The Food Safety Market: An SME-powered industrial data platform to boost the competitiveness of European food certification

D4.1.2 - Annual Report from Iterative Application Development

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EXECUTIVE SUMMARY

This deliverable reports the process and outcomes of agile and iterative development of the software applications, namely Food Inspector Application, FOODAKAI 2.0 application and the Agrivi 2.0 application. It presents how the software applications that food supply chain stakeholders use, can be connected to TheFSM to support data exchange for the business scenarios identified in WP1 and piloted in WP6. More specifically, the objectives during the second year of the project were to a) iteratively develop functional versions of the applications along with and informed by the piloting activities, b) add new features to each application as informed by the focus groups and pilots, c) interconnect the applications internally and also externally with third-party services, d) test and verify the smooth, robust and complete integration of the various components and services.

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1. INTRODUCTION

This task focuses on setting up an **agile process** that will enable the **iterative implementation**, deployment and **testing** of the various product features with actual users. We designed and put in place a method of work that is executing software development sprints which are then tested with representative focus groups with actual users, in order to get early and continuous feedback on the new product features. An appropriate **mechanism** and **virtual communication tools** were set up to enable weekly team check-ins of all the people involved in developing and deploying product features and components.

During the second year, the above process was tested and enhanced in the context of the pilot activities, and two new processes were added: a) weekly "hackathons" internally in the technology team and also within the user and tech teams, b) an ICE process specifically designed for adding new data sources and data types to the platform and applications.

This document is structured as follows. In the second section we define and analyze the agile development process that is adopted for the development of applications. Third section focuses on the collaboration, communication tools and the routines that are adopted by the technical partners and the development teams of the project. In the fourth section we present a methodology that is used to prioritize the developments using criteria such as impact, confidence and ease. The process for testing the new developments is presented in section 5. In the last section we present the outcomes of the agile development process for the three applications that will be developed in the context of the project.

This deliverable uses the outcomes reported in deliverable D1.1 for the user and business requirements, the recommendations of D6.3, as well as the overall architecture of TheFSM Platform presented in deliverable D3.1. In addition to that, the second release of the platform D3.2 is used to develop the interaction of the applications with the TheFSM platform.

2. AGILE APPLICATIONS DEVELOPMENT ITERATIVE PROCESS

The adopted agile development process includes the following steps

1. **Requirements identification:** Based on the business scenarios defined in WP1 a set of user stories were documented and shared with the development team from the partner that leads the development of the application
2. **Design**: Based on the user stories the development team is creating a set of wireframes that gives a good idea of the operations that will be developed. The wireframes are presented to a focus group of users to validate that the designed operations will bring value to the end users. Based on the feedback we are creating the final version of wireframes
3. **Development:** The final wireframes are used to start the development of the alpha version.
4. **Testing:** the alpha version is tested from the technical and usage point of view by internal teams of technology partners.
5. **Deployment:** Based on the testing results the development team is deploying the alpha version of the application.
6. **Review**: the alpha version is open for testing and review by the focus groups and the feedback is collected using interviews and online questionnaires.

The outcomes of the review are the input for the design and deployment of the beta version. The iterative process is repeated for the beta version and for the first official release of the application (1.0).

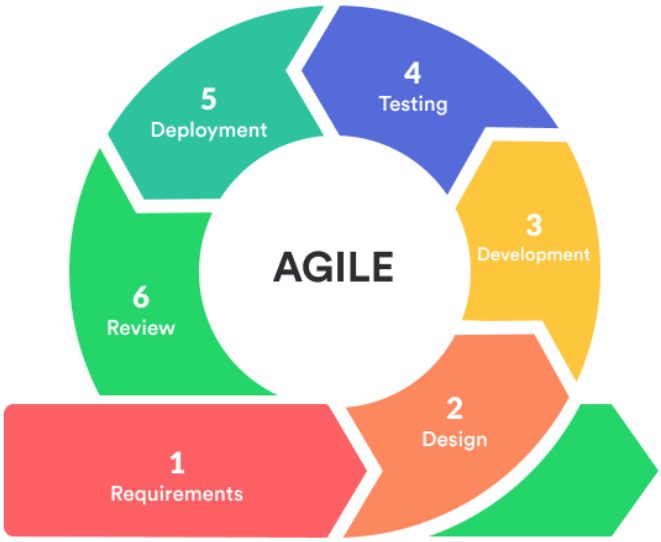


Figure 1: The development iterative process followed in TheFSM project for the implementation of applications

The requirements identification step is the sprint 0 and it creates a set of personas and user stories which are added in the sprint backlog. All the stories are organized in Epics (software modules) and the duration of each sprint is from 2-4 weeks. The outcome of each sprint is one or a couple of features that are developed in their alpha version. The end users may be involved in a sprint, if necessary, to provide clarifications about the required functionality of a feature.

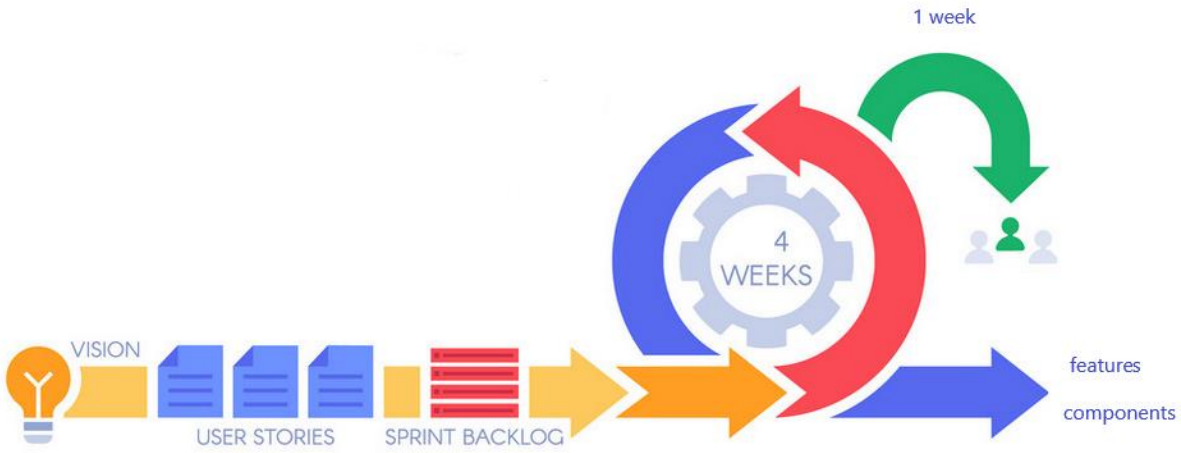


Figure 2: The process that is used to transform users' stories to features

3. ROUTINES AND VIRTUAL COMMUNICATION TOOLS

3.1. MEETINGS

3.1.1. The Program Increment (PI) planning meeting

Following the best practices of the agile development process, every three months we are organizing a Program Increment (PI) Planning meeting, which is a cadence-based event that serves as the heartbeat of the Agile Process, aligning all the teams on the main objectives of the project. This should be a face to face meeting but due to pandemic it is organized online using virtual meeting tools like Zoom and Microsoft teams. To design the program increment for each software application, the development team is using the outcomes of the TheFSM project plenary meeting.

Using the key outcomes that we want to achieve within the next increment, the development team is designing all the iterations (sprints) of the increment. Dependencies between the development teams are identified and discussed to make sure that the work will be completed on time. The potential risks are identified and mitigation actions are planned to ensure that high quality developments will be delivered.

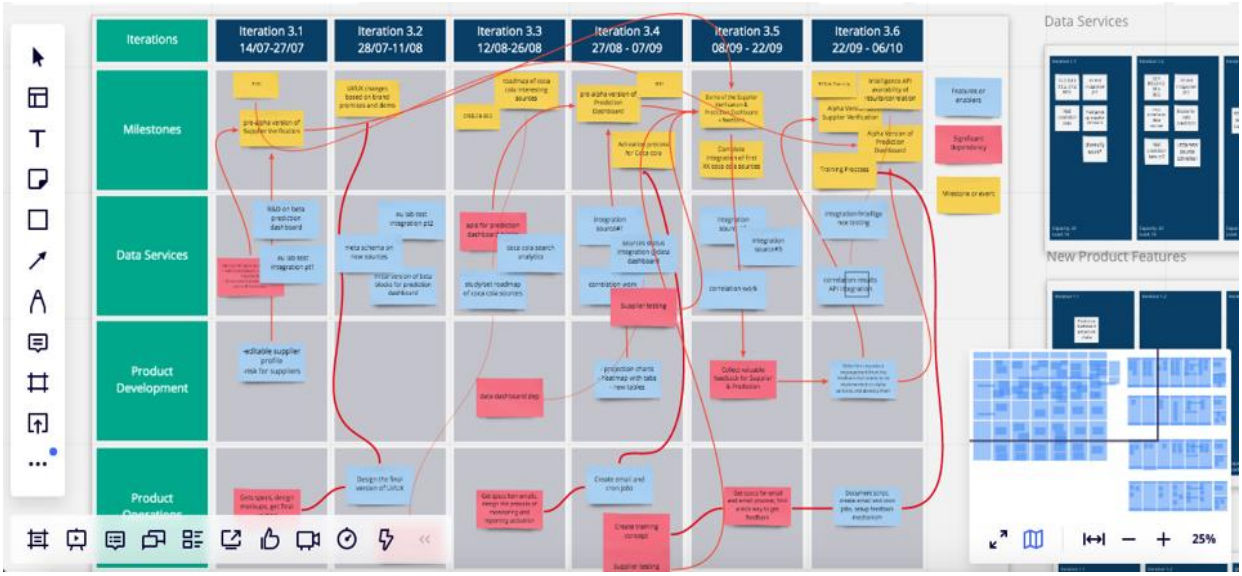


Figure 3: Program Increment planning board

3.1.2. Biweekly sprint planning meetings

Every two weeks, the development teams of the applications together with the partners responsible for the platform development and the data modeling, meet to discuss the progress of the last sprint and to plan the focus of the next sprint. The biweekly meetings include a

retrospective session to discuss what the main learnings from the last sprint were. In addition to that, we are reporting the progress towards the project increment using the key results that are defined after each plenary meeting. The progress of the work in each sprint is monitored using the sprint burndown chart.

