



Preliminary Comments

Tokensfarm.com

Oct 21st, 2021

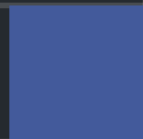


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Disclaimer

About

Summary

This report has been prepared for Tokensfarm.com to discover issues and vulnerabilities in the source code of the Tokensfarm.com project as well as any contract dependencies that were not part of an officially recognized library. A comprehensive examination has been performed, utilizing Static Analysis and Manual Review techniques.

The auditing process pays special attention to the following considerations:

- Testing the smart contracts against both common and uncommon attack vectors.
- Assessing the codebase to ensure compliance with current best practices and industry standards.
- Ensuring contract logic meets the specifications and intentions of the client.
- Cross referencing contract structure and implementation against similar smart contracts produced by industry leaders.
- Thorough line-by-line manual review of the entire codebase by industry experts.

The security assessment resulted in findings that ranged from critical to informational. We recommend addressing these findings to ensure a high level of security standards and industry practices. We suggest recommendations that could better serve the project from the security perspective:

- Enhance general coding practices for better structures of source codes;
- Add enough unit tests to cover the possible use cases;
- Provide more comments per each function for readability, especially contracts that are verified in public;
- Provide more transparency on privileged activities once the protocol is live.

Overview

Project Summary

Project Name	Tokensfarm.com
Platform	Ethereum
Language	Solidity
Codebase	https://github.com/Tokensfarm/tokensfarm-contracts/tree/factory/contracts
Commit	4d08b205354abb45852c68c6c0a7ffc23d330795

Audit Summary

Delivery Date	Oct 21, 2021
Audit Methodology	Static Analysis, Manual Review
Key Components	

Vulnerability Summary

Vulnerability Level	Total	⚠ Pending	⊗ Declined	ℹ Acknowledged	🔄 Partially Resolved	✅ Resolved
🔴 Critical	0	0	0	0	0	0
🟠 Major	3	3	0	0	0	0
🟡 Medium	1	1	0	0	0	0
🟠 Minor	5	5	0	0	0	0
🟢 Informational	7	7	0	0	0	0
🟢 Discussion	0	0	0	0	0	0

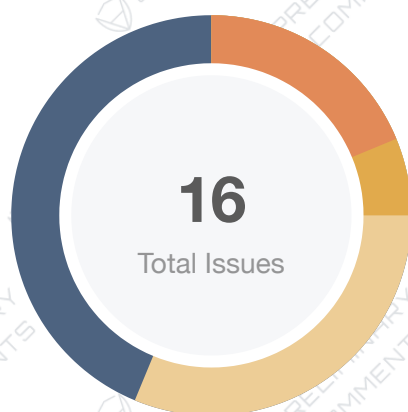
Audit Scope

ID	File	SHA256 Checksum
ICM	governance/ICongressMembersRegistry.sol	ce35a35c94a9b863db70086afade3cc82f911da27ce4d2a750f9893f6957d578
IMR	governance/IMaintainersRegistry.sol	1c378ca360aa48aa93c1a7ea9901795da71566de71679ab4bbd4482c89610e95
ITF	interfaces/ITokensFarm.sol	c500a9e08fab4fbb79e156081550d7f12ebbc4917378f4ead1d083b9c63d894b
SMT	libraries/SafeMath.sol	ce5a1df24bef48b17b1ad30510c031787dfb950f756b888cf6d73a4a328d38da
MRT	system/MaintainersRegistry.sol	4dc60c7b58f471848f42da67d16ba81672d5dd506b1cd743154a7707e5085386
TFU	system/TokensFarmUpgradable.sol	f04395042f45caf9f7be7df6a1fced3a4bffacaa6269f0d99d8a2bf05faec6b8c
TFT	TokensFarm.sol	36c2337ba74c3d9e88563c8094baaf2b4f68b463b1b8f668501c9cb65217e3da
TFF	TokensFarmFactory.sol	056779734faa76d42f3cba72fab2d49c14b0b37aa97b215a804ddb8b315a9402

It should be noted that the system design includes a number of economic arguments and assumptions. These were explored to the extent that they clarified the intention of the code base, but we did not audit the mechanism design itself.

