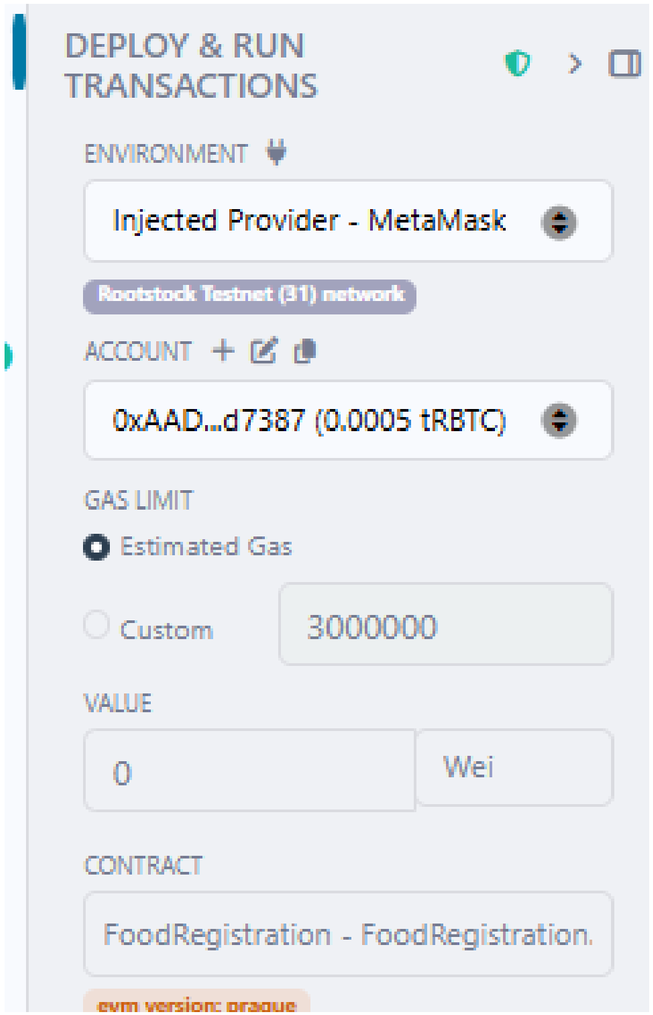
Connect the RSK Testnet to Remix IDE

In the Remix IDE, select the Environment as Injected Web3.





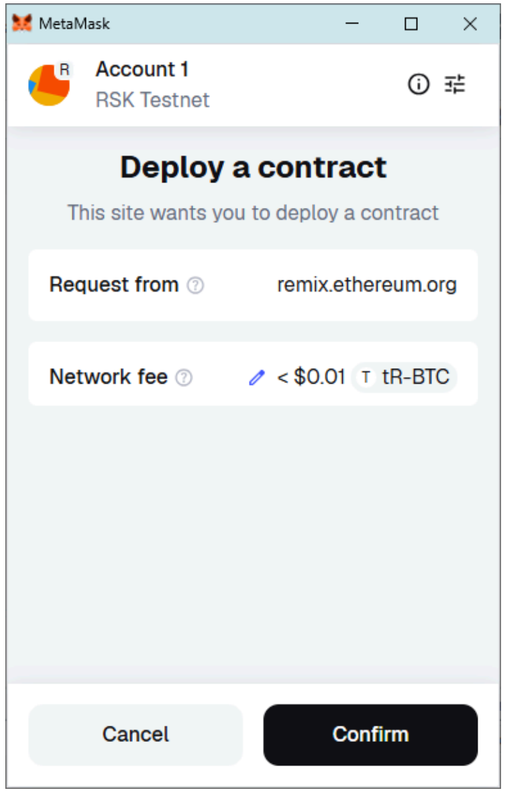
Once the Injected Web3 Provider is selected as Metamask, the following popup appears.

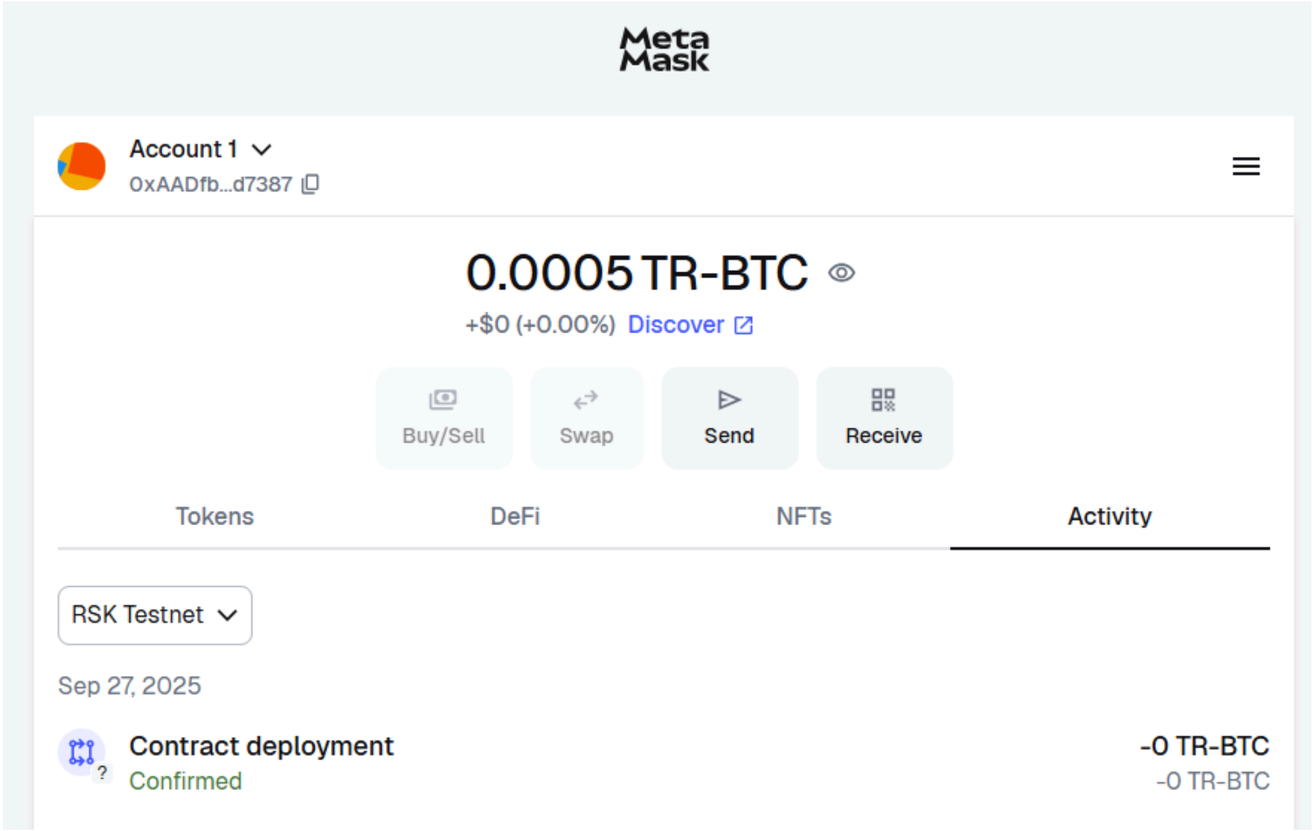


Click on Connect button. Once the Account is linked to Remix IDE, the Metamask Account details appears in the Deployment Environment as given

