STØP FAKE FOOD

Fighting for authenticity against food crimes

ENJOY FOOD NOT LIES



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WHITE PAPER

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Executive summary

The Problem

Food crime is a global $300 billion industry and no one is safe. Food adulteration, substitution, mislabeling, counterfeiting or outright fraud – there are numerous ways consumers are fooled into eating what they're not expecting or not get what they paid for. There are numerous shocking instances around the world – from unintentional supply mismanagement down to unethical businesses, illegal use of toxins or mafia-run mass counterfeiting operations. Just in 2017 alone a Europol-INTERPOL anti-food crime operation seized €230 million worth of fake or substandard food products and beverages.

Food crime is a systematic global problem that is constantly advancing. And our current systems are struggling to keep up – laboratory research remains expensive, slow and unscalable, supply chain tracking cannot address the issue of faking food before packaging while consumer level protection is inadequate and reliant on trust in third-parties.

Solutions and Uniqueness

Stop Fake Food (SFF) is offering a genuinely innovative solution to address the problems plaguing the food industry. SFF is combining the newest achievements in Laser (Raman spectroscopy), Artificial Intelligence (Neural Networks) and Blockchain technologies to create a new type of commercial research service for food product authentication and composition analysis.

The SFF food product analysis solution is able to deliver reliable, user-friendly results significantly faster (in minutes rather than days) and 10 times cheaper that current methods. Furthermore, the solution is non-invasive (most products don't need to be unpacked), flexible and scalable to meet global demand. The solution has been in R&D since 2017, with a highly competent team built and a functional demonstration version (MVP) already developed from the initial seed funding.

Besides technical achievements, the main SFF business innovation is the creation of a model for investment into new digital assets – Authenticity Stamps (the AI reference models used when providing services). Authenticity Stamp investors will receive 80% from the average $10 SFF service price as royalties. All transaction within the SFF Ecosystem will be carried out with the use of a native SFF Token. This token-based incentive structure will ensure continued third-party investment into new SFF services and global growth of the business model.

Customer base and Business strategy

SFF seeks to become a global industry standard in food safety and authenticity assurance of all parties involved in the food industry, both in the Governmental, Business and Consumer segments. Up to 1000 accredited, mostly state-run laboratories around the world are planned to be provided with SFF-integrated Raman spectrometers. This approach will create an initial base of B2G clients that engage in food product analysis on a daily basis.

From there on the SFF solution has huge growth and application potential in the B2B segment (for food manufacturers, supply chain companies, retailers) and eventually ordinary consumers. The SFF company itself is projecting to deliver around 8 mln. product analysis services per year in 2025, reaching an annual gross revenue of $82.6 mln. and a net income of $29.9 mln.

Financing and Investment

SFF is seeking to raise up to $19 mln. in funding for further product and business model development up to their full commercialization phases. Fundraising is done through a Token Generation Event (TGE), organized in two financing rounds – an early (current, up to $1.9 mln.) and a main (in 2019, up to $17.1 mln.) round. Investors are offered the purchase of 380 mln. SFF Tokens (38% of total supply) at a price of $0.05 each (+150% bonus during early round), or company equity acquisition (on a company evaluation of $7 mln.).

Augustas Alesiunas

Founder and CEO of Stop Fake Food

Food crime – an overview

Food is the most fundamental need of existence, yet it is one that is constantly being tampered with across the world. A highly diverse and increasingly global market worth trillions of US dollars annually – food is becoming a lucrative industry for illicit activity, dishonesty and indifference.

Food crime is a vast area of activities that can range from a seemingly innocuous regulatory non-compliance down to organized crime at industrial scale operated by international cartels. According to the UK National Food Crime Unit, food crime can be committed in several ways – from document fraud and product misrepresentation, to unlawful processing and diversion of intended waste back into the supply chain[1].

Illicit practices in the food industry by dishonest or outright criminal market players not only cause severe economic damage to producers and consumers, but also pose very high risks to public health and well-being. The 2008 Chinese milk scandal is one of the biggest and most indicative food safety crises of the past decades, during which an estimated 300.000 babies were affected due to consumption of products laced with toxic additives[2].

Global food crime is estimated to stand at around $300 billion annually

While the net economic and health effects of food crime are hard to quantify, some cases uncovered by law enforcement are very telling about the scope of the problem.

Operation OPSON is an annual joint Europol-INTERPOL operation targeting counterfeit and substandard food and drinks mostly on the EU market. The 2017 operation alone resulted in exposing 47 criminal networks with seizures of 9800 tonnes, over 26.4 million litres, and 13 million units of food products and beverages. The total worth of these assets and various illegal practices was estimated at a staggering €230 million[3]. Cases uncovered by this and similar law enforcement operations, show a myriad of deep-seated problems and grim tendencies embedded in the food industry.

We have selected three of them to go into more detail as being the most indicative of the fundamental problems currently plaguing the food industry, namely **adulterated meat products, counterfeit olive oil** and **formalin-laced fish**.

[1] Food crime. Food Standards Agency
[2] The 2008 Milk Scandal Revisited
[3] 230 million worth of fake food and beverages seized in global OPSON operation targeting food fraud

Case #1: Meat products

Meat is the central diet piece of many people around the world – in 2014 alone more than 317 million tons of various types meats were consumed[4]. Meat consumption has been on a constant rise globally and, in line with the rapidly increasing life standards in the so-called developing countries, these growth rates are not expected to slow down anytime soon.

However, together with this growing demand, a number of high-profile scandals publicly exposed many illicit and potentially dangerous practices within the meat industry. One of the biggest ones was the 2013 horse meat scandal in Europe. A number of investigations carried out in Ireland and the UK (later on in 13 additional European countries) found out that many instances of processed beef products, sold in major supermarket chains, contained undeclared or improperly declared horse meat. On average horse meat is 4 times cheaper than beef and therefore is often used in faking beef. In some cases, the proportion of horse meat in a supposedly "beef" product was found to reach as high as 100%. Additionally, 23 out of 27 samples of beef burgers analysed by the Food Safety Authority of Ireland also contained pig DNA[5].

The 2013 scandal uncovered that even toxic meat from euthanized race horses was used as a substitute for beef

Situations like this can be seen all around the world. For example, China has been plagued by various fake meat related scandals, during one of which, police had to issue guides to help consumers distinguish between mutton and rat meat[6].

Meat-related problems are not limited to adulteration of processed meat, but also include many cases of contamination of supposedly "meat free" products. In June 2018 a number of "meat free" and vegan food products sold at leading UK supermarkets have been found to contain traces of pork and turkey. This affected not only vegans and vegetarians, but also Muslims and Jews who chose these products as supposedly compatible with their religious

Consumer misinformation, industrial greed, unclear animal raising conditions and a whole host of associated food safety issues – in all of these mentioned scandals - clearly show patterns of problems that the meat industry is currently struggling to handle.

[4] Meat and Seafood Production & Consumption
[5] 2013 horse meat scandal
[6] China fake meat scandal: telling your rat from your mutton

Case #2: Olive oil

Food counterfeiting not only violates consumer expectations, but also causes direct financial losses for honest producers and indirect economic damage for their respective countries. This is especially true for Italy, a country praised for having ones of the best culinary traditions in the world.

In 2015, a scandal hit the Italian food industry when it became clear that some of the top olive oil brands were cheating their consumers. 9 out of 20 brands tested in laboratories by Italian customs agency specialists were found to be of lower quality than presented. And this was not a new occurrence – earlier in 2011 it was found that four out of five bottles of 'Italian' olive oil contained oils from other Mediterranean countries[7].