Additionally, financial models of blockchain protocols need to be resilient to attacks. It needs to pass simulations and verifications to guarantee the security of the overall protocol. The accuracy of the financial model is not in the scope of the audit.

Findings



Critical	0 (0.00%)
Major	3 (18.75%)
Medium	1 (6.25%)
Minor	5 (31.25%)
Informational	7 (43.75%)
Discussion	0 (0.00%)

ID	Title	Category	Severity	Status
GLOBAL-01	Potential Front-Running Risk	Volatile Code	Minor	⚠ Pending
GLOBAL-02	Centralization Risk	Centralization / Privilege	Major	⚠ Pending
GLOBAL-03	Missing Emit Events	Gas Optimization	Informational	⚠ Pending
GLOBAL-04	Lack of Zero Address Validation	Volatile Code	Minor	⚠ Pending
GLOBAL-05	Address Type Could Be Indexed In Events	Gas Optimization	Informational	⚠ Pending
GLOBAL-06	Function Visibility Optimization	Gas Optimization	Informational	⚠ Pending
MRT-01	Comparison to A Boolean Constant	Gas Optimization	Informational	⚠ Pending
MRT-02	Lack of Error Message	Coding Style	Informational	⚠ Pending
TFF-01	Lack of Input Validation	Volatile Code	Minor	⚠ Pending
TFT-01	Incompatibility With Deflationary Tokens	Logical Issue	Minor	⚠ Pending
TFT-02	Multiple Storage Reads	Gas Optimization	Informational	⚠ Pending
TFT-03	Check Effect Interaction Pattern Violated	Logical Issue	Minor	⚠ Pending
TFT-04	Not Clear <code>totalFeeCollected</code>	Logical Issue	Major	⚠ Pending
TFT-05	Not Update <code>totalTokensBurned</code>	Logical Issue	Medium	⚠ Pending
TFT-06	Logic Issue Of <code>totalFeeCollected</code>	Logical Issue	Major	⚠ Pending
TFU-01	Unlocked Compiler Version	Language Specific	Informational	⚠ Pending

GLOBAL-01 | Potential Front-Running Risk

Category	Severity	Location	Status
Volatile Code	Minor	Global	🕒 Pending

Description

Malicious hackers may observe the pending transaction which will execute the `initialize` function, and launch a similar transaction but with the hacker's address of `owner` and gain the ownership of the contract.

For example:

- `TokensFarm.initialize()`
- `TokensFarmFactory.initialize()`
- `MaintainersRegistry.initialize()`

Recommendation

We advise the client to design functionality to only allow a specific user to execute the `initialize` function.

GLOBAL-02 | Centralization Risk

Category	Severity	Location	Status
Centralization / Privilege	● Major	Global	⚠ Pending

Description

To bridge the gap in trust between the administrators need to express a sincere attitude regarding the considerations of the administrator team's anonymity.

The owner of TokensFarm has the responsibility to notify users about the following capabilities:

- set `minTimeToStake` through `setMinTimeToStake()`
- set `isEarlyWithdrawAllowed` through `setIsEarlyWithdrawAllowed()`
- set `stakeFeePercent` through `stakeFeePercent()`
- set `rewardFeePercent` through `setRewardFeePercent()`
- set `flatFeeAmount` through `setFlatFeeAmount()`
- set `isFlatFeeAllowed` through `setIsFlatFeeAllowed()`
- withdraw fee collected in ERC value through `withdrawCollectedFeesERC()`
- withdraw fee collected in ETH value through `withdrawCollectedFeesETH()`
- withdraw stuck tokens on the farm through `withdrawTokensIfStuck()`