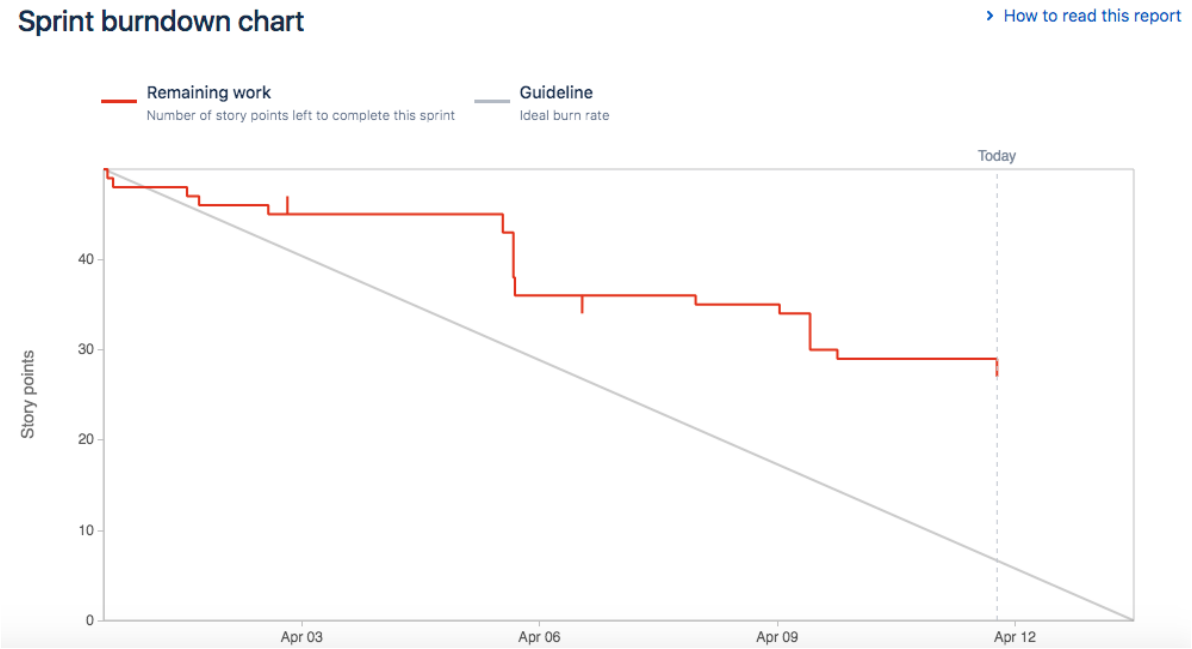


Figure 4: Sprint burndown diagram

3.1.3. Weekly Hackathons

As a direct output of the piloting activities, the need for an intermediate meeting that links the bi-weekly sprint planning meetings was identified. The idea was for a working-session-type meeting, where the tech partners and invited user partners work together on specific technical tasks to overcome blocking issues. Special focus was given to the timely address of any issues that hindered the correct execution of the piloting activities.

3.1.4. Daily Check Ins (Scrums)

The development teams of each TheFSM application meet every working day at the same time to discuss the most important objective of the day and if there are any issues that are blocking the progress of the developments for the sprint.

3.2. Communication and collaboration tools

To organize our work and to share code and documents we use the following tools

- Trello
- Jira
- Gitlab

- Bitbucket
- Google drive

To communicate we use the following tools

- Microsoft teams
- Zoom

4. DEVELOPMENT PRIORITIZATION

In order to select which features are the most important ones to start implementing we use the ICE score prioritization method[1]. The method is based on the following three factors

- **Impact** demonstrates how much your idea will positively affect the key metric you're trying to improve.
- **Confidence** shows how sure you are about Impact. It is also about ease of implementation in some way.
- **Ease** is about the ease of implementation. It is an estimation of how much effort and resources are required to implement this idea.

The development teams are using the following simple rules to run effective the ICE scoring method

- Keep it simple
- Make sure you have cleared the objectives and the focus for the specific period
- Involve leaders from all the departments and partners to select the priorities for the key results
- Use a Lean Canvas to further analyze a product feature
- The ideas which are selected as the ones with high priority to be implemented have a project manager who is responsible for monitoring the progress and validating the outcomes of development.
- For features which have scored in ICE very similarly, we perform an analysis using a Lean canvas

During the second year, the aforementioned process was enhanced and made more specific especially for the integration of new data sources and data types. To ensure the quality and validity of new data, we focused on collecting and processing information only from trusted sources. This cannot be an automated process and is thus highly controlled and based on specific criteria. More specifically, we analyze each data source using the following set of criteria:

- **Authority:** Who publishes the information and which is the authority level of the organization in the food safety and fraud area
- **Openness**: If the data are published under an open license and permit commercial exploitation
- **Quality:** Which are the metadata that the data source provides for the food safety incidents, how reliable and consistent are they
- **Frequency of updates:** How frequent the data is updated and how fresh and relevant they are
- **Format:** Which is the format of the data and how easy is to process the specific format

[1] Ref: https://www.productplan.com/glossary/ice-scoring-model/

- **Accessibility**: If it is possible to get the data in an automated way, through scrapping, an RSS feed or using an API
- **Relevance:** if the data published by the source is relevant to risk intelligence and other TheFSM activities and goals

5. TESTING OF NEW FEATURES

The beta version of the applications (FoodInspector, FOODAKAI 2.0, Agrivi 2.0) are tested both by internal teams of each partner and by end users of the focus groups. During the second year, the applications and their specific features were also demonstrated, tested, and evaluated by internal and outside key stakeholders. The outcome of these pilot activities directed the development of the new features reported in the following sections, but also allowed us to make many of the alpha version features more robust and feature-complete. The relevant feedback and all issues identified during the testing are reported using Jira and Hubspot. Any issue received is stored in the internal ticketing system that the application owners have. The feedback from the end users is processed and classified into one of the predefined ticket categories (e.g., system issue, data accuracy issue improvement request, new functionality request).

During the second year, and through the increased internal testing and external use stemming from the pilot activities, the need for a more detailed and robust process for identifying, reporting, and correcting software bugs was identified. We elaborate on this in the following sections.

5.1. Bug reports during testing

To ensure the quality of the delivered features and data, we are following a multilevel testing approach.

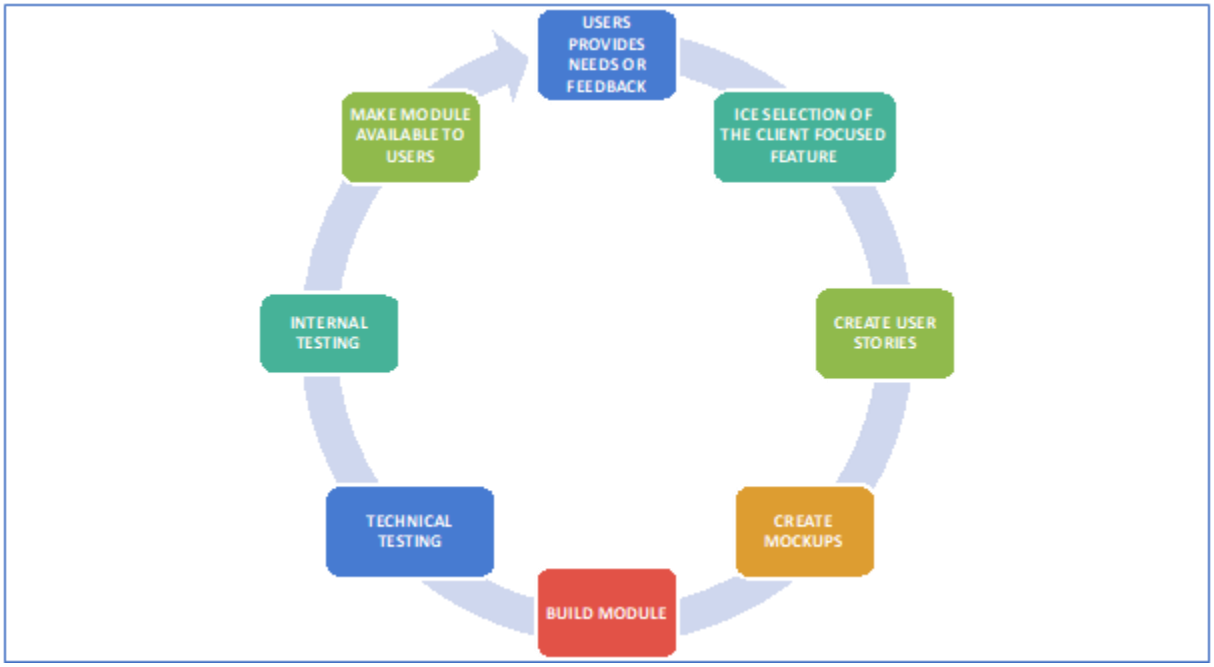


Figure 5: Product development cycle

As one can see in the product development cycle (Figure 5), there are three steps that focus on the testing: technical testing, internal testing and user testing. More specifically, our testing approach includes the following components

- **Automated technical testing** which is conducted during the implementation
- **Manual human testing** by the software development team during the development based on the user stories (D1.1)
- A dedicated sprint for manual human testing of the new products or features by internal **Quality Assurance teams**
- Testing by a small group of end users (**User Acceptance Tests**) that were involved at the stage of identifying the user stories (focus group members)

All the issues identified during the testing are reported using Jira Software as bug reports. The issue reported by the end users is processed and classified into one of the predefined categories (e.g., system issue, data accuracy issue, improvement request).

5.2. Bug reports by end users

The reported bugs by end users are stored in our internal ticketing system. We use a specific set of fields to organize the identified bugs as presented in the following table.

Table 1: Fields used to store and organise user bug reports

Field	Value description
Request text	The actual issue reported by the user
Type	Classification of the issue (functionality issue, data accuracy issue, missing data)
Status	Resolved/ Not resolved
User	Who reported the issue
Company	The company of the user
Date	The date and time the bug was reported by the user

Responsible for collecting and tracking the reported bugs is the Product Manager of each product (Food Inspector, FOODAKAI 2.0, Agrivi 2.0). The list of product bugs is hosted in a CRM's ticketing system (Hubspot) and it can be accessed by all the members of TheFSM team. The HubSpot system was selected as the tool to organize, manage and track all the reported bugs. The ticketing system is automatically linked to the Jira Software system and any reported issue is assigned to product development teams and included in the current sprint.

The bugs (issues) are reported by the end users through three channels: support email, live chat tool, or through live feedback during piloting activities.

For each product we have an escalation matrix which defines when escalation should happen and who should handle incidents at each escalation level. An example of the escalation matrix for FOODAKAI 2.0 product is presented in the following table. Any issue can be submitted to the customer support team using the support email and/or the live chat tool. Any issue can be submitted to the customer support team using the support email and/or the live chat tool. Customer success manager tracks all the issues and escalates them when necessary to the corresponding level.

Table 2: Escalation matrix for FOODAKAI 2.0 product

Escalation level	Responsible	Channel	How/When to Escalate
1	Customer Support Team	support@foodakai.com or Live Chat tool	Difficulty in using the platform, product or data issues
2	Customer success manager	success@agroknow.com	Training & onboarding issues, reporting issues, contact points, feedback from end-users
3	Head of customer success	anna.kasimati@agroknow.com	New service request, feedback from the management, product value issues.
4	Head of FOODAKAI product	stoitsis@agroknow.com	Serious issue of the technology that needs time to be resolved or data/ New features request

5.3. Tracking product bugs and errors

Any reported bug (issue) is stored in TheFSM internal ticketing system by adding information about the date, the end user that reported the bug and the type of the issue. The bug is processed and classified into one of the predefined ticket categories (system issue, data accuracy issue). According to our internal agreed-upon SLA, the TheFSM team is acknowledging the receipt of the report within 24h and works on their appropriate reply and resolution within 3 business days. The per-product Product Manager is responsible to track the time from reporting to solving the issue.

The Product manager is working with the software development and data teams for the resolution of the bug. S/He assigns the product bug to one of our software engineers who have a buffer in his/her sprint for bugs resolution. The status of the resolution (To do, In progress, Done) is updated by the software engineer in Jira Software. After the issue is resolved, the software engineer is updating the status of the issue to Done (Resolved) and the status is automatically updated in the ticketing system.