Create a Simple Solidity Smart Contract

FoodRegistration.sol

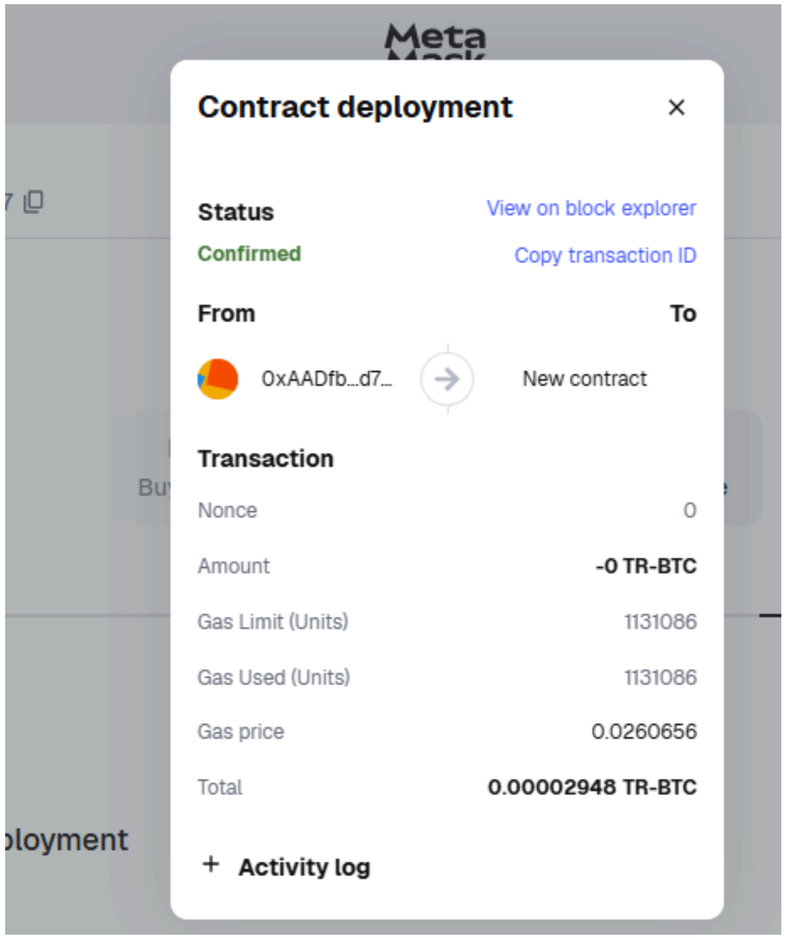




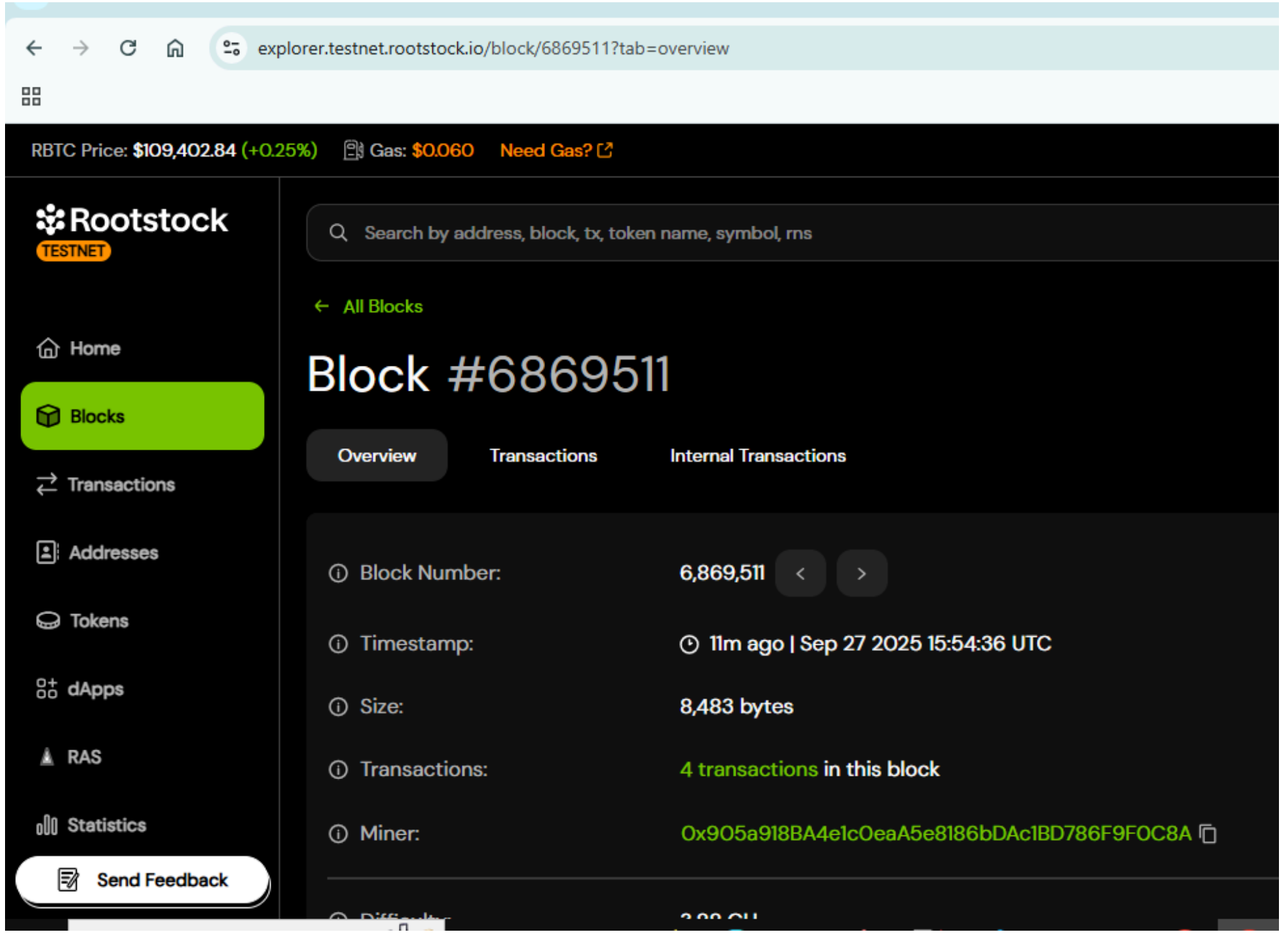
Compile and Deploy the Smart Contract.

Once the Contract is deployed on Remix IDE, the popup appears to confirm the Contract Deployment.

Once the transaction is confirmed the status of the transaction is displayed



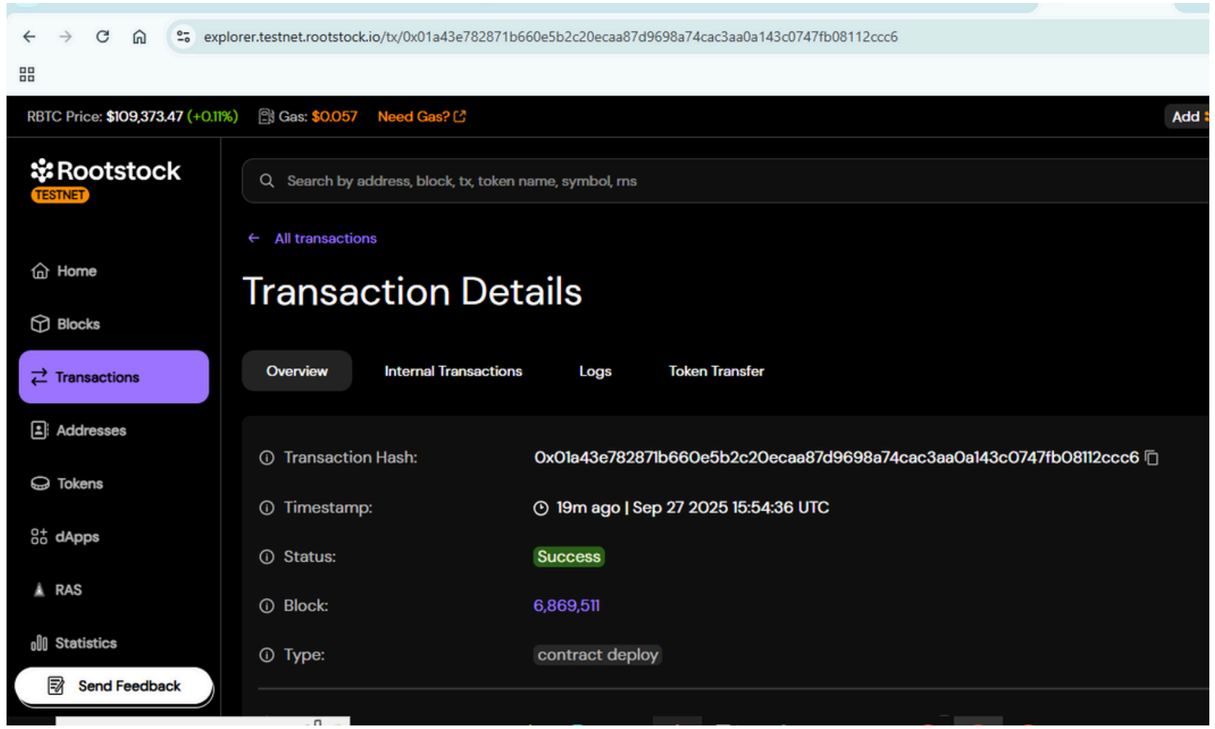
Transaction Deployment details are displayed, w.r.t the Gas Limit, Used, Gas Used, Gas Price and Total Amount