An estimated 69% of Italian extra virgin olive oil imported to the US market is considered to be fake

Whenever buying high value extra virgin olive oil, consumers world-wide are often purchasing products of significantly lower quality instead, either mixed with or completely substituted by pomace oil. Pomace oil is extracted from the olive pulp leftover of the production of higher quality oils, using chemical solvents. In some cases, consumers might even be buying cheap sunflower oil coloured with chlorophyll or other colorants. Therefore, consuming counterfeit olive oil also poses health risks due to dangerous additives or potential allergens not indicated on product labelling.

Italian extra virgin olive oil is highly sought-after in the US market, where it can sell for as much as $50 a gallon. In turn, a fake product can cost only $7 to make. As one journalist noted on this situation, "the profit margin can be three times better than cocaine"[8]. This analogy is very fitting, since olive oil counterfeiting is at the hands of mafia clans. In 2017 Italian police arrested 33 members of the Calabrian mafia who were importing olive pomace oil, labelling the low-quality adulterated products as extra virgin olive oil and exporting them to the US to be sold through retail chains in New York, Boston and Chicago[9].

While extra virgin olive oil is one of the most counterfeit food products worldwide, it is also symptomatic of the many criminal aspects and challenges facing the entire food industry.

[7] Italian olive oil scandal: seven top brands 'sold fake extra-virgin'
[8] Agromafia. CBS News "60 minutes".
[9] Italy Arrests 33 Accused of Olive Oil Fraud

Case #3: Fish and seafood

Fish and seafood are important dietary sources of omega 3's and are often presented as healthy food choices. Most health organizations worldwide recommend eating fish at least 2 times a week while always noting consumers to be aware that various fish and seafood can be contaminated with heavy metals and chemicals. Mercury and PCBs are the most well-known contaminants and a lesser known one is formalin. While the first two end up in fish during their growth period, contamination with formalin is intentional and a result of illicit practices within the food industry.

Formalin (a commercial solution of formaldehyde) is a toxic compound normally used in plastic production, wood processing or preservation of dead bodies in mortuaries. It is forbidden from use in the food industry around the world since it can cause genetic mutations, allergic reactions and cancerogenic illnesses. Despite that in some countries the use of formalin for preserving fish and seafood is widespread.

Formalin is widely used in South and South-East Asia as a fish preservative despite being illegal and highly cancerogenic

A 2005 study done by Indonesia's National Agency of Drug and Food Control found, that of 161 tested samples of sea products 64 were found positive in containing formalin[10]. In 2011 research conducted in Bangladesh found almost 50% of fish samples from local markets to contain formalin[11]. The most recent scandal of lacing fish with formalin arose in Chennai (South India) in June 2018, causing a crash of the local fish market[12].

These problems of illegal formalin use in fish are not limited only to local markets but extend into global trade. Laboratory research in 2013 showed that 1 in 4 imported fish sold at supermarkets in North Carolina contained unnatural levels of formaldehyde. The scope of the problem in the US market is unclear, since the US Food and Drug Administration does not test any imported fish for formaldehyde contamination, and only 4 percent of imported fish gets tested for any contaminants at all[13].

Tracing food contamination with formalin or any other chemicals is hard. Laboratory research is expensive, time-consuming and unscalable to keep on par with increasing flows of global trade. Therefore, food safety organizations and governmental institutions worldwide are in dire need to find solutions to curb illicit industry practices that pose threats to public health.

[10] Formalin in Food
[11] Detection of Formalin in Fish Samples Collected from Dhaka City, Bangladesh
[12] Formalin-laced fish create scare across India
[13] Formaldehyde Detected in Supermarket Fish Imported from Asia

Current approaches and their limitations

Food crime is very difficult to prevent. It can take as many forms and stages of food production, processing, logistics and retail – the tampering possibilities are vast. Besides active law enforcement measures, two main approaches are currently being applied to tackle food crime – analysing the products themselves or trying to track their logistics networks.

The best way to identify counterfeit, substandard or potentially harmful food products is to look at their content – conduct thorough research and analysis in a specialized laboratory. An approximate 1500 private and state-run laboratories worldwide are currently fully or partially specialized in performing research on food product safety, quality and authenticity.

Many different scientific methods can be applied for analysis, depending on the type of the particular food products, regulatory practices around them or the desired outcomes. This includes sensory analysis, various physicochemical, chromatographic and spectroscopic methods or DNA-based techniques. These methods are usually combined with mathematical and statistical result analysis (chemometrics) in order to make research of a broad variety of products more convenient, efficient and reliable.

While very effective, product testing in laboratories is rather expensive and time consuming. The product testing process requires highly skilled personnel and specialized expensive equipment. Furthermore, these current research practices are wasteful, since the required sampling makes the particular product unfit for retail. All of these shortcomings make the conventional laboratory methods limited in their application and unfit for scaling that is necessary to properly face challenges posed by food crime.

With the food industry becoming increasingly global and complex, many solutions have been introduced that focus on product traceability and packaging integrity. From special product containers and smart markers on packaging, down to blockchain-based tracking software – these kinds of approaches try to pre-empt food crime by ensuring end-to-end product integrity and origin tracing. However, these solutions assume that the initial product was originally good and safe – they are not equipped to deal with food crime that involves industrial scale counterfeiting happening before packaging, nor can they prevent products that can cause various health issues from entering the market.

In order to overcome these limitations and challenges facing the food industry, Stop Fake Food presents its innovative product analysis solution that will disrupt the way food integrity, authenticity and safety is being handled around the world.

SFF product analysis solution

Stop Fake Food is on a mission to solve the problems plaguing the food industry and to protect consumers from its negative effects. SFF takes on a completely new approach to tackle food crime and creates a solution that combines the newest scientific achievements and technical innovations in Laser technology (Raman spectroscopy), Artificial Intelligence and Blockchain.

By utilizing the SFF solution, users are able to non-invasively analyze questionable food products and quickly receive reliable results on their safety, authenticity, quality and composition. The entire process is significantly faster, has lowers costs and is easier to implement than any of the current practices.

SFF efficiently scales existing laboratory research practices and brings them straight to the hands of institutional and corporate clients, as well as consumers. Furthermore, SFF presents a complementary improvement to services provided by other businesses working in related industries such as food safety, product tracking or quality control.

The SFF token-driven ecosystem provides an incentive structure that ensures stakeholder cooperation to continually maintain the Platform and expand it by investing into its capabilities.

Main features of the SFF product analysis solution

Fast

While laboratory research can take days or even weeks, SFF is able to provide results in a matter of minutes.

Cost-disruptive

SFF can reduce product analysis costs by more than 80% when compared to those currently made in laboratory conditions.

Non-invasive

Analysed products don't need to be sampled, touched or even unpacked – the SFF solution works through many types of glass, plastic or paper packaging.

Scalable

The SFF solution can be easily scaled and expanded into an all-in-one analysis tool that is capable of handling high flows of product analysis requests.

How SFF works

1. Product data collection

Whenever in doubt on food product safety, authenticity, quality or the ingredients used in it, the questionable product can be scanned using a Raman spectrometer.

Any type of Raman spectrometer can be used as long as it meets the minimal technical threshold – from high precision devices in laboratories to consumer-oriented handheld versions on the field (at customs offices, logistics centres, supermarkets, etc.).

Due to laser technology being used, no sampling or directly invasive procedures are required. In many cases the product scanned does not even need to be unpacked – Raman spectrometers can work through many types of glass, plastic and paper, no matter if the material is solid or liquid (e.g. beverages).

2. Data analysis

User (laboratory or individual) uploads collected Raman spectra into the SFF Platform for immediate data decomposition and analysis.

SFF implements an AI technology-driven data analysis system based on Machine Learning methods. Neural networks which were trained on pure substances are able to decompose provided spectra into individual constituents and determine the ratio of each substance within the sample.