In addition to the bugs reported by users, we are also using a system for logging system errors. More specifically we are using Coralogix[1], a SaaS platform that analyzes log, metric, and security data in real-time and uses machine learning to streamline delivery and maintenance processes. Coralogix can aggregate and analyse all the logs of a product, it automatically notifies the product development team for any error that is logged and sends corresponding alarms and daily reports. Performance monitoring of the product is done using the Scout system[2].

Using both human experts testing and system logging/monitoring services we ensure that all the bugs and errors are correctly tracked.

5.4. Correcting product bugs

In TheFSM we developed and agreed on a specific process which is used to correct the product bugs that are identified by end users. The steps of this process for each reporting channel are presented in the following table.

Table 3: Channels for collecting the feedback

Step	Channel 1: Support chat	Channel 2: email
1.	**End user reports the bug using the chat tool**	**End user reports the bug through support email**
2.	Customer success team member adds the communication in the HubSpot tickets linked to the specific user (name, company) and assigns it to Product Manager. S/He adds the information about the bug in HubSpot tickets and organizes it by categorizing the issue (data issue, functionality issue, module).	Product manager receives the report and adds it from the Hubspot conversation to HubSpot tickets module and s/he links the report to the specific user (name, company).
3.	Product manager thanks the user for reporting the issue and informs him/her about the next steps.	Product manager thanks the user for reporting the issue and informs him/her about the next steps.

4.	Product manager assigns the issue to a software engineer of the product development team.	Product manager assigns the issue to a software engineer of the product development team.
5.	Software and/or data engineer starts working on the resolution of the bug. S/He deploys the solution on the testing environment and request the internal Quality Assurance team to check that the solution is working correctly.	Software or/and data engineer starts working on the resolution of the bug. S/He deploys the solution on the testing environment and request the internal Quality Assurance team to check that the solution is working correctly.
6.	After successfully testing and deploying the solution on the production environment, Product Manager sends an email to the end user that reported the bug and informs him/her that the issue was resolved.	After successfully testing and deploying the solution on the production environment, Product Manager sends an email to the end user that reported the bug and informs him/her that the issue was resolved.

6. OUTCOMES OF AGILE DEVELOPMENT PROCESS

This section reports the developments during the second year of TheFSM for the three end-user applications, namely

- **Food Inspector** which deploys and validates the software application that inspectors use in the context of certification scenarios,
- **FOODAKAI 2.0** which further extends and validates the FOODAKAI software application that food companies use in the context of risk monitoring, traceability and prediction,
- **Agrivi 2.0** which further extends and validates the AGRIVI software application that food processors and their contracted suppliers use in the context of supplier data sharing scenarios

6.1. Food Inspector Application

This section focuses on the development plan and the outcomes of the agile development process for the Food Inspector application during the second year of TheFSM project.

6.2. Application development plan

The plan for the development of the Food Inspector application is presented in table 1. In the second year, we focused on delivering a functional beta version that was extensively used during the pilots of WP6 and incorporated the updated requirements that will be reported in the second version of D1.1 as well as the recommendations of the second version of D6.3.

Table 4: Development plan for the Food Inspector Application

Task	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24
Company Dashboard												
Inspector Dashboard												
Daily Alerts												
Hazards Dashboard												
Risk Dashboard												
Agrivi 2.0 Integration												
GLOBALG.A.P. PoC												
Beta Version Release and Pilot Testing												

6.3. Developments status

During the second year of the project, we focused on gradually delivering the functionalities illustrated in the wireframes and mockups presented during the first version of this deliverable. More specifically, we developed and tested through the piloting activities the following features:

- Develop a first functional version of the Company Dashboard, where the inspector can get an overview of the company that is to be inspected, including: a) certificates and other documents that the company holds, b) previous inspections and recalls that the company has been subjected to, c) an overall risk profile for the company that encompasses all relevant aspects
- Develop a first functional version of the Hazards Dashboard, where the inspector can be informed for the particular hazards associated with a particular ingredient / product
- Develop a first functional version of the Risk Dashboard, where the inspector can be informed for the level of expected risk for a particular ingredient or product
- Establish the integration with Agrivi 2.0 for document exchange prior to an audit and also lay the groundwork for connection with a third-party service (GLOBALG.A.P.)

6.3.1. Search for company profiles prior to inspection

Before a specific inspection, the inspector can search for a specific company to retrieve a succinct company profile (see Company Dashboard in later sections). Using the provided advanced filters, the inspector can also search for companies that meet specific criteria, e.g., companies from Greece that produce meat products, and select any one to delve deeper.

In the following figure, the main screen of the module that can be used to perform the market research is shown. By clicking on a company name, the inspector is redirected to the Company Dashboard.

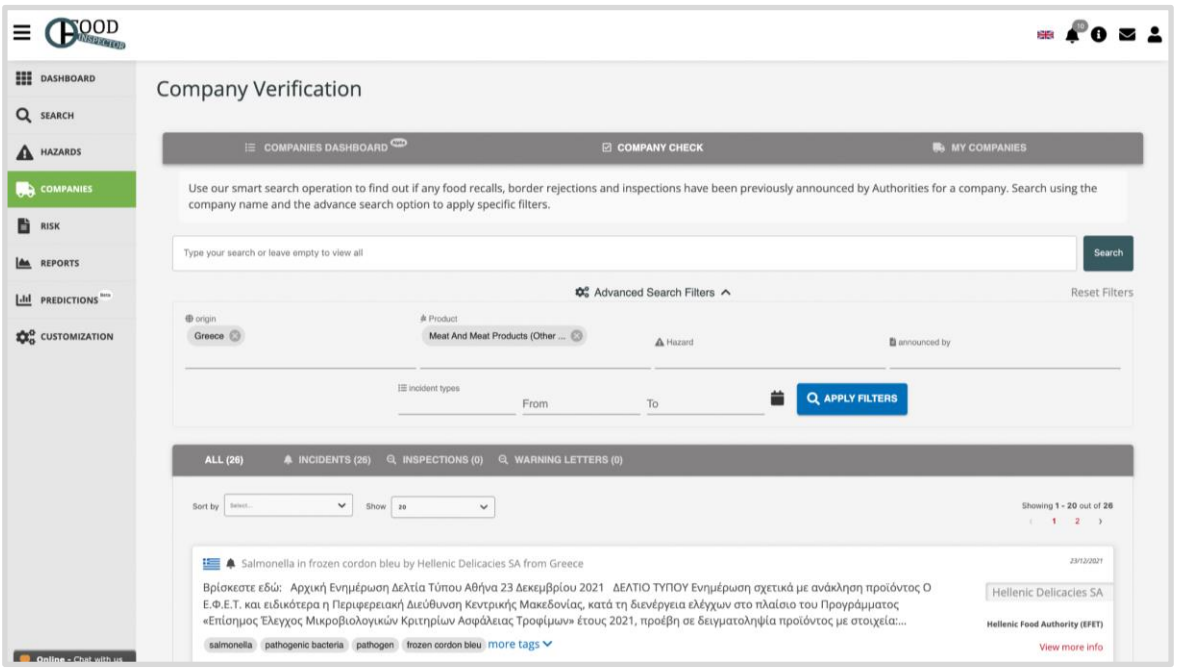


Figure 6: Search Company

6.3.2. Company Dashboard

When the inspector clicks on a company name, the Company Dashboard appears. The main goal of this dashboard is to aggregate all the information that the inspector needs prior to an audit with a specific company. He/she is able to see information that is already aggregated for the specific company, but the inspector will also be able to invite the company to submit more information through an integration link with the Agrivi 2.0 application (see Figure 8 and later sections)