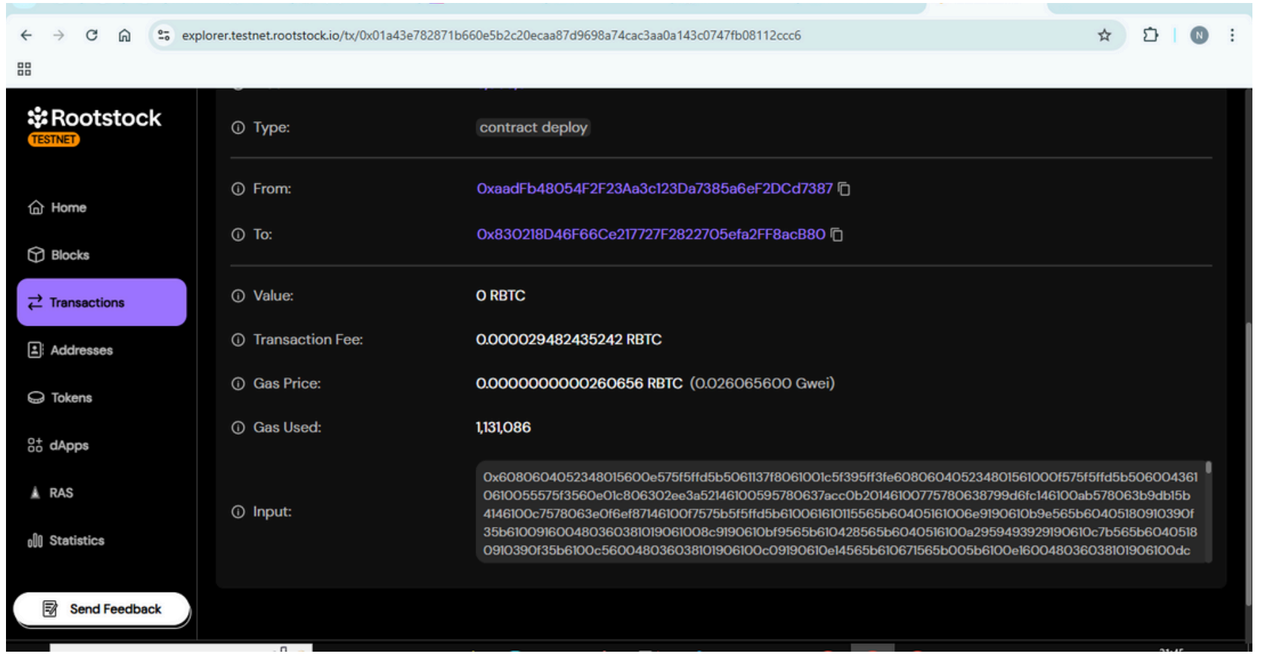


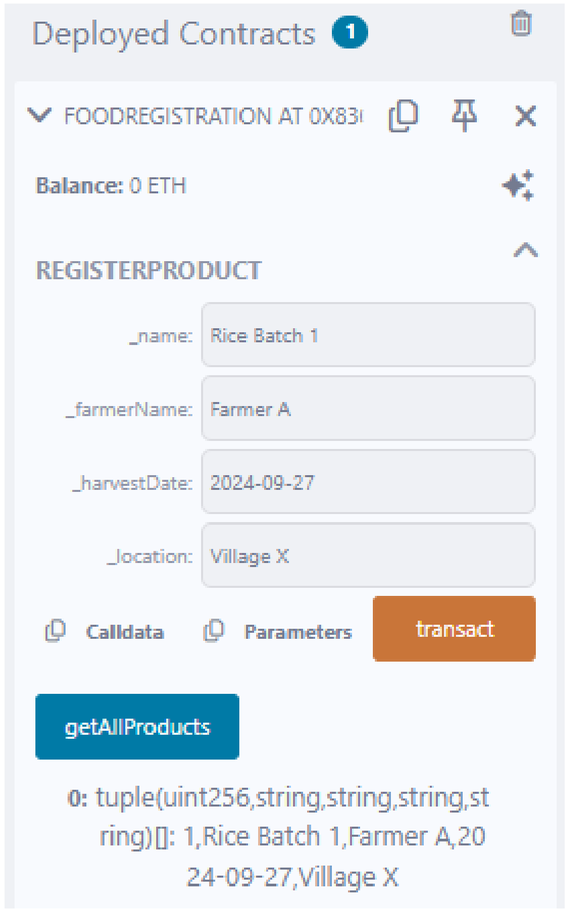
Check the transaction details on the RSK Explorer

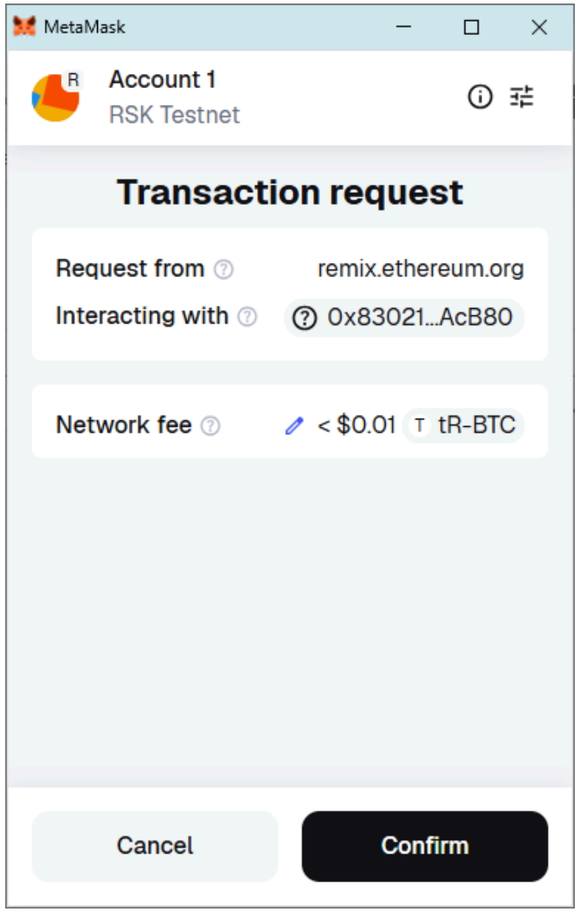
1. Open https://explorer.testnet.rsk.co/
2. Enter the Block Hash / Transaction Hash on the Search. The details of the transactions are displayed as follows