While Machine Learning method already work very well, in time the accuracy will increase drastically as more verified samples will be added to the system. Addition of verified samples of new or already recognizable products and substances is guaranteed by the incentive structure encoded into the SFF Blockchain.

3. Analysis results

Once the analysis is done, user receives a comprehensive report on the content of the analysed product.

SFF can identify product type, check key food safety parameters and compliance with existing standards, examine the composition of ingredients and perform a thorough all-round analysis – all depending on the particular needs of the customer and the settings chosen.

Based on these analysis results, SFF will be able issue certificates proving the content, composition and authenticity of the product.

In comparison with existing methods

The SFF product analysis solution holds many significant advantages over existing laboratory research methods, namely in the areas of usability (can be performed on-the-spot by non-professionals), efficiency (drastically reduced duration and costs) and market scalability.

It must be noted that SFF does not seek to outcompete existing laboratory research methods but is aiming to provide a complementary solution. Laboratories that use the SFF Platform can increase operational efficiency and significantly scale capacities. For example, the SFF product analysis solution can be used to perform quick initial product analyses to help determine which products require additional and costly follow-up research. This initial analysis can also be done on-the-spot by customs officers or retailers to determine which products need to be sent to a laboratory for thorough analysis.

	Various laboratory research methods (sensory, physicochemical, DNA-based, chromatographic)	**Spectroscopic methods in a laboratory** (AAS, NIR, NMR)	**The SFF product analysis solution**
Duration	1-10 work days	5-10 work days	5-15 min. at any time
Location	Laboratory conditions (sample transportation required)	Laboratory conditions (sample transportation required)	Potentially anywhere, on-the-spot (with a handheld Raman spectrometer)
Skill and equipment requirements	Very high	Very high	Average to low (eventually usable by amateurs)
Method invasiveness	Very high (product sampling required)	Medium (some procedures may require sampling)	None (unpackaging not required)
Result reliability	Very high (depends on method)	High (depends on availability of product reference data)	High (depends on the level of AI training)
Estimated service price	30-1000 EUR	50-250 EUR	10 EUR
Scalability potential	Very low	Low	Very high

Key areas of application

Food safety

- **Identification of dangerous substances** – analysing products for substances that are toxic for consumption or pose long-term danger to consumer health (e.g. carcinogens, pesticides, antibiotics, heavy metals, etc.);
- **Foodborne disease prevention** – identifying various parasites, bacteria, viruses or other biological traces that could cause illnesses upon consumption of infected products;
- **Procedural efficiency and scaling** – using the SFF product analysis solution to significantly scale procedures related to food safety and increase regulatory efficiency.

Product authenticity

- **Fighting product counterfeiting** – a means for various interested parties to check on product authenticity in order to fight counterfeiting, reduce financial loss incurred by producers and protect brand integrity;
- **Licencing and quality control** – ensuring that products or their ingredients that are produced by several producers are in line with industry requirements, brand standards or franchise agreements;
- **Complementing existing solutions** – integrating the SFF Platform with existing B2B services (such as logistics and supply chain tracking blockchains) to provide complete and all-rounded business solutions.

Consumer expectations

- **Consumer assurance** – proving that the product is truly what it is presented to be (e.g. Italian extra virgin olive oil instead of cheap oil, or high-end Bordeaux wine instead of a knock-off);
- **Packaging information accuracy** – verifying the accuracy of ingredients stated on the packaging, determining non-specified allergens, GMOs or other substances that could be unsuitable for some consumers;
- **Religious or ethical diets** – assuring that the product is suitable for consumers that follow religious practices (such as halal or kosher diets), are concerned about ethical issues (such as vegan) or have other specific personal or cultural dietary preferences.

Technological base

Raman spectroscopy

SFF utilizes the newest innovations in Raman spectroscopy and applies them to the food industry.

Raman scattering (or the Raman effect) is a phenomenon observed in spectroscopy and used in chemistry to identify various materials. When monochromatic light (usually from a laser) is shined on a material, it interacts with its molecules. Due to this molecular interaction, a very small fraction of the light illuminated back has different characteristics – usually lower frequencies and energy levels. Therefore, from these small changes it is possible to identify different materials on a molecular level.

Raman spectroscopy is an expanding field with far-reaching potential of application in various areas. Raman spectroscopy has already been applied in the military sector for recognizing particular explosive materials[14]. It is also used in the pharmaceutical industry to identify drugs and various compounds[15].

Engineering of Raman spectrometers – devices that measure this effect – has been developing rapidly over the past decade. Formerly an expensive and bulky piece of laboratory equipment, current Raman spectrometers are significantly cheaper, easier to use and are even becoming portable with handheld versions currently entering the market. In 5 years' time, it is expected that these spectrometers will become widely applicable in many industries and even attainable by ordinary consumers.

In the context of the SFF Platform, Raman spectroscopy is used as the main method for scanning food products and collecting data for further analysis. Raman spectrometry is an especially useful technology in food analysis due to its non-invasiveness:

- Since it works using lasers, the method is non-destructive to most materials and no direct physical contact with the product is needed;
- It can work through many types of glass, plastic or paper, therefore products are not required to be unpacked;
- Raman spectroscopy can be applied both for solid and liquid food product analysis;
- With handheld device versions entering the market, it will become more convenient to use Raman spectroscopy in outdoor (non-laboratory) conditions.

[14] Explosives Identification Using Raman Technology
[15] Pharmaceutical Applications of Raman Spectroscopy

Artificial Intelligence

Artificial Intelligence is at the centre of the technological solution offered by SFF.

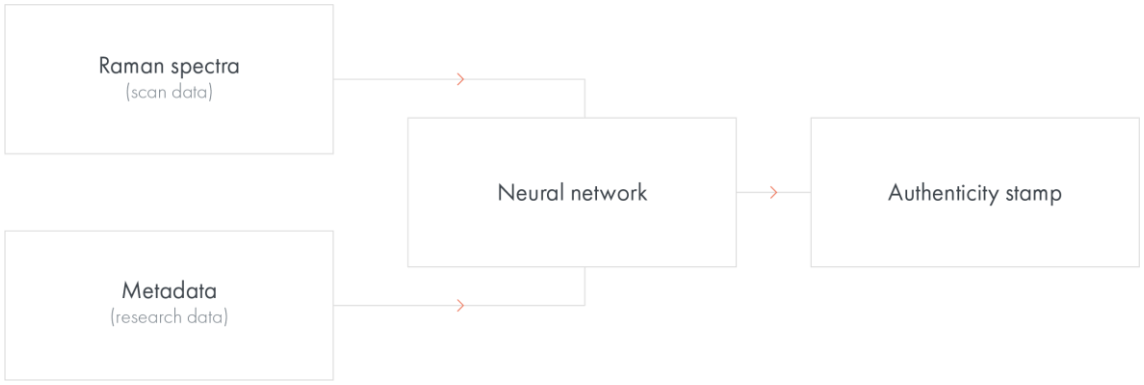
Before the flourishing of AI technologies, applications of Raman spectrometry were limited to comparatively simple substances. This was due to the fact that many complex materials (such as food products or other organic materials) are heterogeneous in compositions. Raman spectra of an organic molecular structure (i.e. various acids in meat) provide very sophisticated and multidimensional data outputs that require multiparametric nonlinear pattern recognition methods (like neural networks) in order to decompose them *a posteriori*.

Advancements in AI technologies, especially Machine Learning, enable SFF to introduce Raman spectrometry into the food industry. SFF employs various Machine Learning techniques (like neural networks) to learn the slightest features of complicated data produced by scanning of food products with Raman spectrometers. Verified training data is coupled with metadata from the research done in laboratories using other conventional methods.