The maintainer of TokensFarmFactory has the responsibility to notify users about the following capabilities:

- deploy and fund farm through `deployAndFundTokensFarm()`
- fund again the farm if necessary through `fundTheSpecificFarm()`
- set `minTimeToStake` in tokens farm through `setMinTimeToStakeOnSpecificFarm()`
- set `isEarlyWithdrawAllowed` in tokens farm through `setIsEarlyWithdrawAllowedOnSpecificFarm()`
- set `stakeFeePercent` in tokens farm through `setStakeFeePercentOnSpecificFarm()`
- set `rewardFeePercent` in tokens farm through `setRewardFeePercentOnSpecificFarm()`
- set `flatFeeAmount` in tokens farm through `setFlatFeeAmountOnSpecificFarm()`
- set `isFlatFeeAllowed` in tokens farm through `setIsFlatFeeAllowedOnSpecificFarm()`

The `tokensFarmCongress` of TokensFarmFactory has the responsibility to notify users about the following capabilities:

- withdraw fee collected in ERC value through `withdrawCollectedFeesERCOnSpecificFarm()`

- withdraw fee collected in ETH value through `withdrawCollectedFeesETHOnSpecificFarm()`
- withdraw stuck tokens on the farm through `withdrawTokensIfStuckOnSpecificFarm()`
- set `farmImplementation` through `setTokensFarmImplementation()`
- set `feeCollector` through `setFeeCollector()`

The `tokensFarmCongress` of `TokensFarmUpgradable` has the responsibility to notify users about the following capabilities:

- set new maintainers registry address through `setMaintainersRegistry()`
- set new congress registry address through `setTokensFarmCongress()`

The `tokensFarmCongress` of `MaintainersRegistry` has the responsibility to notify users about the following capabilities:

- add maintainer through `addMaintainer()`
- remove maintainer through `removeMaintainer()`

Recommendation

We advise the client to carefully manage the privileged account's private keys to avoid any potential risks of being hacked. In general, we strongly recommend centralized privileges or roles in the protocol to be improved via a decentralized mechanism or via smart-contract-based accounts with enhanced security practices, e.g. Multisignature wallets.

Indicatively, here are some feasible suggestions that would also mitigate the potential risk at the different levels in terms of the short-term and long-term:

- Time-lock with reasonable latency, e.g., 48 hours, for awareness on privileged operations;
- Assignment of privileged roles to multi-signature wallets to prevent a single point of failure due to the private key;
- Introduction of a DAO/governance/voting module to increase transparency and user involvement.

GLOBAL-03 | Missing Emit Events

Category	Severity	Location	Status
Gas Optimization	● Informational	Global	ⓘ Pending

Description

Functions that affect the status of sensitive variables should be able to emit events as notifications to customers.

For example:

- `TokensFarm.setMinTimeToStake()`
- `TokensFarm.setIsEarlyWithdrawAllowed()`
- `TokensFarm.setStakeFeePercent()`
- `TokensFarm.setRewardFeePercent()`
- `TokensFarm.setFlatFeeAmount()`
- `TokensFarm.setIsFlatFeeAllowed()`
- `TokensFarmFactory.setTokensFarmImplementation()`
- `TokensFarmFactory.setFeeCollector()`

Recommendation

We advise the client to add events for sensitive actions and emit them.

GLOBAL-04 | Lack of Zero Address Validation

Category	Severity	Location	Status
Volatile Code	Minor	Global	🕒 Pending

Description

The given input is missing the check for the non-zero address. For example:

- contract TokensFarm: `_beneficiary` in function `withdrawTokensIfStuck()`
- contract TokensFarmFactory: `_feeCollector` and `_farmImplementation` in function `initialize()`, `_farmImplementation` in function `setTokensFarmImplementation()`
- contract TokensFarmUpgradable: `_tokensFarmCongress` and `_maintainersRegistry` in function `setCongressAndMaintainersRegistry()`, `_tokensFarmCongress` in function `setTokensFarmCongress()`, `_maintainersRegistry` in function `setMaintainersRegistry()`
- contract MaintainersRegistry: `_tokensFarmCongress` in function `initialize()`

Recommendation

We advise the client to add the check for the passed-in values to prevent unexpected errors.