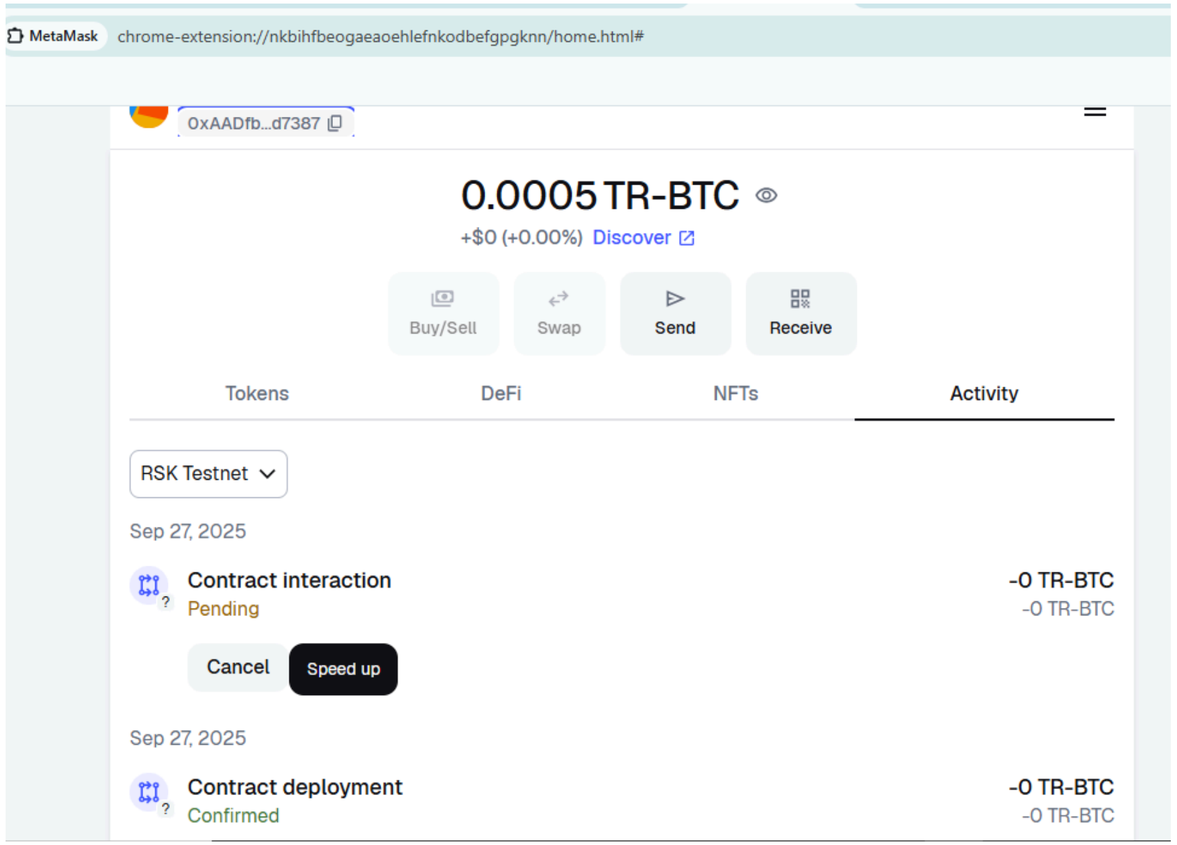
Transaction Details



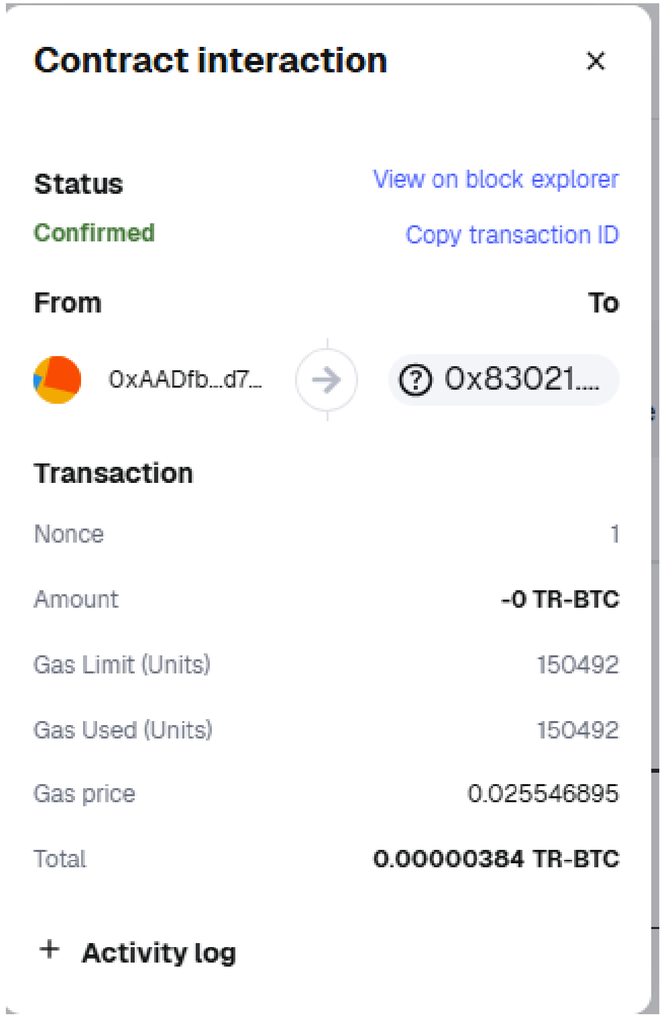


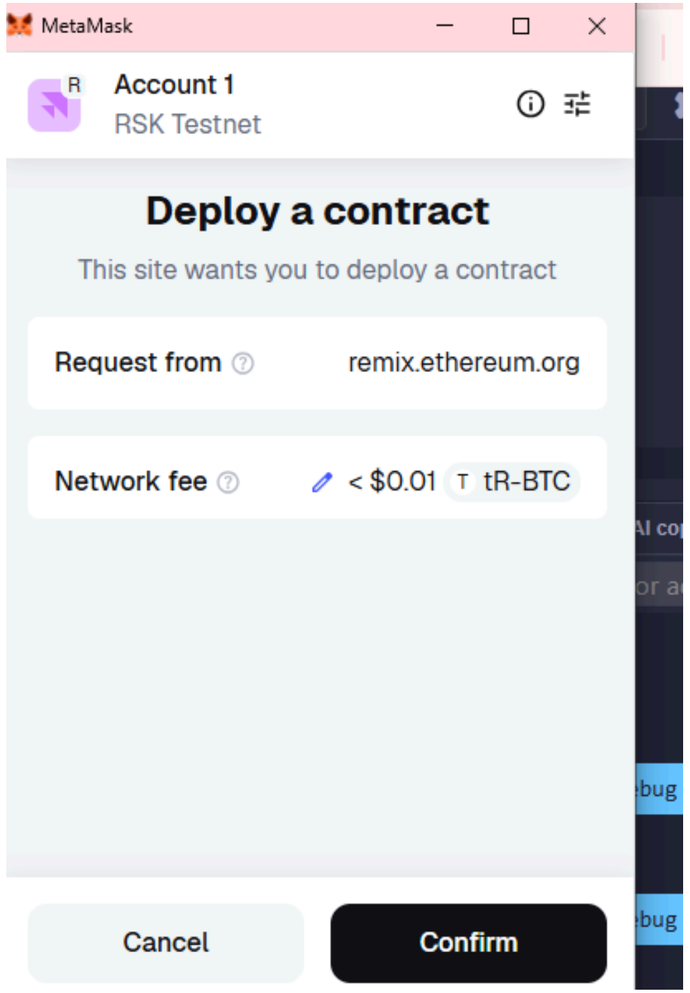




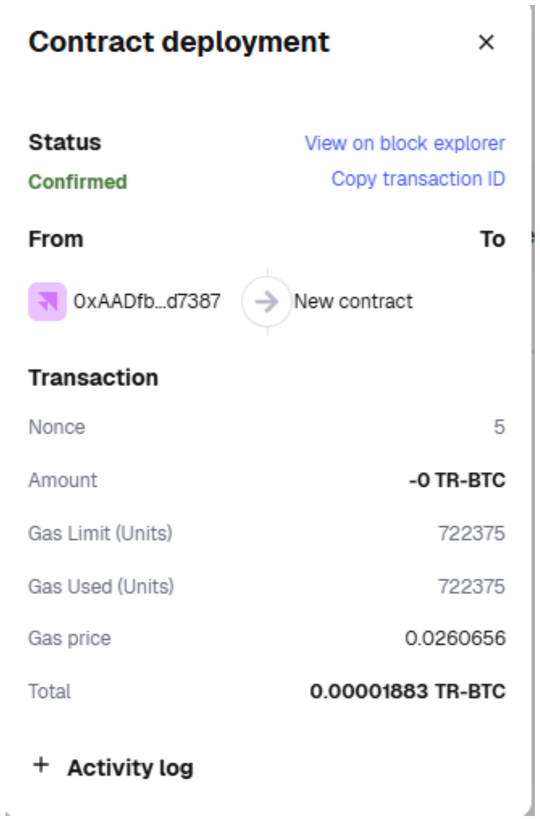


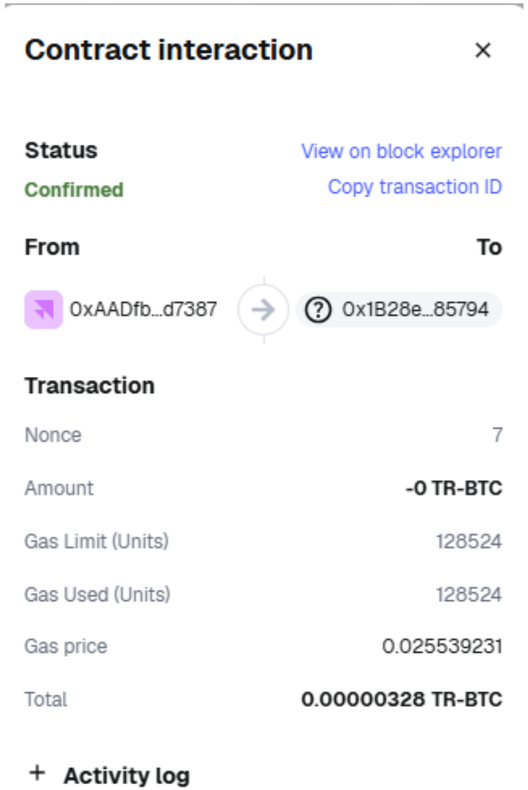
Interact with the smart contract

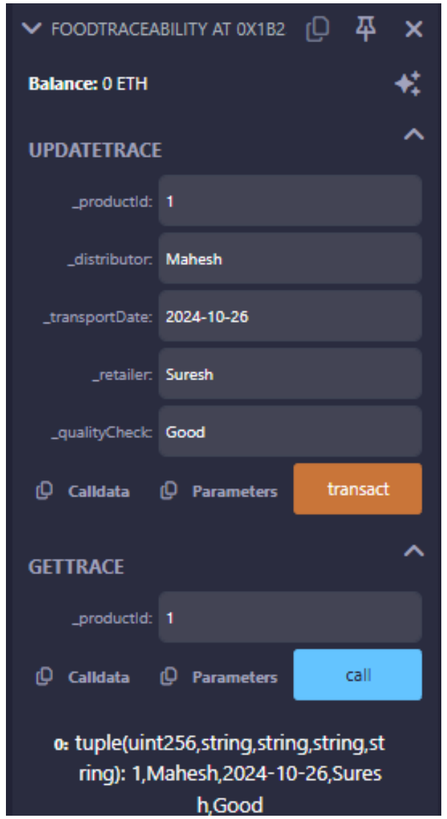