Eventually, SFF Machine Learning algorithms are able to cope with provided unlabelled data and distinguish certain unique features and markers inherent to specific food products. The algorithm and its parameters which were assembled during the training phase are included in the reference register and stored on the SFF Blockchain, thus making up an Authenticity Stamp. Unlabelled product scans made at a later date use these Authenticity Stamps to conduct analysis in a matter of seconds.

Initially SFF is training its neural network and developing Authenticity Stamps for identifying various meats, distinguishing between different edible oils and recognizing traces of formaldehyde in fish and seafood products. Samples are picked from well-known and reliable sources, such as national laboratories, carefully prepared at the university laboratory and scanned with high precision scientific Raman spectrometer. Models created based on these spectra are carefully verified by using the testing dataset which was not used during the training in order to simulate the actual production environment.

With ever increasing amounts of input data, the SFF Machine Learning algorithms will improve and learn to identify virtually any food product, its composition or even non-food related materials, like motor oil, etc. In order to incentivize contributions of high amounts of training data needed for new service development, SFF is creating a blockchain-based Ecosystem.



Blockchain infrastructure

SFF is utilizing the potential of Blockchain technologies to create a distributed infrastructure that supports the SFF Platform and enables creation of an Ecosystem surrounding it. Development of a proprietary, custom-built blockchain solution arises from the need to have specific AI functionalities already embedded in the protocol (rather than build around it) as well as to reduce dependence on parties external to the SFF Ecosystem.

In general, blockchain is chosen as a solution for its intrinsic properties in providing transparency, data immutability and creating distributed trust.

The SFF Blockchain is used in order to:

- **Create an incentivized Ecosystem** – leveraging on blockchain-based transparency and immutability to create a distributed network of stakeholders with mutually-aligning interests and incentives;

- **Host key research and analysis data** – data on product research (metadata) and their analysis models (Authenticity Stamps) will be hosted on the blockchain in order to make it transparent;

- **Perform SFF token transaction tracking** – the SFF Blockchain will have its own finite token that will be used as a means to incentivize stakeholder participation in the Ecosystem.

The SFF Blockchain is a distributed permissioned ledger with Artificial Intelligence functionalities. In the context of SFF, nodes that run this blockchain are called Ecosystem nodes. These stakeholders run the blockchain by maintaining the transaction ledger and hosting the Authenticity Stamp register with its associated research metadata.

The ecosystem nodes maintain the integrity of the blockchain by communicating directly with each other, using peer-to-peer communication channels. In order to ensure protection against potential malevolent actors and increase resistance from unwanted outside interference, ecosystem nodes (as well as other key ecosystem stakeholders) are required to provide proof-of-authority – to lock a required amount of SFF tokens. If a stakeholder is found to cause deliberate damage to the functioning and well-being of the Ecosystem, he is removed from the network with the stake being seized.

The SFF Blockchain solution is being engineered and developed in cooperation with Swisscom Blockchain AG – a global leader in Blockchain technological solutions, advisory, business development and specialized services.

The SFF Ecosystem

The Stop Fake Food Ecosystem is a distributed, blockchain-based environment that ensures continued scaling of capacities and capabilities of the SFF Platform.

The SFF Ecosystem provides a solution in several key areas:

- **Technological scaling** – ensures a constant stream of high amounts of reliable research data vital to neural network training and further expansion of the Authenticity Stamp register;

- **Business model scaling** – provides the means to expand the SFF business model globally throughout different markets and industry segments;

- **Procedural distribution** – spreads out various activities among different stakeholders in order to ensure platform reliability and self-sustainability;

- **Incentive structure** – creates a token-backed internal economy and system of incentives to foster lasting stakeholder participation and mutually-beneficial cooperation.

The Ecosystem includes various stakeholders that have vested interests in its well-being and expansion. Stakeholders participate in the Ecosystem by taking up different roles and performing various activities – either in utilizing, maintaining or expanding the Platform.

Ecosystem roles are not mutually exclusive and stakeholders are allowed to fulfil several of them at once. E.g. a research institute could be simultaneously performing the roles of an end user (utilization), an ecosystem node (maintenance) and a product research laboratory (expansion). In the future new stakeholder roles may be introduced in line with the expansion of the platform and its functionalities.

Ecosystem model

Ecosystem node

- Hosts the SFF Blockchain
- Receives SFF tokens

End user

- Uses the SFF product analysis solution
- Pays in SFF tokens

Reference investor

- Invests into new product reference R&D
- Receives reference ownership

The SFF Platform

Laboratory

- Provides product research services
- Receives SFF tokens

Computation provider

- Provides power for AI training and analysis
- Receives SFF tokens

B2B service client

- Utilized the SFF infrastructure
- Pays in SFF tokens

Stakeholder roles

Utilization	**End user**	**B2B service client**
	Directly uses the analysis tools provided by SFF to analyse various products and substances. This includes individual (e.g. ordinary consumers), institutional (e.g. laboratories or government agencies) and business (e.g. food producers) users. End users pay service fees in SFF tokens.	Businesses that integrate their services and processes with the SFF infrastructure. This can be businesses working in food production, logistics, retail, consumer safety or any other related industry. B2B service clients pay fees and commissions in SFF tokens.
Expansion	**Research laboratories**	**Reference model (Authenticity Stamp) investors**
	Conducts laboratory research on various products and substances. Uploads research data on to the platform for neural network training and Authenticity Stamp development. Services provided by laboratories are remunerated in SFF tokens from the designated Authenticity Stamp R&D budget.	All SFF platform users can initiate and invest in the R&D of a new Authenticity Stamp for a particular product. Once the R&D is done, investors gain ownership of the new Authenticity Stamp. Authenticity Stamp ownership can be traded on an internal marketplace or held to gain commissions from Authenticity Stamp use.
Maintenance	**Ecosystem node**	**Computation provider**
	Participates in the maintenance of the ecosystem by hosting the SFF blockchain and other core platform elements. Nodes are rewarded in SFF tokens for their services.	Provides computation power to the ecosystem necessary for data analysis and neural network training. Receive SFF tokens as remunerations for the services provided.

Ecosystem deployment and scaling

The SFF Ecosystem will be deployed following a step-by-step process. The key participants in this process are partner laboratories and research centers, who will aid in continually testing and optimizing the SFF product analysis solution and its underlying blockchain infrastructure.

Ecosystem deployment stages

2019 Q1	Alpha	Blockchain development and ecosystem testing in-house
2019 Q2	Closed Beta	Ecosystem testing in cooperation with selected partners
2019 Q3	Open Beta	Ecosystem open access testing and Bug Bounty program
2019 Q4	Public launch	Launch of the SFF Ecosystem and beginning of the Ecosystem Initial Scaling Program

Ecosystem Initial Scaling Program

SFF will stimulate ecosystem deployment and accelerate scaling by providing additional incentives and premiums to initial ecosystem participants. The Ecosystem Initial Scaling Program will be temporary with the additional incentives and premiums reducing over time.

This includes measures such as:

- When the development of a new product Authenticity Stamp is initiated, SFF will provide a discount by covering part of the required R&D budget cost;
- Ecosystem nodes and computation providers will get additional premiums for their services based on their produced work, maintenance capabilities and size of the network at the time;
- Strategic partners will gain exclusive conditions and reduced fees to participate in the Ecosystem or integrate their services with the SFF Platform;
- First 1000 accredited laboratories will be provided with portable Raman spectrometers to start using product analysis services immediately, and hardware costs will be deducted from service fees.