GLOBAL-05 | Address Type Could Be Indexed In Events

Category	Severity	Location	Status
Gas Optimization	● Informational	Global	ⓘ Pending

Description

It is recommended to add `indexed` keyword for parameters in events, which makes it easier for users to navigate event logs.

Recommendation

We advise the client to add keyword `indexed` in the declaration of events.

GLOBAL-06 | Function Visibility Optimization

Category	Severity	Location	Status
Gas Optimization	● Informational	Global	ⓘ Pending

Description

`public` functions that are never called by the contract could be declared `external`. When the inputs are arrays, `external` functions are more efficient than `public` functions.

For example:

- `TokensFarmUpgradable.setMaintainersRegistry()`
- `TokensFarmUpgradable.setTokensFarmCongress()`
- `MaintainersRegistry.initialize()`
- `MaintainersRegistry.addMaintainer()`

Recommendation

We advise that the functions' visibility specifiers are set to `external` and the array-based arguments change their data location from `memory` to `calldata`, optimizing the gas cost of the function.



MRT-01 | Comparison to A Boolean Constant

Category	Severity	Location	Status
Gas Optimization	● Informational	system/MaintainersRegistry.sol: 68, 90	⚠ Pending

Description

Comparison to a boolean constant.

Recommendation

We advise the client to remove the comparison to the boolean constant.

MRT-02 | Lack of Error Message

Category	Severity	Location	Status
Coding Style	● Informational	system/MaintainersRegistry.sol: 68, 90	ⓘ Pending

Description

`require` can be used to check for conditions and throw an exception if the condition is not met, in which case the descriptive error message provided by the developer will appear and help to tracking error and debugging.

Recommendation

We advise the client to add error messages.

TFF-01 | Lack of Input Validation

Category	Severity	Location	Status
Volatile Code	Minor	TokensFarmFactory.sol: 485	ⓘ Pending

Description

The `start` should less than `end`. If you don't do that there will be underflows.

Recommendation

We advise the client to check that the variables `start` and `end` like as follows:

```
require(start < end, "start should less than end.");
```

TFT-01 | Incompatibility With Deflationary Tokens

Category	Severity	Location	Status
Logical Issue	Minor	TokensFarm.sol: 553, 612	⚠ Pending

Description

The contract operates as the main entry for interaction with staking users. The staking users deposit LP tokens into the pool and in return get a proportionate share of the pool's rewards. Later on, the staking users can withdraw their own assets from the pool. In this procedure, `deposit()` and `withdraw()` are involved in transferring users' assets into (or out of) the protocol. When transferring standard ERC20 deflationary tokens, the input amount may not be equal to the received amount due to the charged (and burned) transaction fee. As a result, this may not meet the assumption behind these low-level asset-transferring routines and will bring unexpected balance inconsistencies.

Recommendation

We advise the client to regulate the set of LP tokens supported in the contract. If there is a need to support deflationary tokens, add necessary mitigation mechanisms to keep track of accurate balances.

TFT-02 | Multiple Storage Reads

Category	Severity	Location	Status
Gas Optimization	● Informational	TokensFarm.sol: 310, 333, 377	⚠ Pending

Description

Repeatedly read from storage, which is very gas inefficient.

Recommendation

We advise the client to assign the values to memory variables first before using, as a call from storage costs 200 gas and a call from memory costs only 3 gas.

TFT-03 | Check Effect Interaction Pattern Violated

Category	Severity	Location	Status
Logical Issue	● Minor	TokensFarm.sol: 612, 690, 722	⚠ Pending

Description

The sequence of external call/transfer and storage manipulation must follow a check effect interaction pattern.