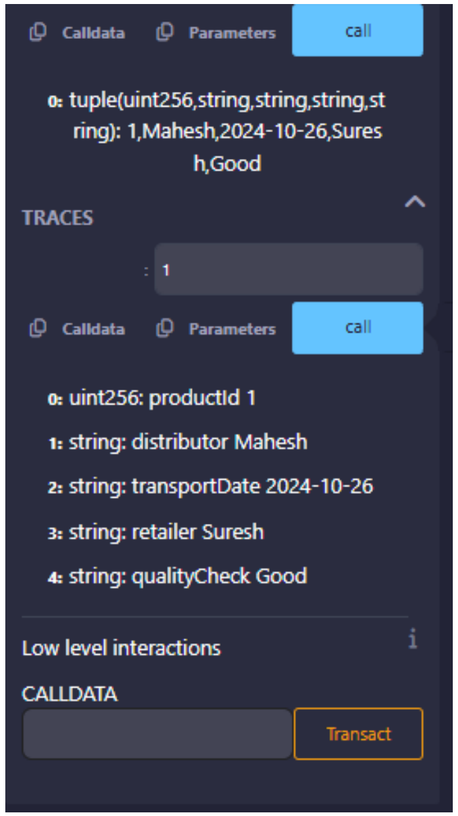


FoodTraceability.sol



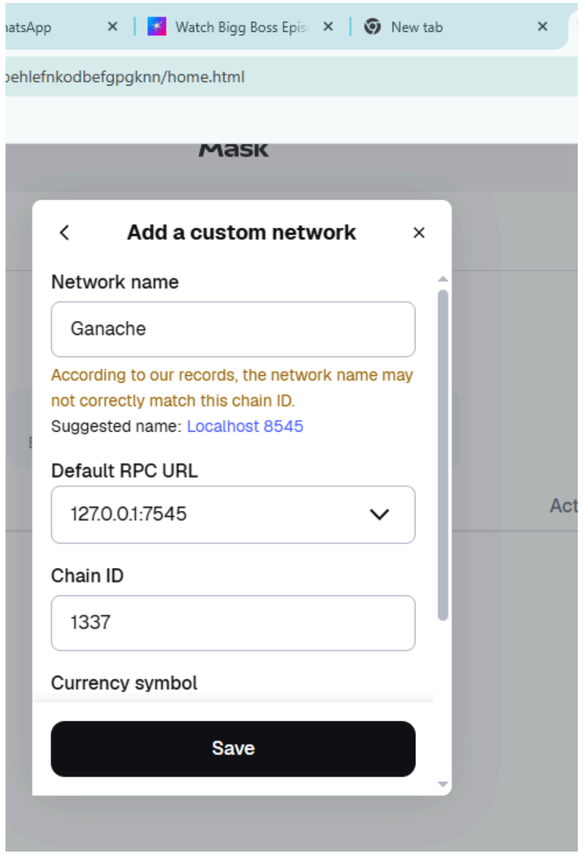


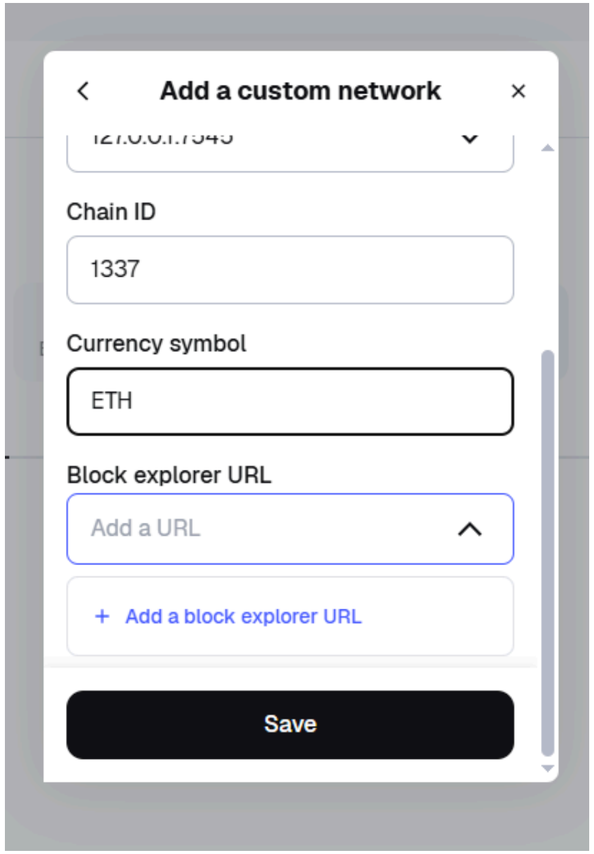


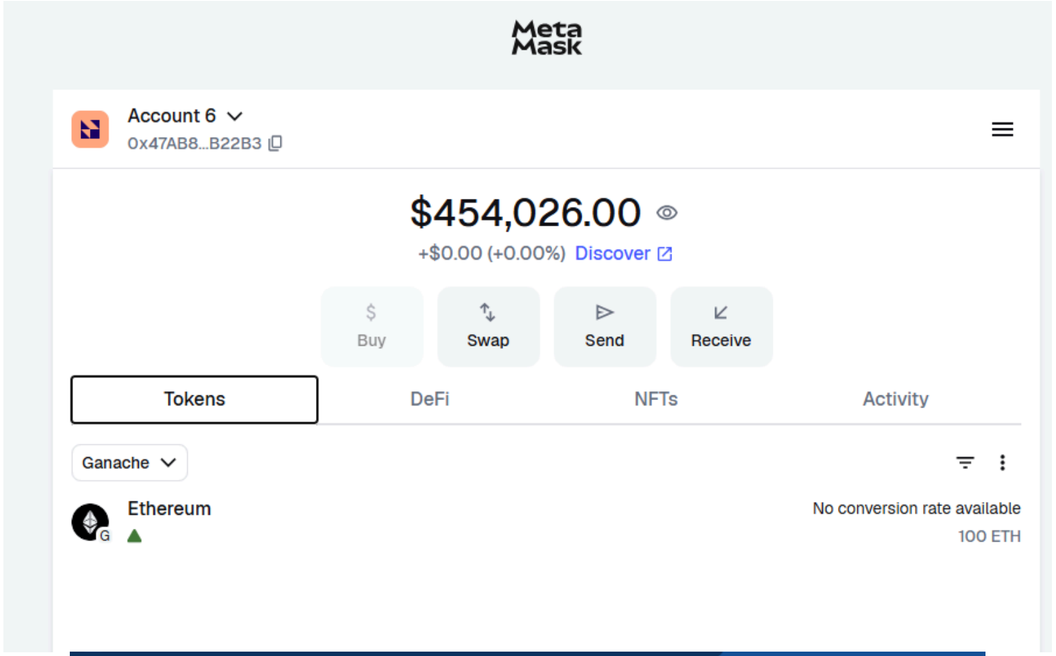


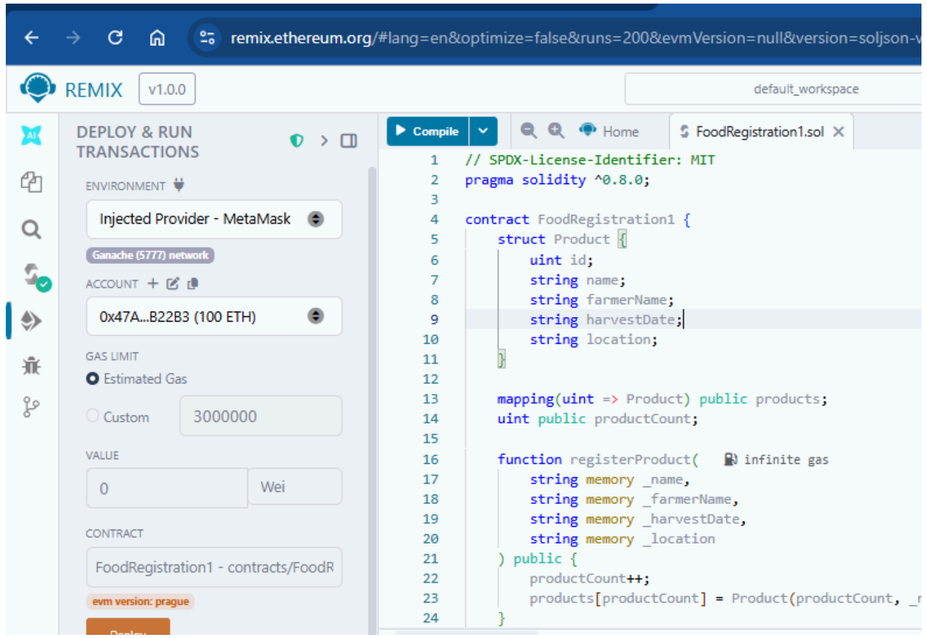
Interact With Contract

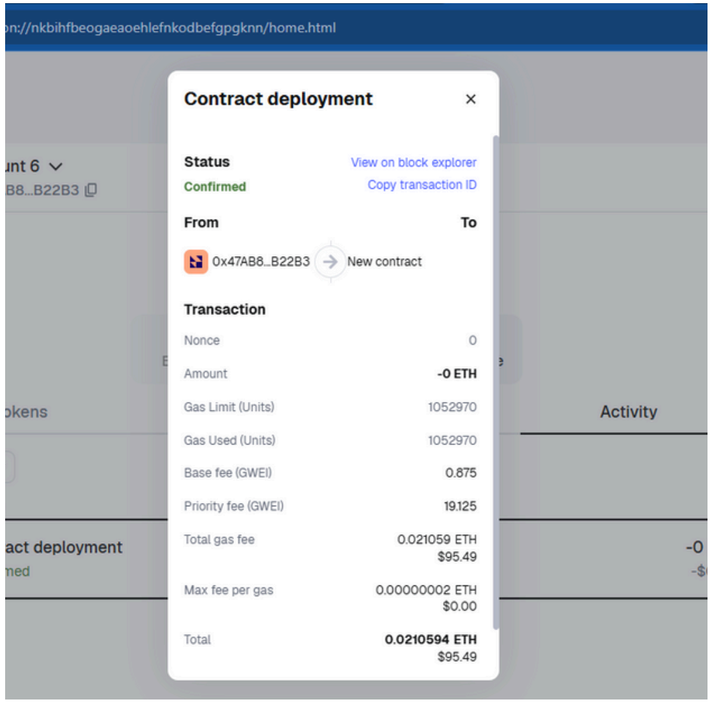
IMPLEMENTATION OF EXP 8