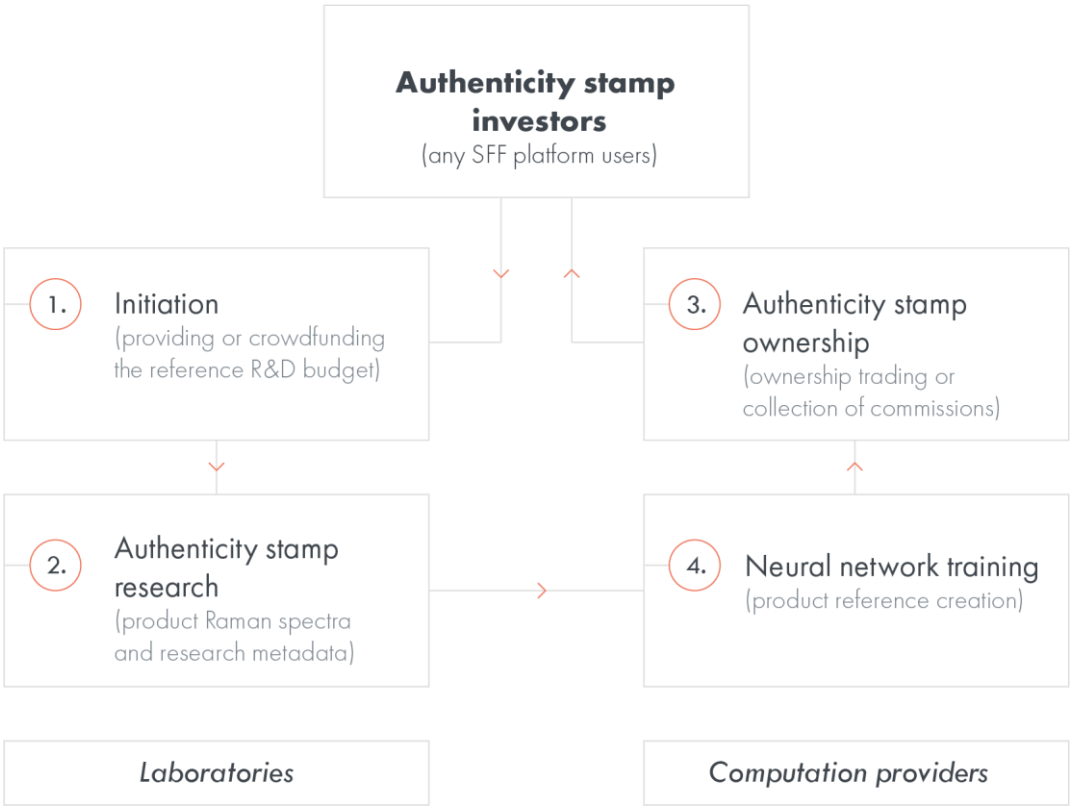
Investment into new Authenticity Stamp R&D

The SFF Platform will be continually improved and expanded to be able to identify more products and substances. For this, the SFF neural network will need to be trained with high amounts of reliable data and new Authenticity Stamps will need to be developed for later use in performing product analysis.

The Authenticity Stamps are the most important value-creating elements of the SFF Platform and essential to answering product analysis requests submitted by SFF end users. The ownership of each Authenticity stamp provides its owner with a revenue stream, proportional to how much it is utilized in SFF services.

Because of their relevance, Authenticity stamps are created analyzing large amounts of samples and data, that is later cross checked and confirmed by external and independent laboratories. This process ensures the reliability, accuracy and legitimacy of each single Authenticity Stamp.

SFF applies a process of new Authenticity Stamp development that is distributed among different ecosystem stakeholders and provides self-sustaining incentives – any platform user will be able to invest into R&D of a new product Authenticity Stamp and benefit from its ownership (via trading or collection of commission from Authenticity Stamp use). This open access paradigm will make SFF more responsive to changing market conditions and more reactive to arising needs for specific new services.



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1. Initiation

Any platform user can initiate training of the SFF neural network and development of a new Authenticity Stamp. Reasons for doing so may vary according to different users and their motivations, for example:

- Institutions, NGOs and individuals that support the public interest in ensuring food safety;
- Food producers who have interest in the SFF Platform being able to identify their own products;
- Pragmatic investors who seek to provide support for financial returns in the future.

Investors will need to submit an Authenticity Stamp development request and provide a budget in SFF tokens that will be necessary for the R&D. The budget can be either fully covered by a single investor, or it can be collectively funded through crowdfunding efforts.

2. Authenticity Stamp research

Once the Authenticity Stamp R&D request is submitted and the required budget fulfilled, an open order to perform product or substance analysis is published for all research laboratories willing to take it. If the analysis required is very specific, the order is sent to an appropriate laboratory that has the necessary technical means to fulfil it.

Laboratories perform high precision product scans of their unique Raman spectra signatures. In parallel thorough research using traditional laboratory methods (chemical, biological, etc.) is also conducted in order to verify findings.

Laboratories are paid for their services in SFF tokens from the Authenticity Stamp R&D budget.

In some cases, several laboratories can be asked to perform research on the same product. This could depend on the type of the request, product characteristics, technical aspects or the amounts of data required to develop a reliable Authenticity Stamp.

Research from several independent and mutually unrelated laboratories can also be ordered when malicious interference is expected (e.g. unethical producers or the food mafia trying to bribe laboratories to falsify research findings).

3. Neural network training

Research data produced by laboratories – both Raman spectra and metadata associated with the researched product – are uploaded to the SFF Platform. This data is used in machine learning for neural network training.

The process of training neural networks is very demanding in computational power since many different calculations need to be done and different pattern recognition algorithms need to be applied. Therefore, the SFF Platform outsources part of its computational needs to other ecosystem participants – the computation providers. SFF breaks down calculations into separate parts and sends out requests to perform the required computation. Service providers who do so are rewarded in SFF tokens from the Authenticity Stamp R&D budget.

Once the neural network is trained, a data model (product Authenticity Stamp) is deduced and stored on the SFF Blockchain. Later on, these new Authenticity Stamps are used in product analysis to identify their authenticity and composition. The training data with its accompanying metadata is securely stored in order to be investigated or re-used at a later time if the need arises.

4. Authenticity Stamp ownership

Once the R&D has ended, users who initiated the process (provided the budget) gain ownership of the new Authenticity Stamp. If the R&D budget was crowdfunded, the Authenticity Stamp ownership is split proportionally to the size of contributions provided.

SFF users who own Authenticity Stamps receive regular commissions for their use. This happens when an Authenticity Stamp is utilized in order to identify products or specific substances. Commissions are deduced from the service fee paid in SFF tokens by end users, with 80% of the fee sum going to the owners of a particular Authenticity Stamp.

Authenticity Stamp owners can also trade their Authenticity Stamps with other platform users on an internal marketplace. This trading of ownership is executed using SFF tokens.

Alternatively, Authenticity Stamp owners can renounce the ownership of an Authenticity Stamp, which in turn makes it available for end users without the ownership commission applied. The commission-free can also be temporarily or permanently waivered without actually losing ownership. These options maybe chosen in instances when the investor in Authenticity Stamp development is non-profit seeking or is a business that wants to lower the costs of identifying its own products.

Ecosystem maintenance and expansion

The functioning of the SFF Ecosystem will be ensured by the distributed ecosystem of stakeholders:

- The SFF Blockchain and core platform elements will be hosted by a distributed network of Ecosystem nodes. Stakeholders performing this role will ensure data integrity of the Authenticity Stamp register and associated research metadata, and conduct SFF token transaction tracking;

- Computation providers will support the Ecosystem by providing calculation capacities for neural network training or product analysis;

- B2B clients who integrate their services with the SFF Platform will provide additional scaling and distribution of the Ecosystem while contributing to the expansion of its functionalities and use cases;

- The SFF Platform operator will incentivize and coordinate the expansion of the Ecosystem while continuously providing technical support, software development and updates.