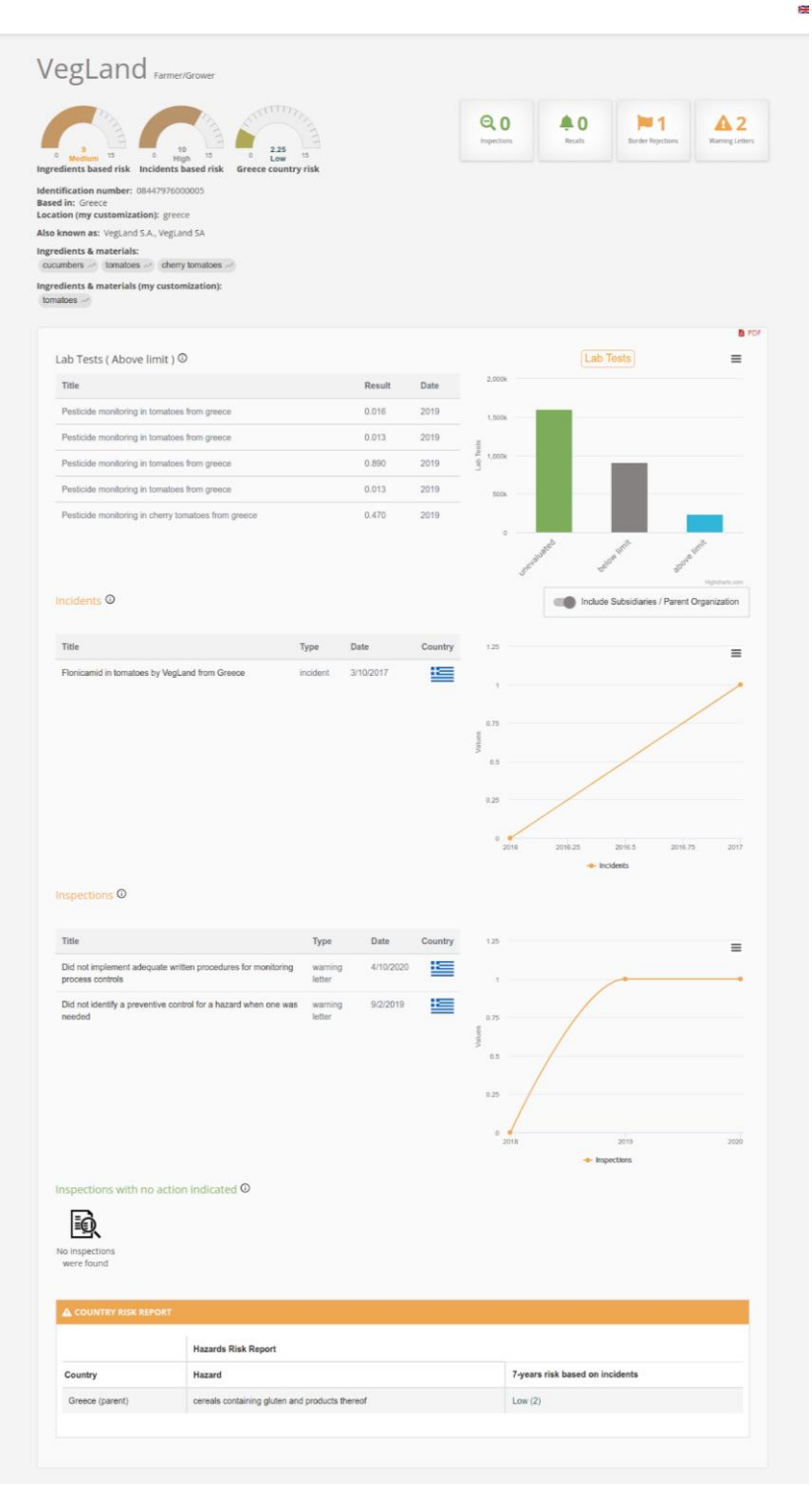


Figure 7: Company Dashboard

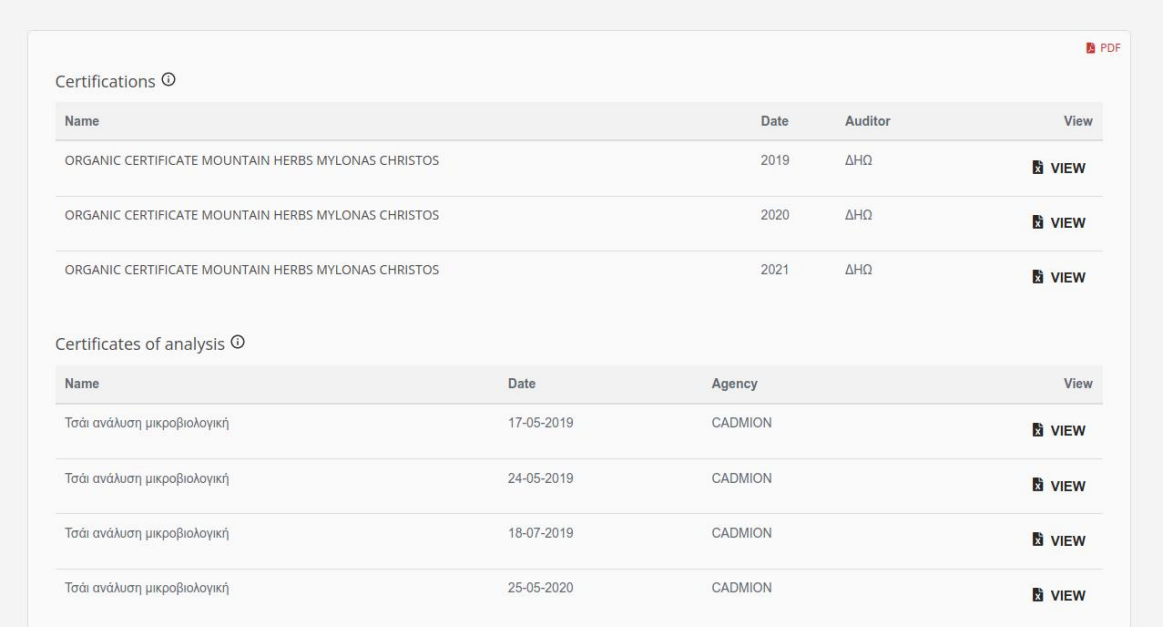


Figure 8: Documents held by inspected company

6.3.3. Inspector Dashboard

The Inspector Dashboard highlights the most important information that the inspector needs to know about the companies which he/she audits and/or certifies (risk levels, historical incidents record and past inspections). All entries are interactable and the inspector can click on them to get more details (Figure 10). An overview and visualization for the certificate statuses that the companies hold and the distribution and type of audit results will also be made available at later versions of the application. The inspector can add new companies to appear in the dashboard but also to continually monitor them and receive email updates and alerts (Figure 11).

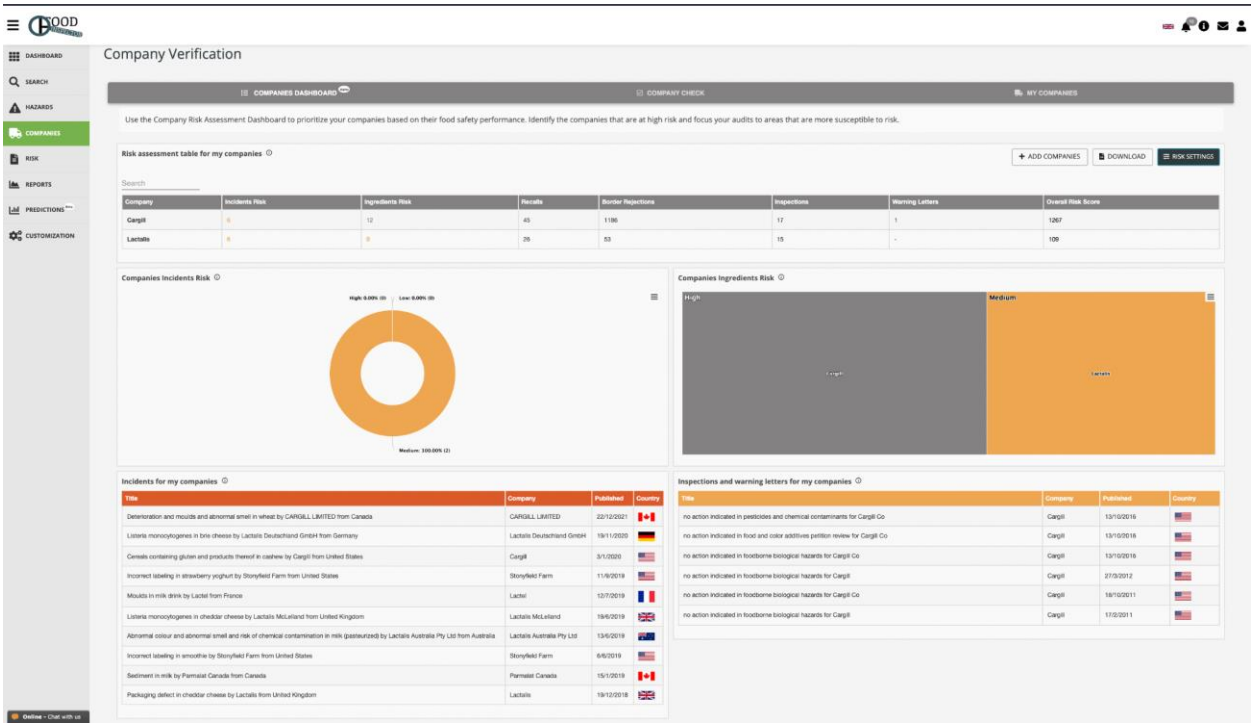


Figure 9: Inspector/Auditor dashboard

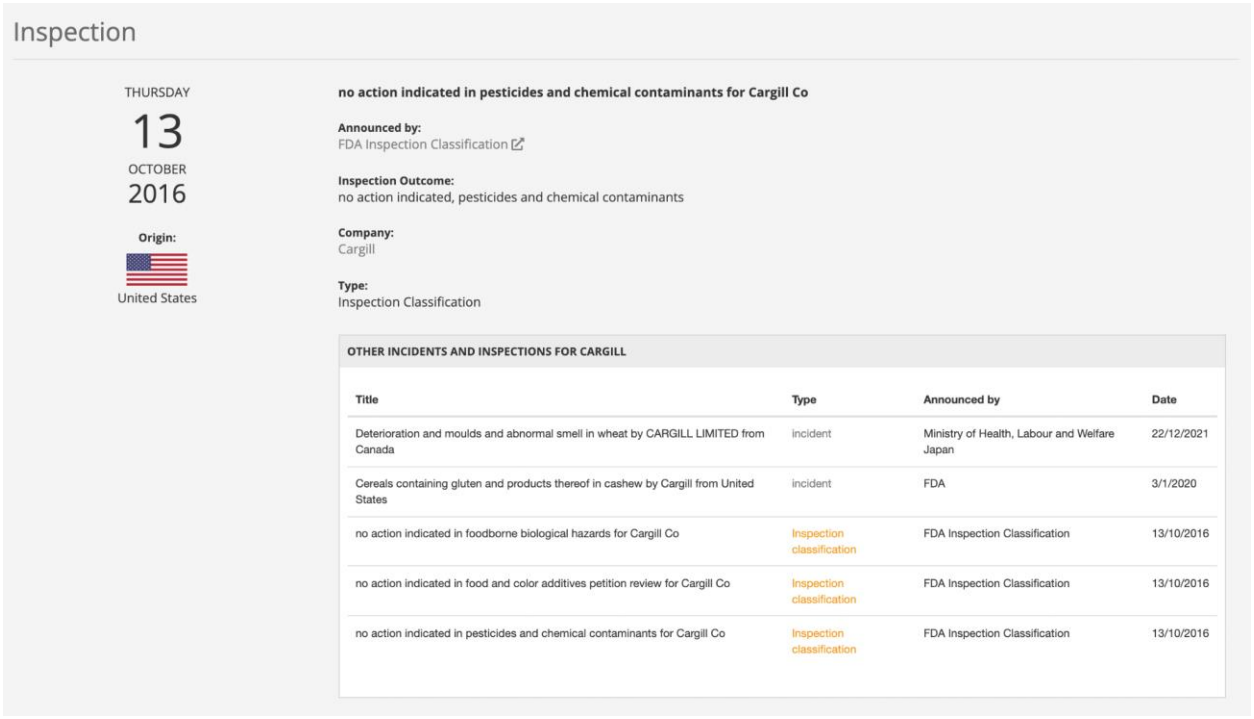


Figure 10: Inspection details

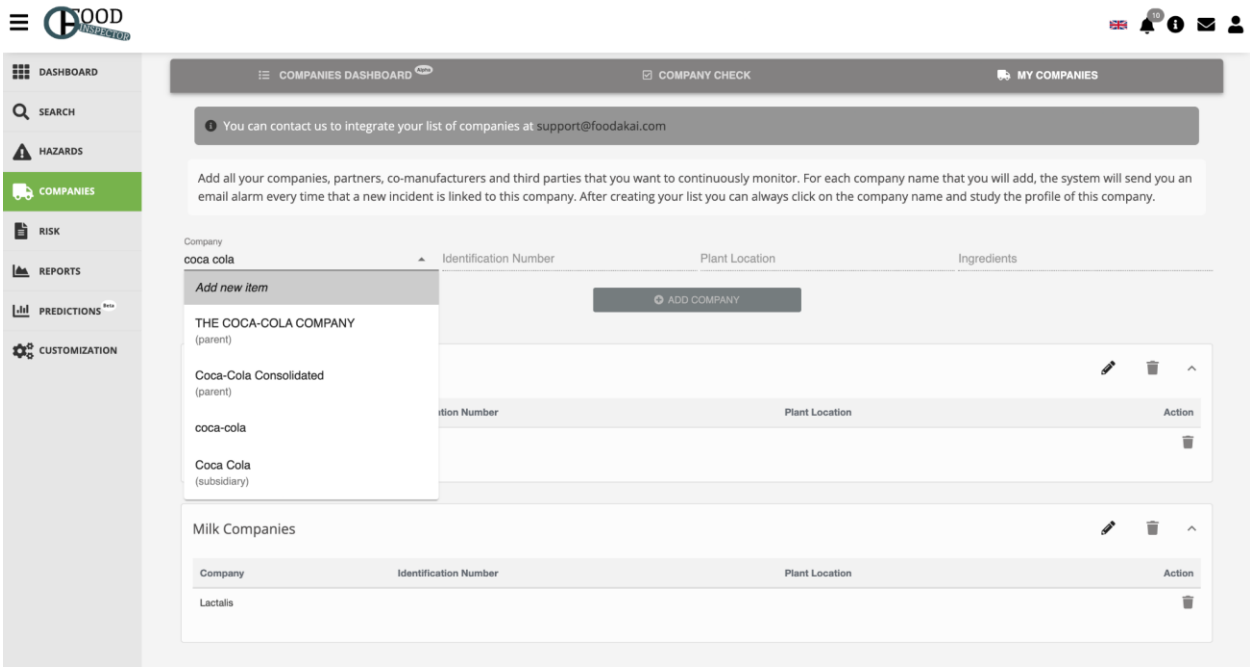


Figure 11: Continuously track a new company

6.3.4. Daily Alerts

Based on the companies that the inspector has decided to actively monitor, he/she receives daily personalized email alerts. These alerts highlight important and emerging/increasing incidents and risks that are relevant to the companies he/she monitors and their specific supply chains. An emerging risk is a new risk that has not recently appeared in the supply chain of the relevant industries, and an increasing risk is a known risk whose frequency and number of incidents is increasing lately.