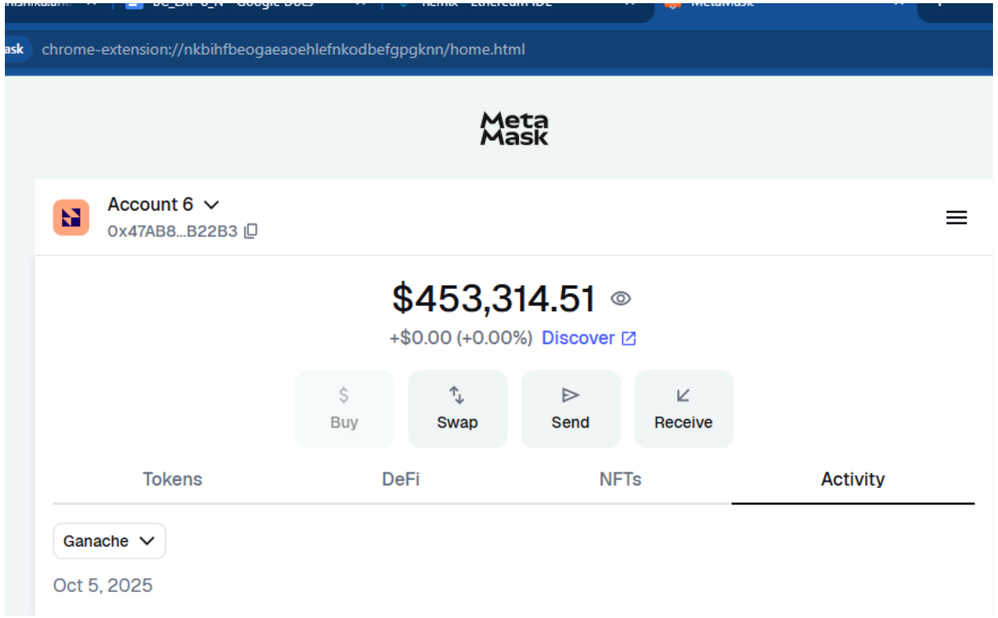


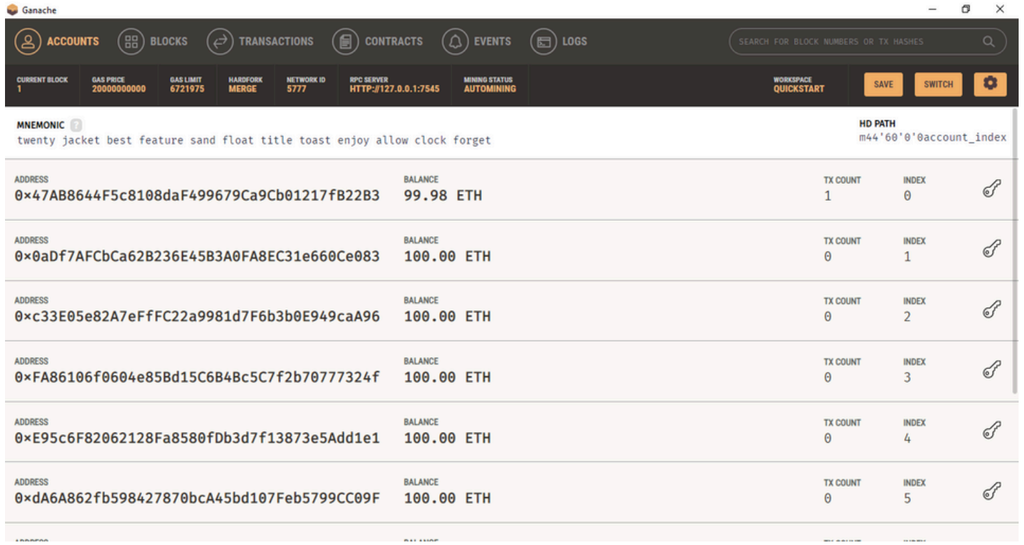


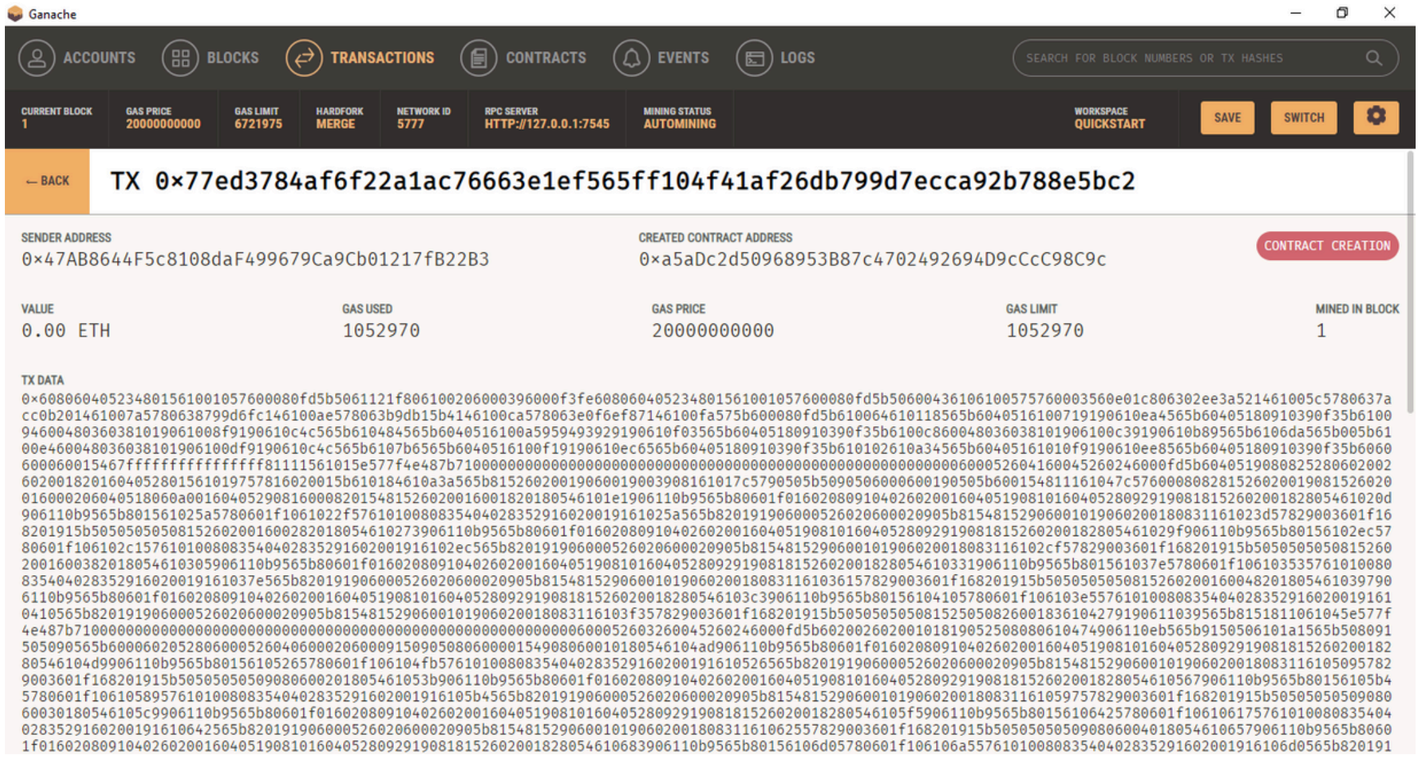


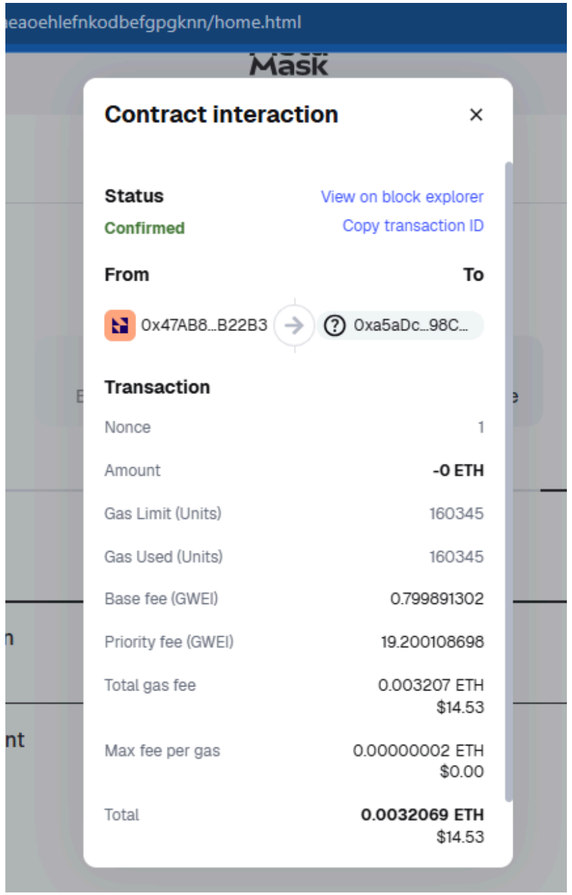


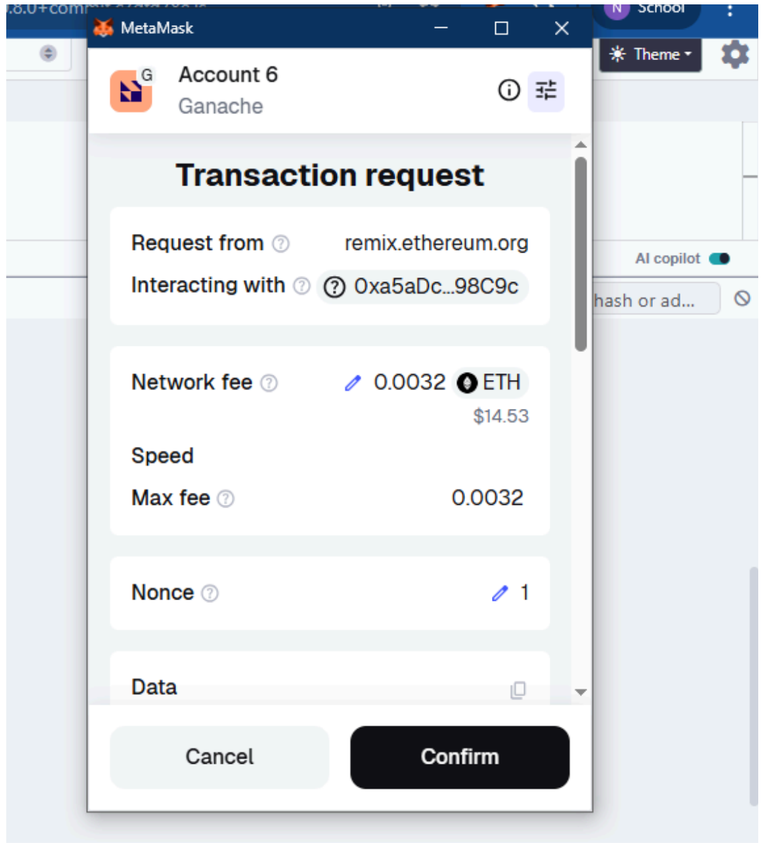

chrome-extension://nkbihfbeogaeaoehlefnkodbefgpgknn/home.html
Contract deployment
Status
View on block explorer
Confirmed
Copy transaction ID
From
To
0x47AB8...B22B3
New contract
Transaction
Nonce 0
Amount -0 ETH
Gas Limit (Units) 1052970
Gas Used (Units) 1052970
Base fee (GWEI) 0.875
Priority fee (GWEI) 19.125
Total gas fee 0.021059 ETH $95.49
Max fee per gas 0.00000002 ETH $0.00
Total 0.0210594 ETH $95.49
Activity