As core stakeholders in the proper functioning of the Ecosystem, nodes, computation providers and B2B service clients (as well as research laboratories) will be required to lock a required amount of SFF tokens in order to provide proof-of-authority.

Areas of future expansion

- **New methods and services** – due to storage of metadata from previous research and an established ecosystem of incentivized stakeholders, SFF will not be limited only to Raman spectrometry and will have the potential to build on the existing base, integrate additional technological innovations and develop new analysis services;

- **Product certification** – with a highly trained and accurate neural network in place, SFF will be able to offer certification services that prove product compliance with consumer expectations (such as non-GMO or halal product certificates);

- **Other blockchains** – interoperability solutions with other blockchain projects specializing in supply chain tracking, product patenting, consumer review or similar areas related to the food industry;

- **Applications in other industries** – expanding the scope of the SFF Ecosystem and developing solutions for non-food related industry sectors, such as analysis and verification tools for medicine, cosmetics or other high-value substances.

Stop Fake Food use case, spotlight on Authenticity Stamp

Anyone can use the Stop Fake Food solution to check the authenticity of a food product, the same way that anyone can own the Authenticity Stamp used to check that product and receive the share of the service cost.

Let's use the example of honey.

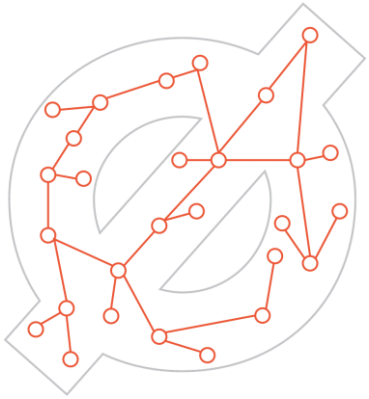
Any SFF platform users (or an individual user) can provide the budget for research and development of a honey Authenticity Stamp. Once this process is done, these users become Authenticity Stamp investors and thus gain ownership of the honey stamp.

Any user can scan-check honey products with any type of Raman spectrometer, through its transparent package, plastic bottle or glass jar. The service fee is paid with X SFF tokens.

The user's device interface uploads the collected Raman spectra into the SFF Platform for immediate data analysis. SFF Neural network is already trained to analyze and identify honey through the model contained on the previously developed Authenticity Stamp, so it's able to provide an accurate and comprehensive answer in a matter of minutes (or most of the time is seconds) and show it in a user-friendly front-end environment.

The SFF infrastructure recognizes that the Neural Network used the specific Honey Authenticity Stamp and sends to its owner(s) 80% of X tokens paid by the end user.

The SFF Token



SFF tokens are the facilitators of the SFF Ecosystem. They act as the main medium of interaction on the ecosystem and are used as a means to create incentives for stakeholders to engage in mutually beneficial cooperation.

A total of 1.000.000.000 SFF tokens will be issued with 380.000.000 (38%) of them offered to private buyers. This will be a one-time issue of a finite amount and no additional tokens can or will be introduced in the future.

Tokens issued during the TGE will run on the Ethereum blockchain and will be based on the ERC20 standard. Therefore, these tokens will be easily compatible with most crypto wallets, exchanges and other contemporary crypto infrastructure.

Once the SFF Blockchain is publicly launched, a token swap solution will be introduced. It will allow token holders to convert their SFF tokens running on the Ethereum blockchain into a corresponding amount of tokens on the SFF blockchain. Once converted, the Ethereum based tokens will be automatically burned.

Token utility

Ecosystem internal payments. The SFF token is used as an internal currency exclusive to the SFF Ecosystem. The need for an ecosystem specific token arises due to several factors inherent to the SFF Ecosystem:

- SFF will be reliant on fast transactions between different stakeholders without being depend on the proper functioning of other public blockchains or being disrupted by their overloads;
- The majority of transactions made on the Ecosystem will be small-scale and, in turn, require very low transaction fees attainable through the SFF Blockchain;
- The Ecosystem is expected to be highly distributed throughout the world and therefore requires a unified payment solution.

Investment into Authenticity Stamps. The SFF token will be utilized as a means for investment into new Authenticity Stamp development, as well as a vehicle for automatic, smart contract-based revenue sharing between Authenticity Stamp owners, the SFF platform and other involved stakeholders.

Asset for staking and Proof-of-Authority. Key Ecosystem stakeholders (nodes, research laboratories, computation providers and B2B service clients) will be required to provide proof-of-authority by locking an adequate amount of SFF tokens. This feature is implemented as a means for stakeholders to provide an assurance of good intentions and an incentive to maintain the SFF Ecosystem.

Business strategy

The business strategy of Stop Fake Food revolves around 4 key factors that are based on the strengths of the technologies used:

- Provision of genuinely new and innovative services;
- Market disruption with cost-efficiency and time-saving;
- Global and fast-paced deployment through partnerships;
- Openness to growth according to market needs.

With no competition of comparable technological potential in place, SFF will be the prime market mover of Raman spectroscopy-based services in the food industry.

The initial primary user base of SFF will be private and government-run laboratories working in food safety and research related areas. SFF will closely cooperate and coordinate with selected partner laboratories during the development and testing of the product analysis solution with its surrounding Ecosystem. Later on, up to 1000 laboratories worldwide will be invited to join as end users with SFF compensating acquisition of the necessary equipment, provide required training, support and expertise. Thus, laboratories that adopt the innovations and methods proposed by SFF will be able to offer Raman spectrometry-based product analysis solutions to their direct clients.

The current market for food fraud testing in laboratories using standard methods is estimated at around 120 million EUR annually. Introduction of the SFF product analysis solution is expected to grow this market substantially by increasing accessibility to new and more efficient testing methods. The technologies utilized by SFF will allow for the pursuit of true market disruption by enabling food testing to be done several times cheaper, faster and more conveniently.

The evolution and future growth of services offered will rely on the openness of the SFF Ecosystem, the inclusion of a wide range of interested parties and use of mechanics of investment into new product Authenticity Stamp R&D. This will make SFF highly receptive and adaptive to the changing needs and conditions of the market, both on local and international levels.

Main customers and clients

End users

- **Research institutions** – governmental and private laboratories, veterinary services, research centres and corporate R&D departments who will benefit from the SFF product analysis solution by significantly scaling their operational scope and efficiency;

- **Public institutions and NGOs** – food safety agencies, customs offices, law enforcement, consumer rights protection organizations and others working in the public sector;

- **Private companies** – food producers, product manufacturers, logistics companies, retailers, restaurants and others directly or indirectly participating in the food industry;

- **Consumers** – once Raman spectrometry devices are engineered to be widely accessible to the mainstream, ordinary consumer will be able to directly use services provided by the SFF Platform.

B2B service clients

- **Product trackers** – product packaging markers, supply chain tracking blockchains, logistics management systems and other current or upcoming providers of product tracking solutions will be able to improve their services by integrating with the SFF Platform through dedicated APIs;

- **Intermediary businesses** – those that have the technical capacity and use the SFF Platform in providing on-the-ground product analysis services directly to local institutions, businesses and consumers;

- **Licencing and quality control service providers** – companies using the SFF Platform to provide their clients with additional verification of product authenticity and evaluation of compliance with industry standards and corporate requirements.