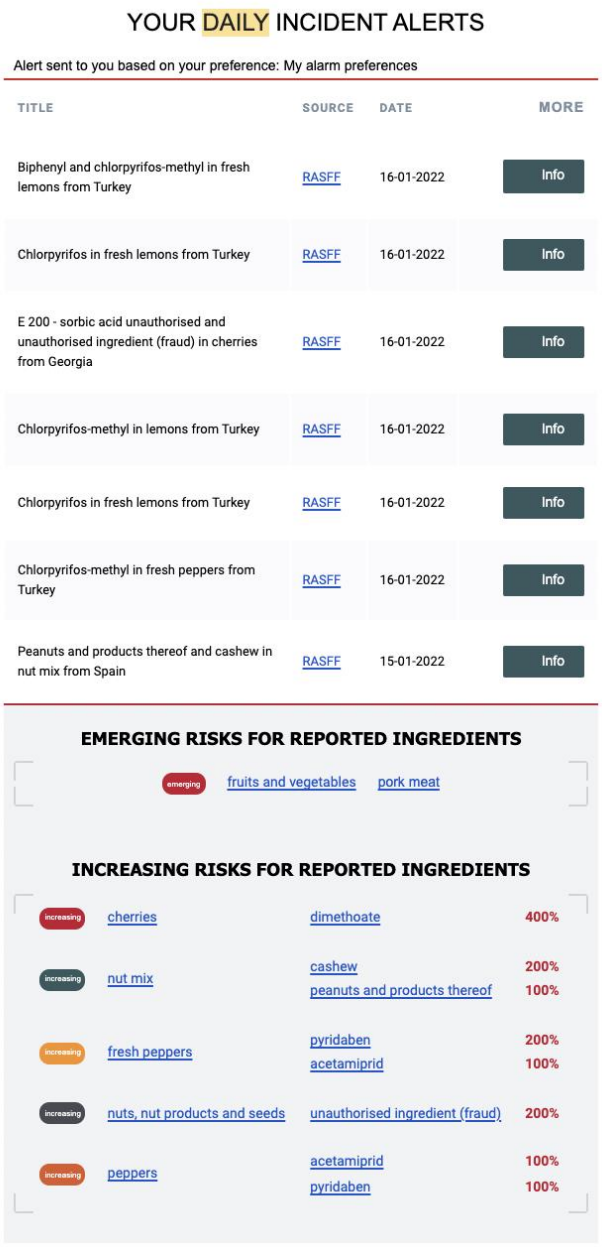


Figure 12: Daily Alerts

6.3.5. Get prepared for audits: Hazards Dashboard

The inspector can remain informed with up-to-date information on the hazards that are relevant to ingredients or products he/she inspects. By using the Hazards Dashboard and searching for a particular ingredient, the inspector can see a set of visualizations on the types of hazards that historically appear in the selected ingredient, corresponding incidents per year, and the geographical origin of the reported incidents connected to the selected ingredient.

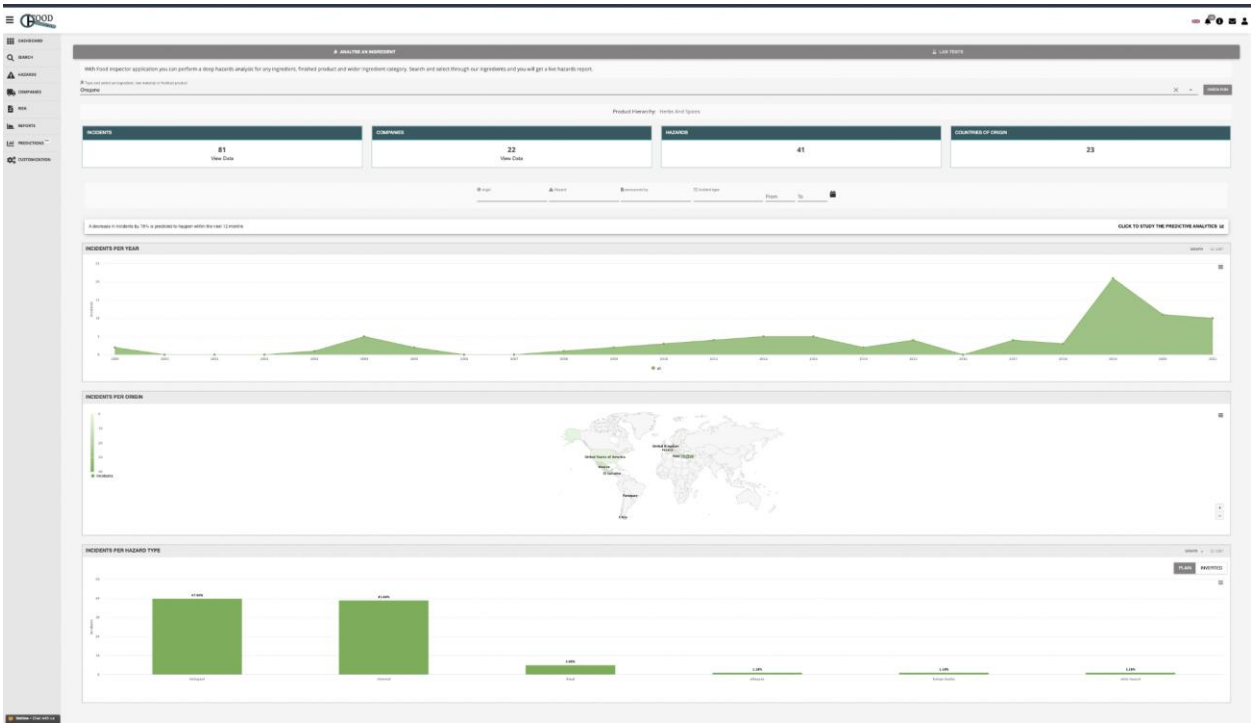


Figure 13: Hazards Dashboard

The hazards type bar chart is highly interactive and the inspector can click on any chart to drill down into more particular hazard types (Figure 14 illustrates this process: chemical > alkaloids > PYRROLIZIDINE ALKALOIDS (PAS)).

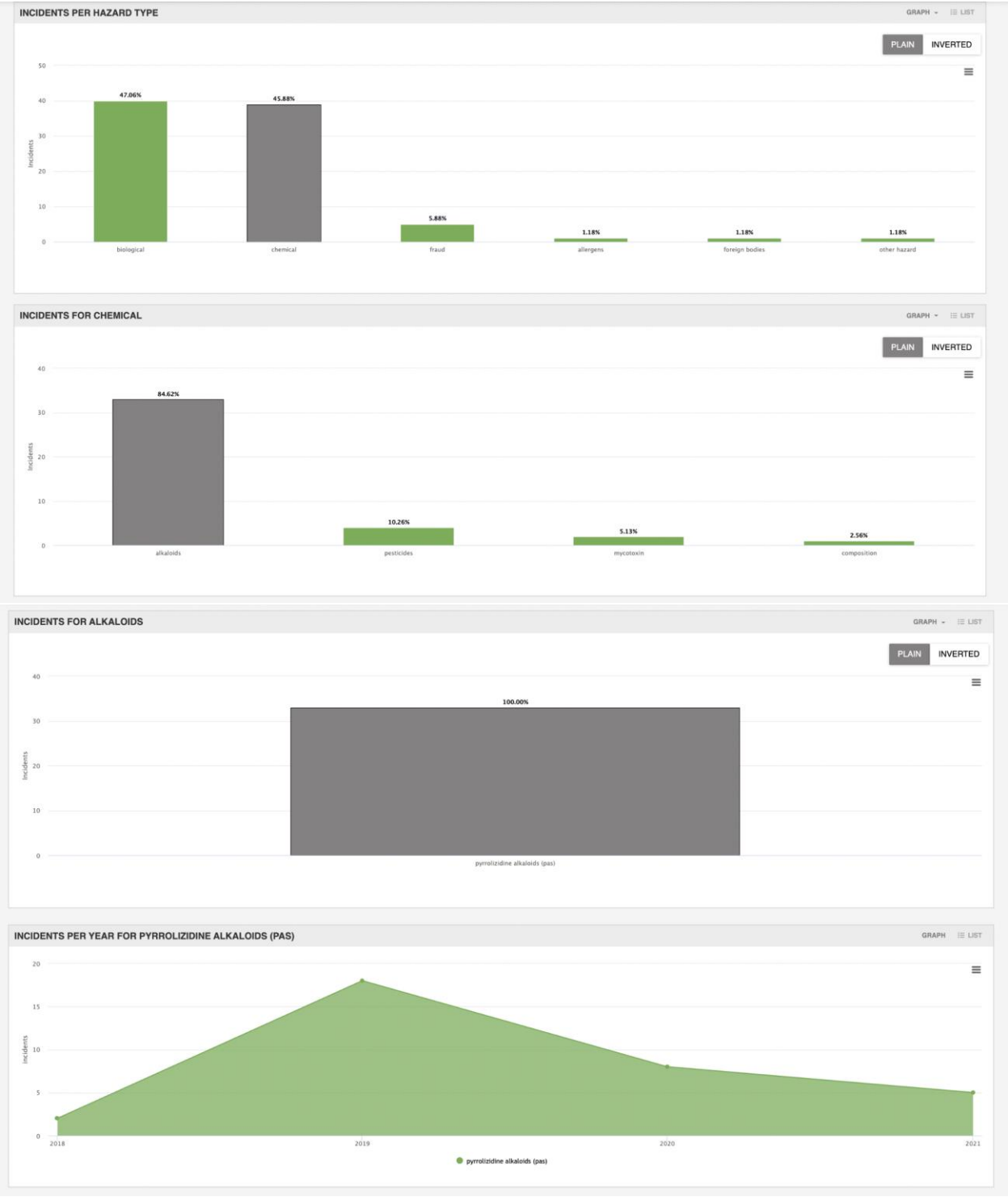


Figure 14: Drill down through historical incidents per hazard

In a subsequent version, the inspector will also be able to see the predictive analytics for the ingredients of the company and to identify increasing and emerging issues that may affect the safety and quality of the company's products.