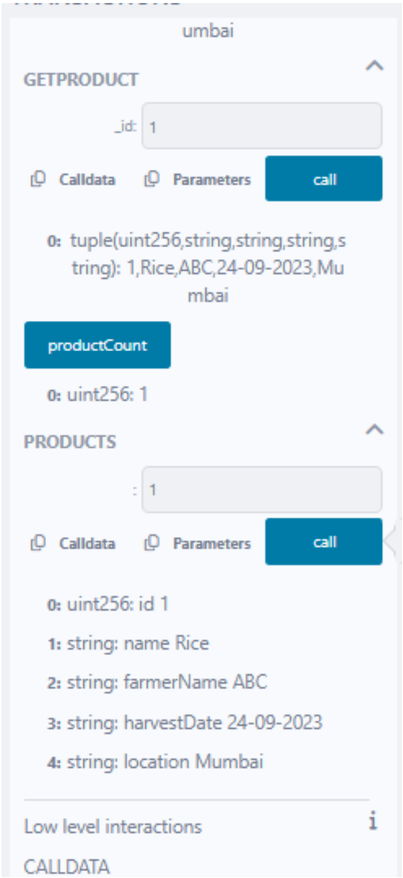

chrome-extension://nkbihfbeogaeaoehlefnkodbefgpgknn/home.html
MetaMask
Account 6
0x47AB8...B22B3
$453,314.51
+$0.00 (+0.00%) Discover
Buy
Swap
Send
Receive
Tokens
DeFi
NFTs
Activity
Ganache
Oct 5, 2025

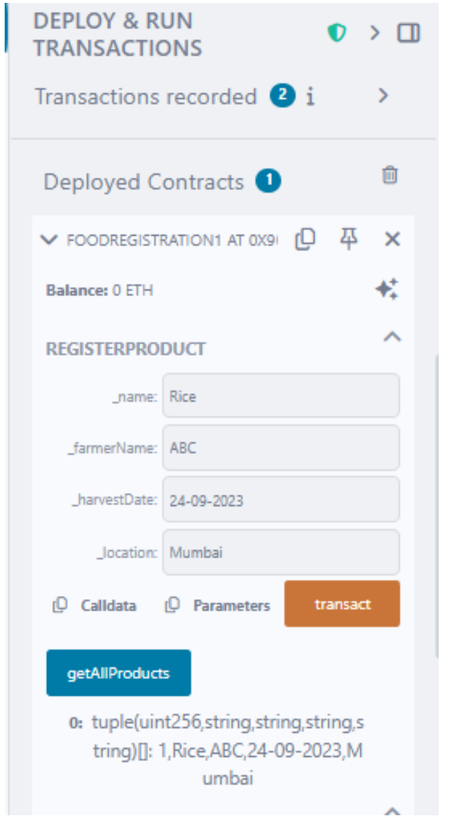

Ganache
ACCOUNTS
BLOCKS
TRANSACTIONS
CONTRACTS
EVENTS
LOGS
SEARCH FOR BLOCK NUMBERS OR TX HASHES
CURRENT BLOCK 1
GAS PRICE 20000000000
GAS LIMIT 6721975
HARDFORK MERGE
NETWORK ID 5777
RPC SERVER HTTP://127.0.0.1:7545
MINING STATUS AUTOMINING
WORKSPACE QUICKSTART
SAVE
SWITCH
MNEMONIC
twenty jacket best feature sand float title toast enjoy allow clock forget
HD PATH
m44'60'0'0'account_index
ADDRESS 0x47AB8644F5c8108daF499679Ca9Cb01217fB22B3 BALANCE 99.98 ETH TX COUNT 1 INDEX 0
ADDRESS 0x0aDf7AFCbCa62B236E45B3A0FA8EC31e660Ce083 BALANCE 100.00 ETH TX COUNT 0 INDEX 1
ADDRESS 0xc33E05e82A7eFfFC22a9981d7F6b3b0E949caA96 BALANCE 100.00 ETH TX COUNT 0 INDEX 2
ADDRESS 0xFA86106f0604e85Bd15C6B4Bc5C7f2b70777324f BALANCE 100.00 ETH TX COUNT 0 INDEX 3
ADDRESS 0xE95c6F82062128Fa8580fDb3d7f13873e5Add1e1 BALANCE 100.00 ETH TX COUNT 0 INDEX 4
ADDRESS 0xdA6A862fb598427870bcA45bd107Feb5799CC09F BALANCE 100.00 ETH TX COUNT 0 INDEX 5


Ganache
ACCOUNTS
BLOCKS
TRANSACTIONS
CONTRACTS
EVENTS
LOGS
SEARCH FOR BLOCK NUMBERS OR TX HASHES
CURRENT BLOCK 1
GAS PRICE 20000000000
GAS LIMIT 6721975
HARDFORK MERGE
NETWORK ID 5777
RPC SERVER HTTP://127.0.0.1:7545
MINING STATUS AUTOMINING
WORKSPACE QUICKSTART
SAVE
SWITCH
BACK
TX 0x77ed3784af6f22a1ac76663e1ef565ff104f41af26db799d7ecca92b788e5bc2
SENDER ADDRESS 0x47AB8644F5c8108daF499679Ca9Cb01217fB22B3
CREATED CONTRACT ADDRESS 0xa5aDc2d50968953B87c4702492694D9cCcC98C9c
CONTRACT CREATION
VALUE 0.00 ETH
GAS USED 1052970
GAS PRICE 20000000000
GAS LIMIT 1052970
MINED IN BLOCK 1
TX DATA


eaoehlefnkodbefgpgknn/home.html
Contract interaction
Status
View on block explorer
Confirmed
Copy transaction ID
From
To
0x47AB8...B22B3
0xa5aDc...98C...
Transaction
Nonce 1
Amount -0 ETH
Gas Limit (Units) 160345
Gas Used (Units) 160345
Base fee (GWEI) 0.799891302
Priority fee (GWEI) 19.200108698
Total gas fee 0.003207 ETH $14.53
Max fee per gas 0.00000002 ETH $0.00
Total 0.0032069 ETH $14.53


MetaMask
Account 6
Ganache
Transaction request
Request from remix.ethereum.org
Interacting with 0xa5aDc...98C9c
Network fee 0.0032 ETH
$14.53
Speed
Max fee 0.0032
Nonce 1
Data
Cancel
Confirm
Theme
AI copilot


umbai
GETPRODUCT
_id: 1
Calldata
Parameters
call
0: tuple(uint256,string,string,string,string): 1,Rice,ABC,24-09-2023,Mumbai
productCount
0: uint256: 1
PRODUCTS
: 1
Calldata
Parameters
call
0: uint256: id 1
1: string: name Rice
2: string: farmerName ABC
3: string: harvestDate 24-09-2023
4: string: location Mumbai
Low level interactions
CALLDATA


DEPLOY & RUN TRANSACTIONS
Transactions recorded 2
Deployed Contracts 1
FOODREGISTRATION1 AT 0X9
Balance: 0 ETH
REGISTERPRODUCT
_name: Rice
_farmerName: ABC
_harvestDate: 24-09-2023
_location: Mumbai
Calldata
Parameters
transact
getAllProducts
0: tuple(uint256,string,string,string,string)[]: 1,Rice,ABC,24-09-2023,Mumbai

CONCLUSION

- Successfully implemented FoodRegistration and FoodTraceability smart contracts on a private blockchain.
- Farmers can securely register crop details; distributors and retailers can update product journey.
- Blockchain ensures transparency, immutability, and trust in the agricultural supply chain.
- Enables full farm-to-consumer traceability, improving food safety and authenticity.
- Demonstrates the potential of blockchain to enhance efficiency and accountability in agriculture.

THANK YOU