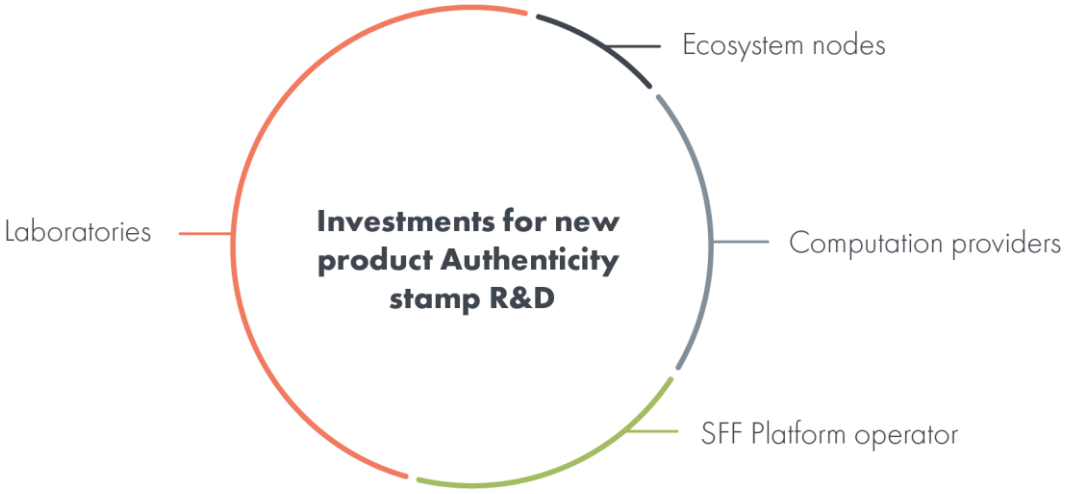
Other beneficiaries

- **Laboratories and research centres** – will not only form the initial base of SFF Platform users, but will also continually receive service orders for conducting research on new products and their compositions using various laboratory methods;

- **Blockchain miners** – due to similar technical requirements associated with AI training, many current GPU-based blockchain miners will be able to utilize their infrastructure in providing distributed computation services to the SFF Ecosystem in return for remunerations in SFF tokens.

Revenue distribution model

SFF will distribute received revenue among Ecosystem participants for the services provided. The proportions presented here are for example purposes only and may be different from the ones implemented.



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Roadmap

Research on Raman spectroscopy application to food analysis	**2017 Q2**	Project team build-up
Research on AI applications to analysis of Raman spectra	**2017 Q3**	Angel investor seed funding received for initial project development
R&D of analysis methodology	**2017 Q4**	Project business case development
Product analysis system proof-of-concept	**2018 Q1**	European Commission structural funding received for project R&D activities
Product analysis service and Ecosystem concept development	**2018 Q2**	Strategic partnership establishment with: ○ National Food and Veterinary Risk Assessment Institute of Lithuania; ○ National Center for Physical Sciences and Technology; ○ Vilnius University Faculty of Mathematics and Informatics
Product sampling and Raman spectra library compilation; Initial neural network development and testing; Analysis system Minimal Viable Product development	**2018 Q3**	Project incorporation in Zug (Switzerland) and regulatory approvals; Start of the project private fundraising round
Continued neural network development and optimization; Blockchain architecture and modelling	**2018 Q4**	Stop Fake Food TGE
Meat type, fish and edible oil analysis service commercial testing; Launch of SFF Blockchain Infrastructure development; Private off-chain implementations - Business Proof of concept	**2019**	End of TGE – June; Launch of SFF global public awareness campaign; Official accreditation of SFF methodology in EU and US World Wide SFF Solution Patent application
Token listing on an exchange; Launch of Stop Fake Food Commercial Version	**2020**	Equipping 250 partner laboratories with Raman Spectrometers; Reaching 20 Authenticity Stamps officially accredited in the EU and US

SFF fundraising and TGE

The Stop Fake Food fundraising campaign consists of equity and token sales. These will be the main methods in raising funds necessary for developing the project to its full fruition. Additional investment options also include investment (early ordering) into Authenticity Stamps or early acquisition SFF Blockchain Nodes.

The Token Generation Event (TGE) model was chosen to encourage global participation and community involvement in tackling food crime, as well as a way of distributing tokens among prospective Ecosystem stakeholders and partners.

380.000.000 SFF tokens (38% of the total amount) will be privately offered for sale to individual and institutional buyers during the TGE.

Total funding required to develop the project to its full potential is 19.000.000 USD and is expected to be raised during the TGE. The TGE is organized in two rounds:

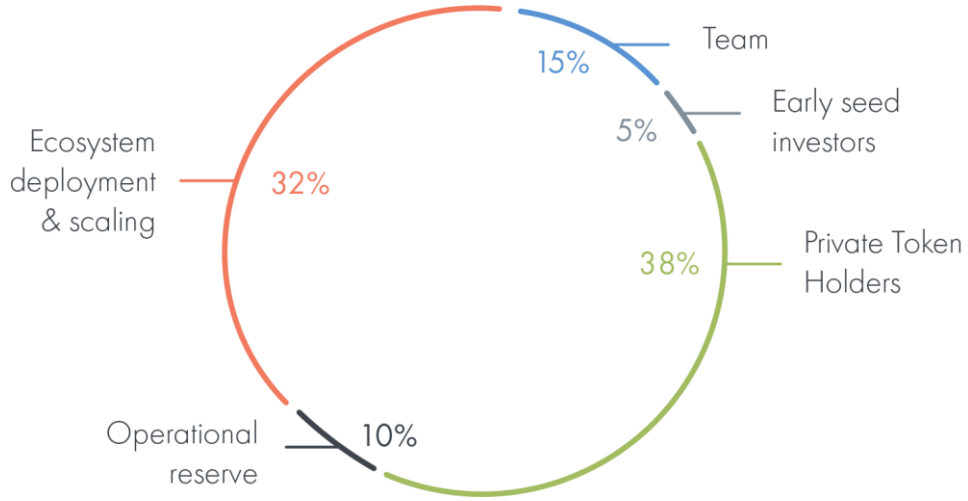
- Early financing round – where hybrid equity and token deals are possible, and will end once reached 10% of the total funding predicted (1.900.000 USD). These funds are for immediate available liquidity in all areas of the project development and, for that reason, are non-refundable;

- Main sale – for private project supporters and will run until the round hard cap is reached (17.100.000 USD) or the predicted end of the TGE (June 2019).

The TGE minimum funding to ensure the viable development of the Project is 7.000.000 USD. The full development of the project is only ensured if this amount is reached until the end of the TGE (June 2019). Funds raised during the main sale (after the first 10% of funding was reached) will be refunded to all token buyers.

The TGE will be conducted following all legal requirements, industry guidelines and best practices. SFF will apply Know-Your-Customer (KYC) and Anti-Money Laundering (AML) procedures to contributions made during its fundraising efforts.

Token distribution



38% – Private Token Holders

Sold to project supporters during the TGE. All unsold tokens will be transferred to the ecosystem expansion reserve and locked for 36 months.

5% – Early seed investors

Designated for early project investors for initial funding of the project and R&D of the minimum viable product.

32% – Ecosystem deployment and scaling

Reserved to provide support for platform ecosystem deployment and incentivize global scaling:

- 10% used for private node incentivization (issued during the second stage of the project, to be implemented no sooner than after 6 months and not later than 3 years after the launch of SFF Blockchain. Distribution will be based and adjusted to the network load and capacity);
- 8% for SFF Data Harvesting Campaign;
- 8% towards business development and marketing needs;
- 6% for tokens stacking for Nodes installed in governmental or licensed institutions.