- `withdraw()`
- `emergencyWithdraw()`
- `withdrawCollectedFeesERC()`

Recommendation

We advise the client to adopt the `nonReentrant` modifier from openzeppelin library to the function `emergencyWithdraw()` and `withdraw()` to prevent any reentrancy issue or use the checks-effects-interactions pattern as follows. ([LINK](#))

TFT-04 | Not Clear `totalFeeCollected`

Category	Severity	Location	Status
Logical Issue	● Major	TokensFarm.sol: 733	⚠ Pending

Description

The function should set `totalFeeCollected` to 0 before calling. If not that, the `owner` can invoke the function more times.

Recommendation

We advise the client to set `totalFeeCollected` to 0.

TFT-05 | Not Update `totalTokensBurned`

Category	Severity	Location	Status
Logical Issue	● Medium	TokensFarm.sol: 662	⚠ Pending

Description

According to line 656, `totalTokensBurned` should be cumulative when burning to address(1).

Recommendation

We advise the client to update the `totalTokensBurned`.

TFT-06 | Logic Issue Of `totalFeeCollected`

Category	Severity	Location	Status
Logical Issue	● Major	TokensFarm.sol: 75	⚠ Pending

Description

The `totalFeeCollected` records the total fee collected. If the `isFlatFeeAllowed` is true, the `totalFeeCollected` records the amount of ETH, else records the amount of tokens. If the `isFlatFeeAllowed` toggles, the `totalFeeCollected` records sum of ETH and tokens, which results in withdrawing error fee collected in the `withdrawCollectedFeesERC()` or `withdrawCollectedFeesETH()`.

Recommendation

We advise the client to use the different variables to record total fee collected.

TFU-01 | Unlocked Compiler Version

Category	Severity	Location	Status
Language Specific	● Informational	system/TokensFarmUpgradable.sol: 2	⚠ Pending

Description

The contract contains unlocked compiler versions. An unlocked compiler version in the contract's source code permits the user to compile it at or above a particular version. This, in turn, leads to differences in the generated bytecode between compilations due to differing compiler version numbers. This can lead to ambiguity when debugging as compiler-specific bugs may occur in the codebase that would be difficult to identify over a span of multiple compiler versions rather than a specific one.

Recommendation

It is general practice to alternatively lock the compiler at a specific version rather than allow a range of compiler versions to be utilized to avoid compiler-specific bugs and thus be able to detect emerging ones. We recommend locking the compiler at the lowest possible version that supports all the capabilities required by the codebase. This will ensure that the project utilizes a compiler version that has been in use for the longest time and as such is less likely to contain yet-undiscovered bugs.

Appendix

Finding Categories

Centralization / Privilege

Centralization / Privilege findings refer to either feature logic or implementation of components that act against the nature of decentralization, such as explicit ownership or specialized access roles in combination with a mechanism to relocate funds.

Gas Optimization

Gas Optimization findings do not affect the functionality of the code but generate different, more optimal EVM opcodes resulting in a reduction on the total gas cost of a transaction.

Logical Issue

Logical Issue findings detail a fault in the logic of the linked code, such as an incorrect notion on how `block.timestamp` works.

Volatile Code

Volatile Code findings refer to segments of code that behave unexpectedly on certain edge cases that may result in a vulnerability.

Language Specific

Language Specific findings are issues that would only arise within Solidity, i.e. incorrect usage of `private` or `delete`.

Coding Style

Coding Style findings usually do not affect the generated byte-code but rather comment on how to make the codebase more legible and, as a result, easily maintainable.

Checksum Calculation Method

The "Checksum" field in the "Audit Scope" section is calculated as the SHA-256 (Secure Hash Algorithm 2 with digest size of 256 bits) digest of the content of each file hosted in the listed source repository under the specified commit.

The result is hexadecimal encoded and is the same as the output of the Linux "sha256sum" command against the target file.

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