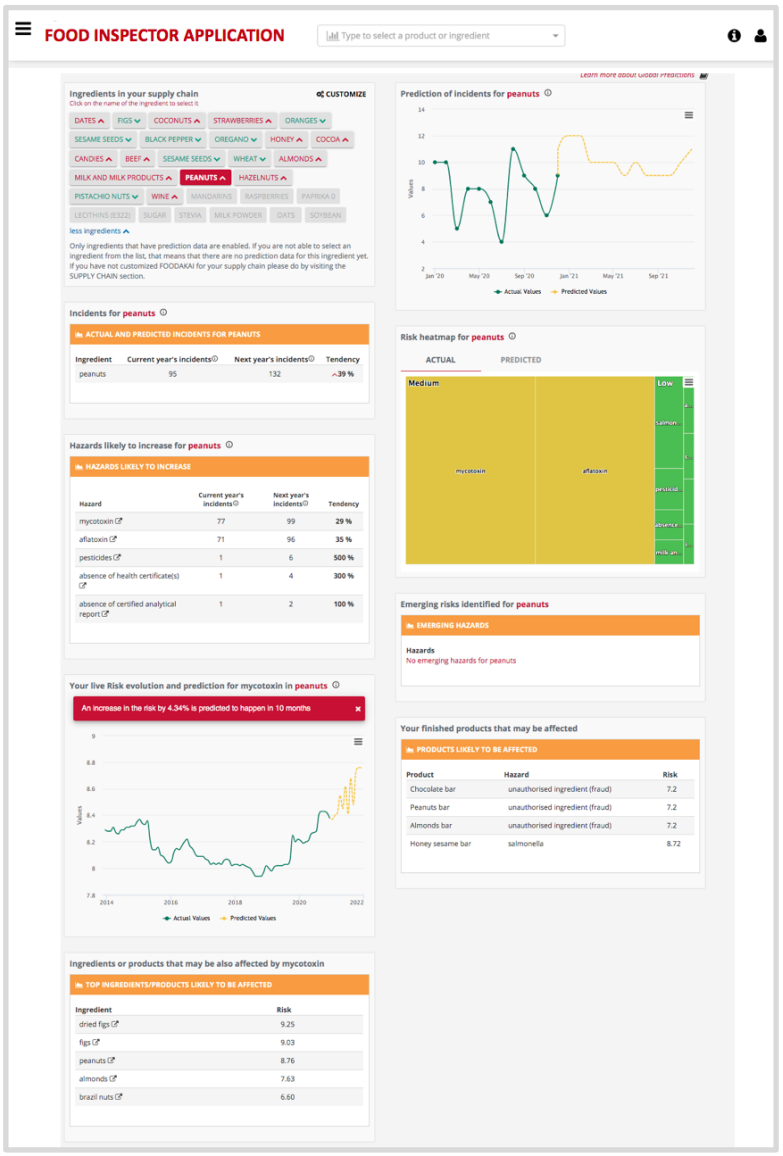


Figure 15: Predictive analytics for the ingredients of the company to be inspected

6.3.6. Get prepared for audits: Risk Dashboard

Apart from the particular hazards, the inspector can also get a numerical representation of the risk associated with each potential hazard, but also overall for a product he/she will be inspecting. By adding the ingredients that comprise a product (Figure 16), he/she is then able to run a comprehensive risk analysis (Figure 17). The risk analysis takes into account all the ingredients that comprise the product, all the relevant hazards and the historical frequency of their incidents, and

presents both an overall risk score for the product as a whole, but also an interactive heatmap that highlights the risk per hazard per ingredient in the product.

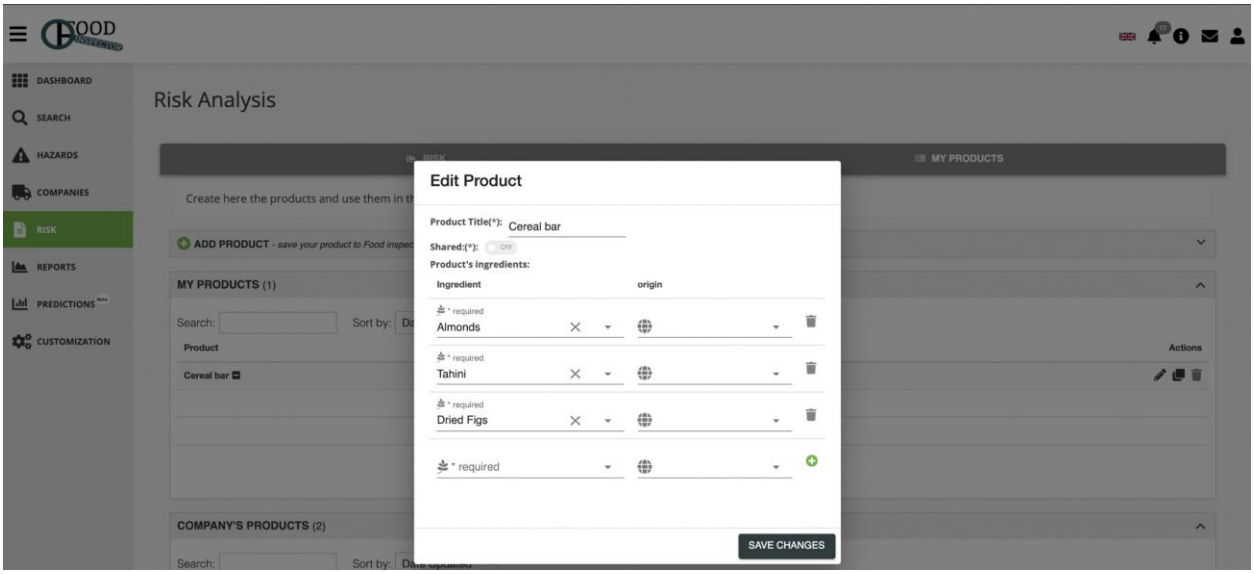


Figure 16: Add a product for risk analysis

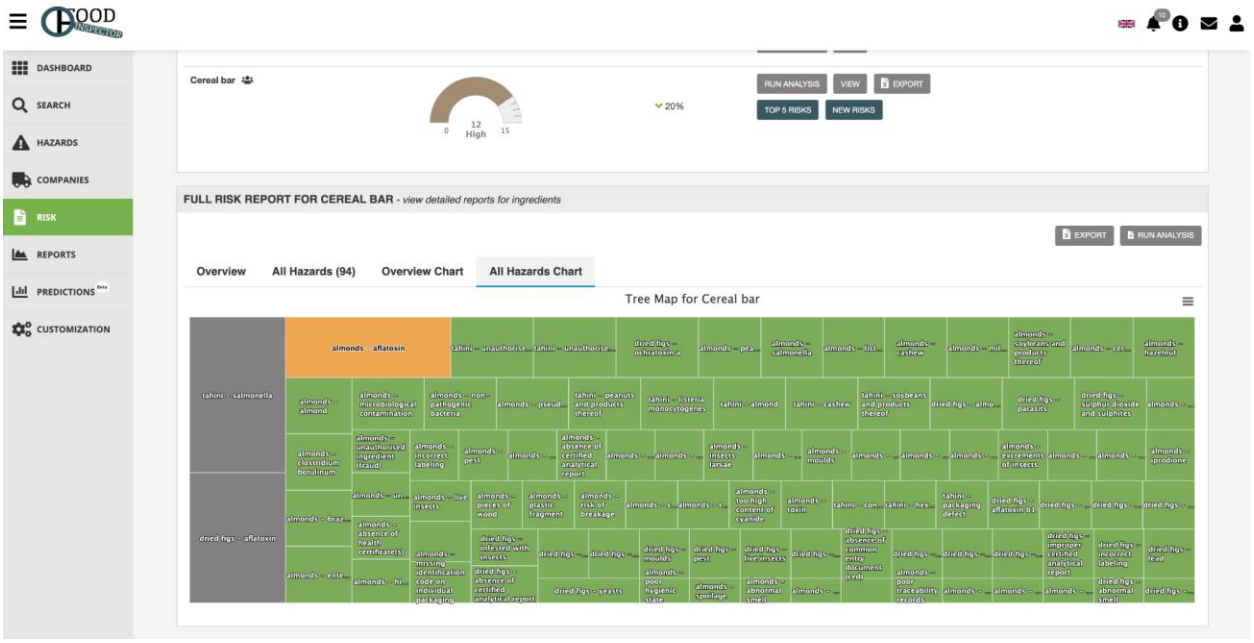


Figure 17: Analyse the level of risk for a product

6.3.7. Data Exchange prior to audit/inspection

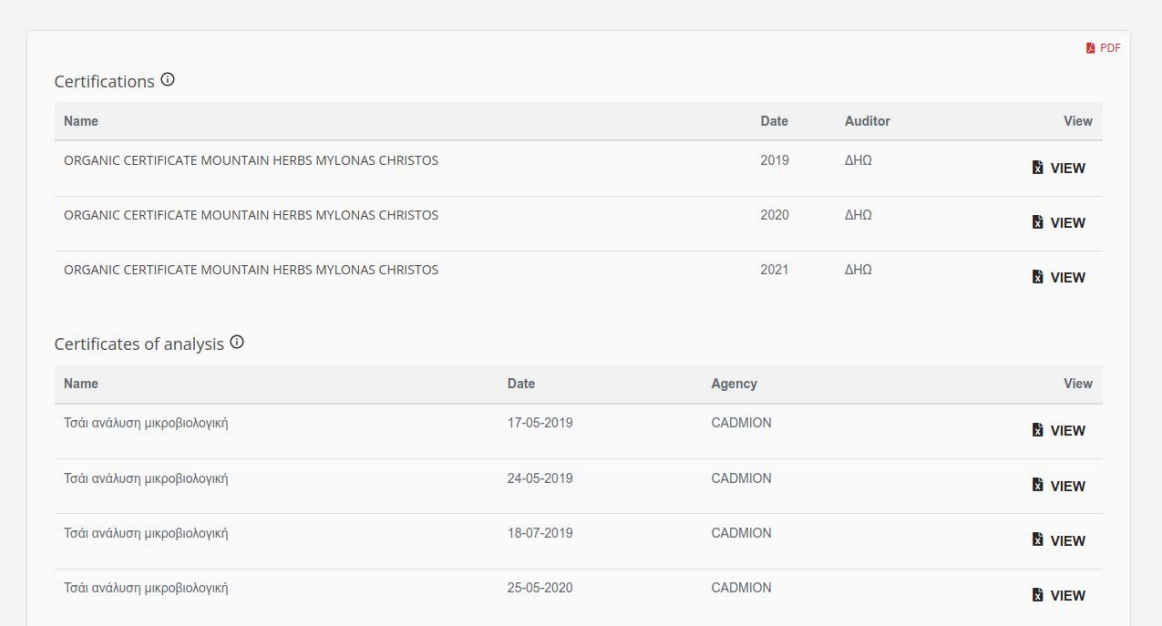
Needed documents prior to an inspection are currently made available to the inspector (and the FoodInspector application) through an integration link with the Agrivi 2.0 application through the

TheFSM Platform. The Agrivi 2.0 document storage and sharing features permits the exchange of information about the company to be inspected, and specifically:

- Facilities that they have
- Certificates that they have
- Information about products and ingredients that they are using in the product
- Lab test results and Certificate of Analysis

More specifically, the process for making this information available to the FoodInspector application goes through the following steps:

1) Acquisition of a secure authentication token from TheFSM Platform that identifies the request as originating from a verified application (in this case, FoodInspector)
2) Request of the available document types from the Agrivi 2.0 application
3) Transfer of the actual documents from the Agrivi 2.0 application



This process is being appropriately extended to allow similar integration between FoodInspector and any other third-party app via the TheFSM Platform. More specifically, the back-end of the FoodInspector application (node.js server) is being extended so that new data types and formats can be plugged-in and presented to the FoodInspector front-end. This extensible back-end is currently being developed and tested by introducing a new integration link between the FoodInspector application and the GLOBALG.A.P. service via the TheFSM Platform, thus providing another data source for certification documents. In a similar fashion, when this functionality is complete, the FoodInspector application will be able to leverage TheFSM Platform to retrieve documents from any application connected to TheFSM Platform.