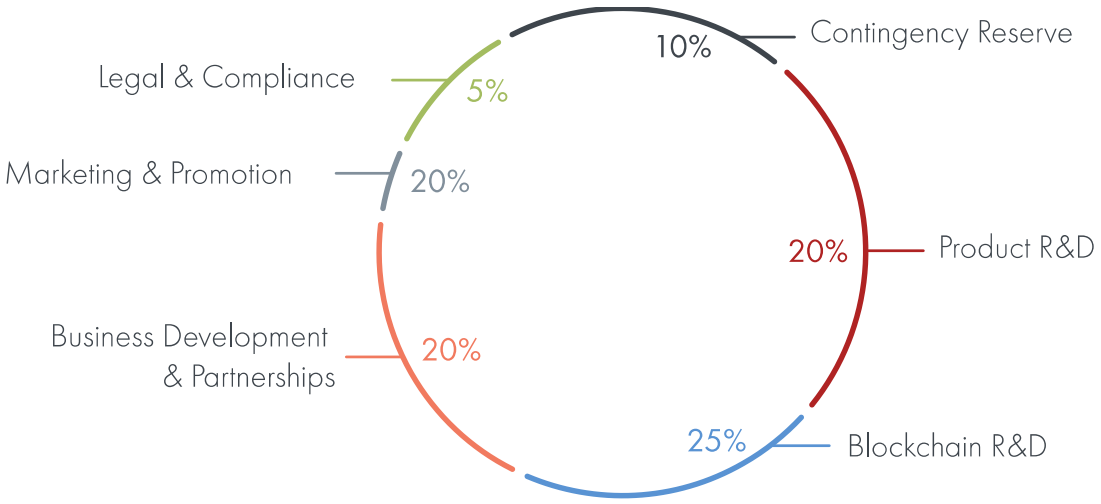
15% – Team

Split among founders, team members, developers and advisors. Tokens vested for 18 months and paid out quarterly.

10% – Operational reserve

Designated as a liquidity reserve, used for partnerships and exchange gateways.

Funding allocation



20% – Product R&D

Funding required to build upon the current minimum viable product for further expansion of neural network capabilities and Raman spectrometry integration.

25% – Blockchain R&D

Allocated for the development, testing, security and launch of the proprietary blockchain infrastructure behind the SFF Platform and the surrounding Ecosystem.

20% – Business Development & Partnerships

Dedicated for the establishment of a strategic partnership network – funding the purchase of Raman spectrometers by partner laboratories to allow rapid Platform scaling and global business expansion throughout different markets.

20% – Marketing & Promotion

Reserved for implementation of the marketing strategy, including community building, increasing brand awareness and conducting various promotional activities.

5% – Legal & Compliance

Budget to cover legal, accounting and regulatory compliance costs associated with the expansion of SFF offerings to a global customer base.

10% – Contingency reserve

Safety reserve to mitigate unforeseen contingencies during the implementation of the SFF solution.

Team

Business, Financial and Legal

Augustas Alešiūnas

CEO

Business angel in FoodTech and AgTech industries for 10+ years. Founder of myfoodsniffer.com and agrosmart.eu

Darius Montvila

Chairman of the Board

Senior executive with 30+ years of international experience in high tech industries. Board Member at Ericcson, Avaya, BITE, LEO LT, etc. Business mentor and founder of several companies.

Donatas Černiauskas

COO

Executive business management professional with 15+ years of experience in various business areas. CEO of the Crypto Economy Organization.

Evaldas Balkys, CFA, FRM

CFO

Senior financial consultant working with multinational corporates and financial institutions. Extensive international experience in treasury and financial risk management, control and financial analysis.

João Alberto Martins

CMO

VP of Business Development at Birdchain.io, Brand ambassador at Vertex.lt, co-founder and former COO at magnoliaporto.com group. B2B relations and community outreach expert.

Darius Mockevičius

Head of Business Development

Co-founder at Foris Consulta. Global partnerships developer with experience in 30+ countries and 15+ sectors, including business partnerships with General Electric, Pernod Ricard, Permanent TSB Group.

Linas Didžiulevičius

Project Manager

Former sergeant at NATO army forces, SATCOM engineer and section head. International missions to Turkey, workgroup with US special forces (SOCC). Specialist in communication network security.

Vladas Latvėnas

Partnership Manager

Co-founder at Foris Consulta. Expert in B2B sales and export market search & analysis. Former financial analyst in the Food Retail sector.

Erika Budrytė

International Partnership Manager

Project manager at Foris Consulta. Experienced business cooperation manager with multinational corporations, as well as participant in non-governmental initiatives.

Dr. Deividas Soloveičik

Legal Counsellor

Associate Professor at Vilnius University, Partner and Head of Public Procurement practice at COBALT Lithuania. 15+ years of lawyer practice. Member of the Chartered Institute of Arbitrators, Honorary Consul General for the Philippines in Lithuania.

Jolita Žukovienė

Legal Counsellor

Master in Law with 6+ years of lawyer practice. Specialized in the fields of regulated activities, financial IT based service regulation, corporate governance and tax planning. Board member in foreign financial institutions, legal counsellor for projects in 7+ countries.

Anthony Abunassar

Advisor

Anthony built his experience within the most prominent companies, starting in PWC and then Rotschild & Co, Goldman Sachs and JPMorgan, before tackling the world of crypto trading and ICO investing. His pedigree in finance is unparalleled.

Science and Technology

Dr. Laurynas Jukna

CSO

Senior Lecturer at Vilnius University. Project leader and interdisciplinary researcher with expertise in hyperspectral imaging, spectral data analysis and spatial modelling.

Dr. (HP) Valdas Šablinskas

Raman Spectroscopy Advisor

Professor at Vilnius University, Director of the Institute of Chemical Physics. Academic with 30+ experience in Raman and infrared spectroscopy applications to the studies of biological systems. Author and co-author of 80+ scientific papers.

Dr. Justinas Čeponkus

Lead Raman Spectroscopy Researcher

Associate Professor at Vilnius University. Internationally recognized physicist working in the areas of vibrational spectroscopy, infrared microscopy and spectroscopy of nano and biological systems. Author and co-author of 50+ scientific papers.

Kristina Šermukšnytė-Alešiūnienė

Lead Project Manager

CSPO at ART21, Ltd. Experienced senior manager of product development working at the intersection of information technology, agriculture and the B2B service industry.

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Blockchain and Development

Justas Gribovskis

CIO

CEO at IT Sistemos. Professional in IT infrastructure project management (PMI PMP, Cisco CCNA) with 15+ years of experience. PhD student in information sciences.

Dmitrij Radin

Crypto and Blockchain Advisor

CTO and Co-Founder of ORCA Alliance and Crypto Evangelist.

Suwan Bamunu

Tokenomics and Blockchain Advisor

Founder of G-Force crypto investment and strategy advisor.

Mindaugas Kelpša

Concept Advisor

Lecturer at Vilnius University. Blockchain project advisor, startup concept developer and strategist. Techno-anthropologist with interdisciplinary academic experience.

Tomas Žeimys

Lead Developer

Former CEO and CFO in multiple projects. 16+ years of experience in software R&D, consumer electronics and sensor systems engineering with a focus on Food and Agriculture industries.

Paulius Petronis

Senior Software Developer

Senior programmer with 11+ years of experience in software development for the Food and Agriculture industries.

Tomas Karvauskas

Senior Software Developer

Senior programmer with 9+ years of software development experience for the B2B sector.

Partners

National Center for Physical Sciences and Technology (NFTMC)

The largest scientific research institution in Lithuania that is conducting fundamental research and technological development in the scientific fields of laser technology, optoelectronics, nuclear physics, organic chemistry, bio and nanotechnologies, electrochemical material science, functional materials, electronics, etc.

Vilnius University Faculty of Mathematics (VU MIF)

The leading higher education institution in Lithuania that prepares high competence professionals in the fields of mathematics, computer science and statistics, as well as conducts fundamental scientific research in the related fields.

Swisscom Blockchain AG

A global leader in Blockchain technological solutions, advisory, business development and specialized services. The company is part of Swisscom – the leading telecommunication service and IT infrastructure group in Switzerland.

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