6.4. FOODAKAI 2.0

This section focuses on the development plan and the outcomes of the agile development process for the FOODAKAI 2.0 application, which implements the Retailer and Manufacturer business use case scenarios presented in D1.1.

6.5. Application development plan (Gantt Chart)

The plan for the developments of the FOODAKAI 2.0 application is presented in table 1. During the second year of the project, we focused on developing new features and improving existing ones that enable remote supplier checking and machine-assisted assessment.

Table 5: Development plan for the FOODAKAI 2.0 application

Task	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24
Sourced Ingredient Risk												
Weekly Insights												
My Suppliers Dashboard												
Supplier Reports												
Beta Version Release and Pilot Testing												

6.6. Developments status

In this section we present and analyse the developments that were completed within the second year of the project for the FOODAKAI 2.0 application.

The FOODAKAI is the food safety intelligence platform that provides risk assessment and predictive analytics services. Within the context of TheFSM project the FOODAKAI application will be extended with functionalities that will allow Retailers and Food Manufactures to perform remote supplier verification.

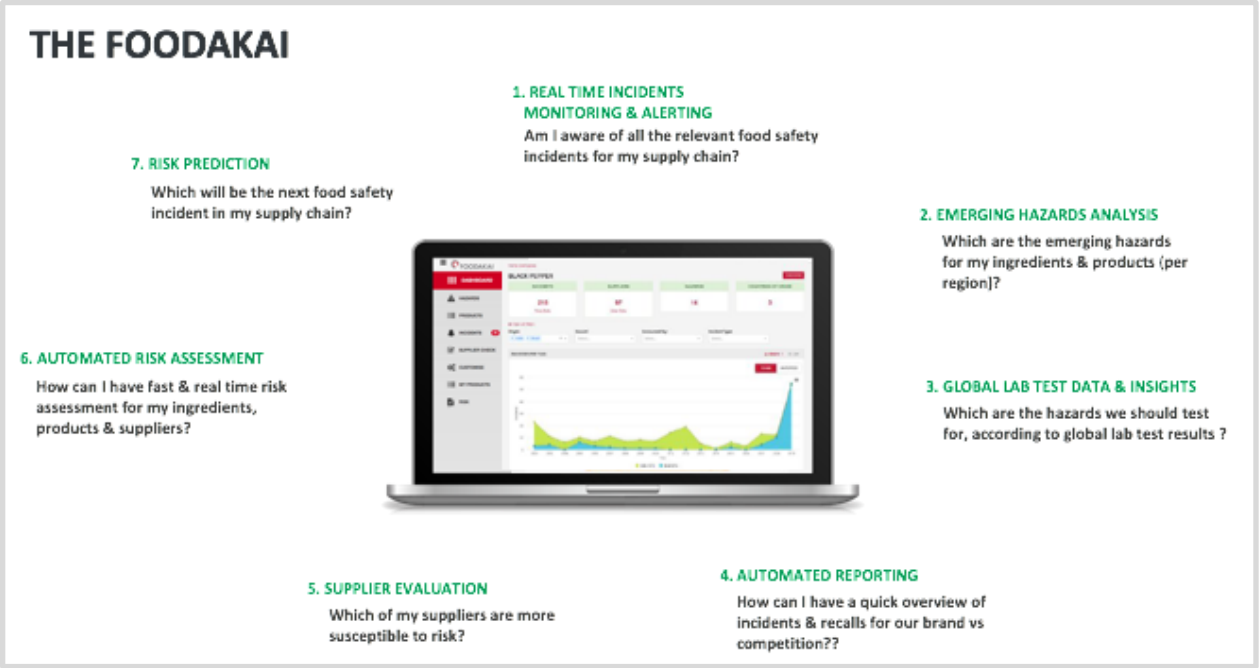


Figure 18: The FOODAKAI platform services

The data that is used for risk assessment and prediction is collected and processed through a big data platform that focuses on data quality and accuracy. Millions of data records published by National Authorities from all around the world are collected and processed following a methodology that includes several steps as presented in the following diagram.

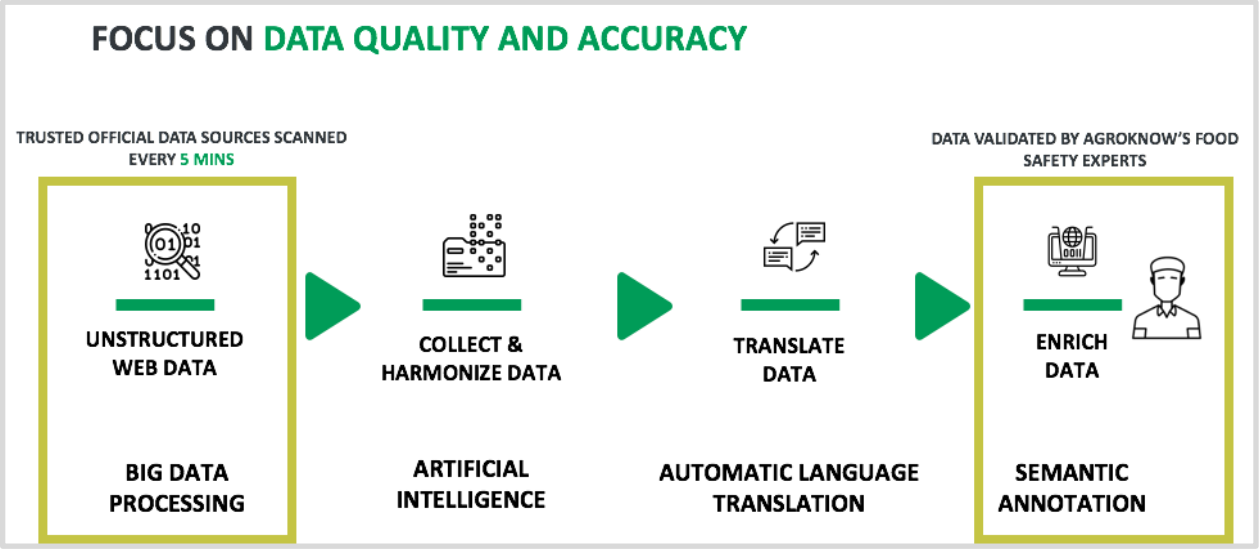


Figure 19: The big data processing workflow

The new features for FOODAKAI 2.0 that were developed during the second year of the project are presented in the following sections. Features developed during the first year are also included for a more complete picture.

6.6.1. My Suppliers Dashboard

FOODAKAI 2.0 has been re-engineered to be directly relevant to the particular suppliers that a company uses. This information then feeds into and personalises multiple aspects of the FOODAKAI 2.0 features and also permits the company to continually monitor its suppliers and get real-time incident and inspection updates through the Suppliers Dashboard.

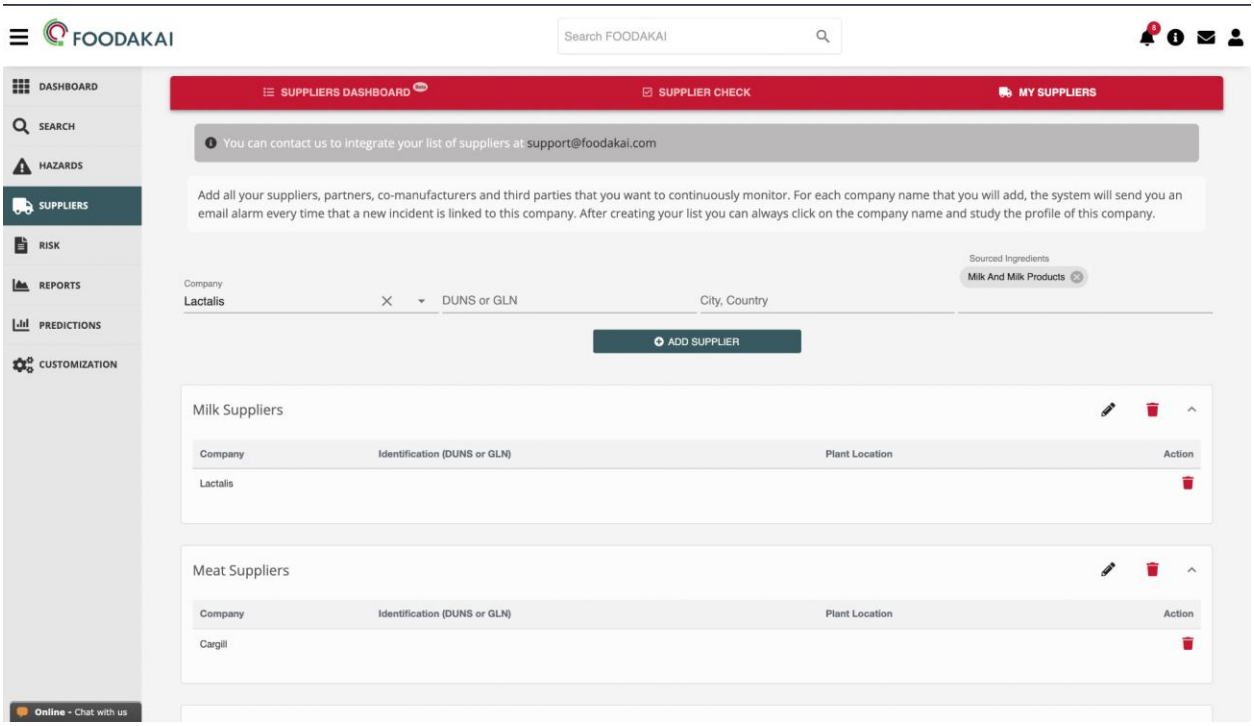


Figure 20: Add a company as supplier

The Suppliers Dashboard presents an overview of computed risk profiles, and real-time dynamic incidents and inspections for the particular suppliers used by the company.

Figure 21: My Suppliers Dashboard

6.6.2. Import Suppliers

One of the first features that were developed within the context of the project was the possibility to import all the suppliers that a retailer or food manufacturer has.

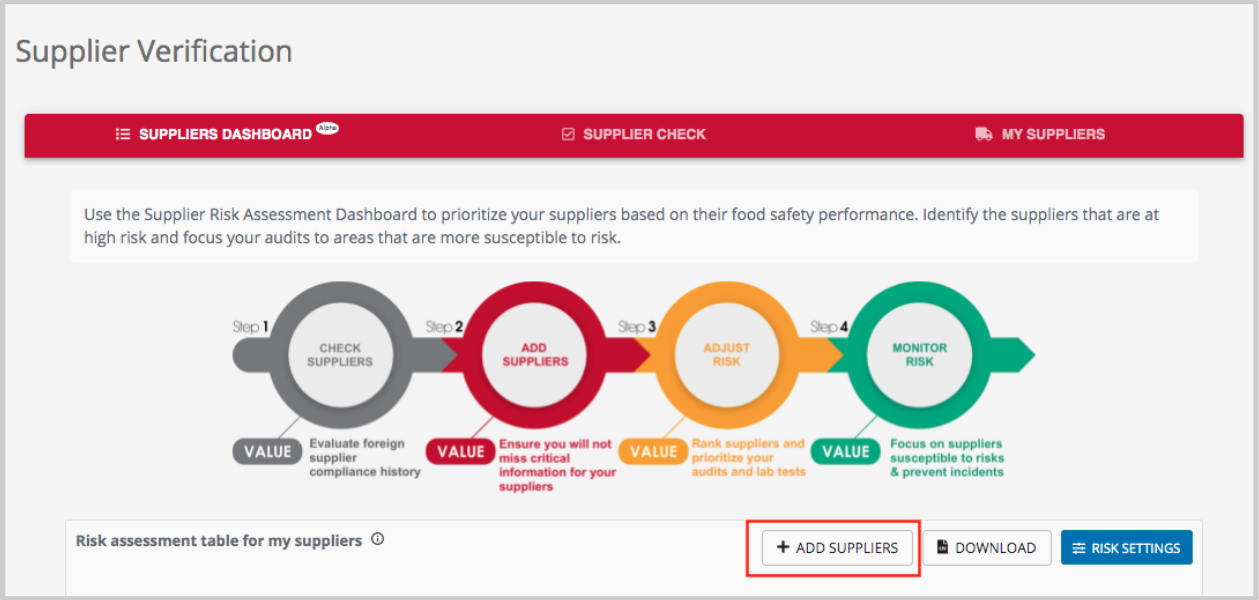


Figure 22: Add suppliers feature that allows the import of hundreds of suppliers

To facilitate the process of importing hundreds of suppliers and their ingredients, the development team of Agroknow has designed and implemented a data importing wizard. The import process includes a step for mapping the properties (columns) of the original file to the GS1 compliant properties of the data model of the TheFSM platform. Values of each property can be also mapped to the ingredient vocabularies used by TheFSM platform.

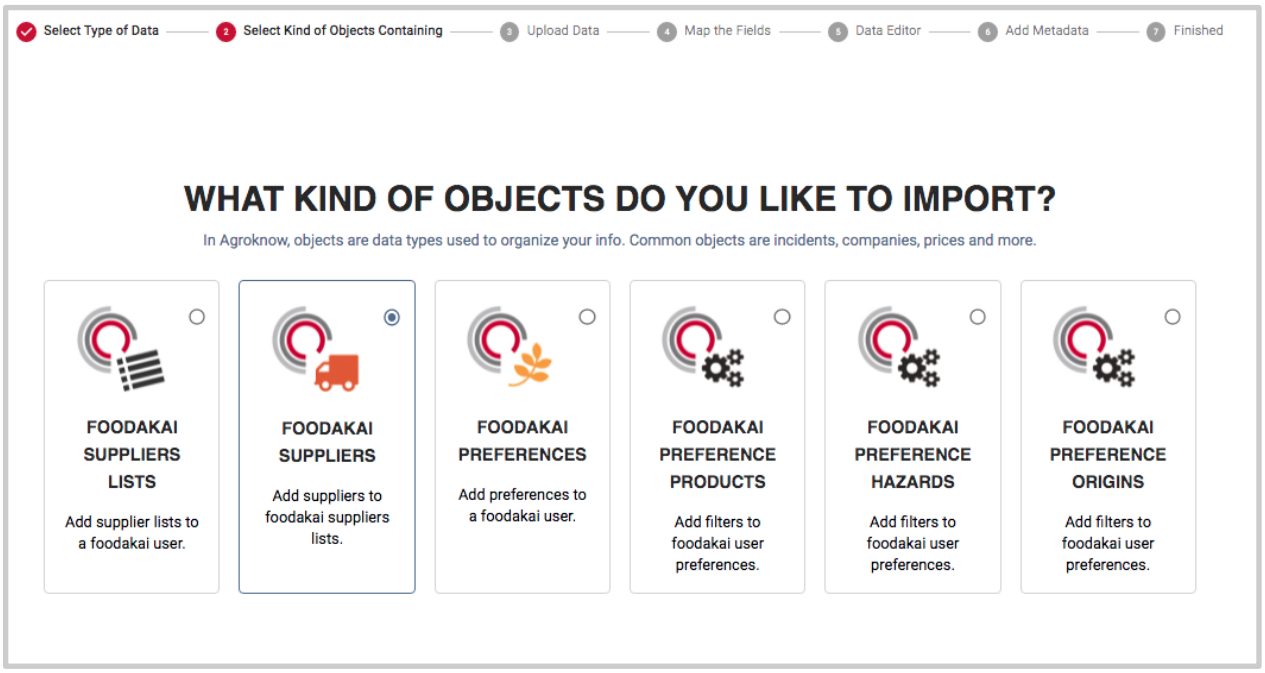


Figure 23: Import mechanism for suppliers and their ingredients

6.6.3. Supplier evaluation profile

Based on the requirements of Retailers and Manufacturers and the pilot activities, Agroknow team further enhanced the food safety evaluation page that aggregates all the critical information for the food safety profile of a company. The user has access to all the historical recalls and border rejections in which the company was involved as well as the outcomes of the inspections that were conducted in this company by the Authorities. During the second year, new useful visualizations were added and quality-of-life and stability improvements were pursued.

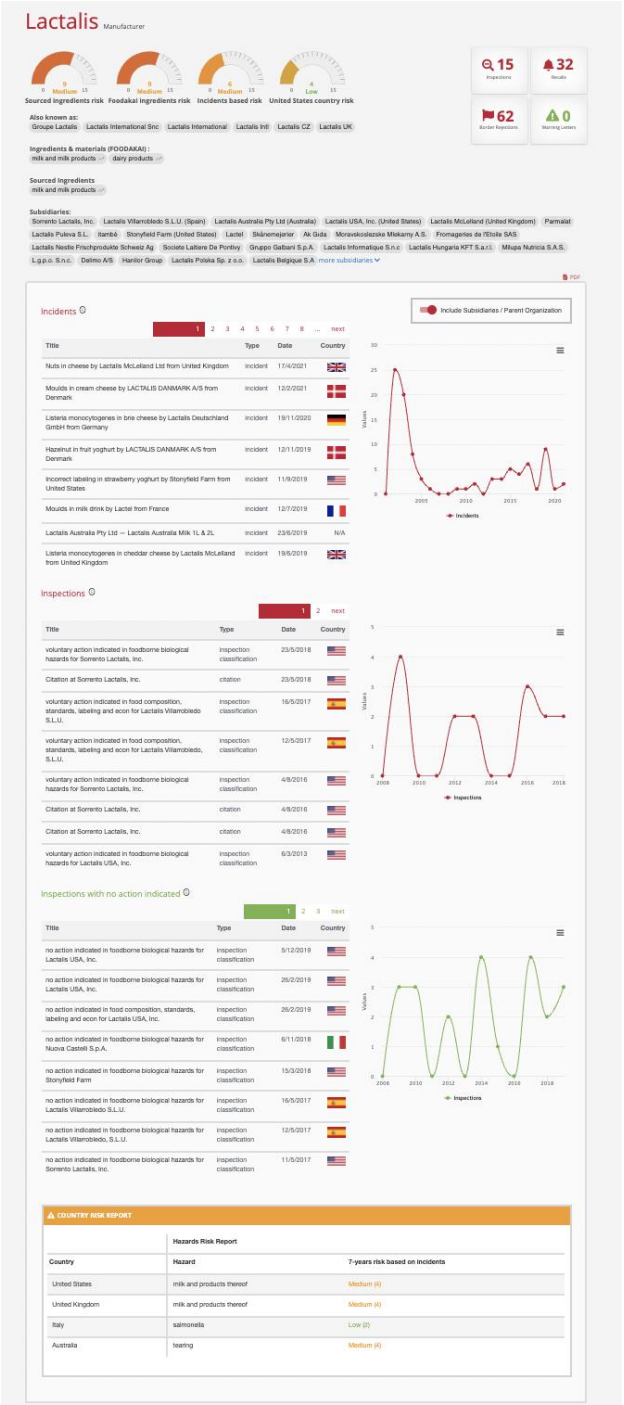


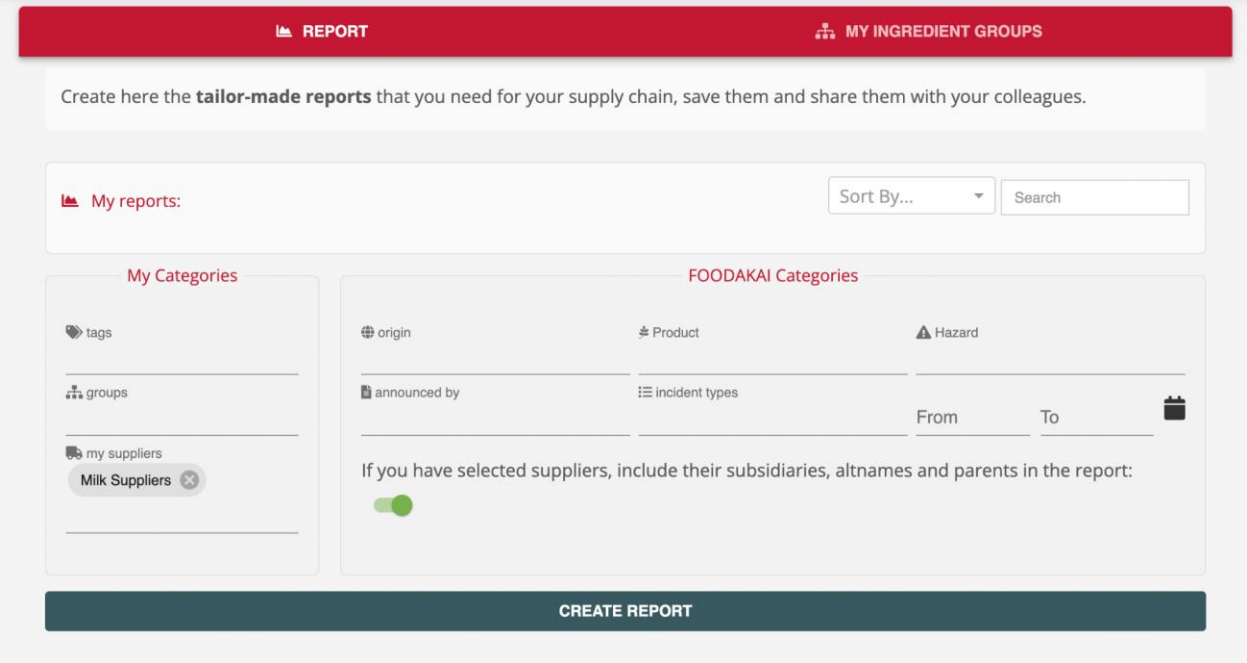
Figure 24: An evaluation profile page for a supplier

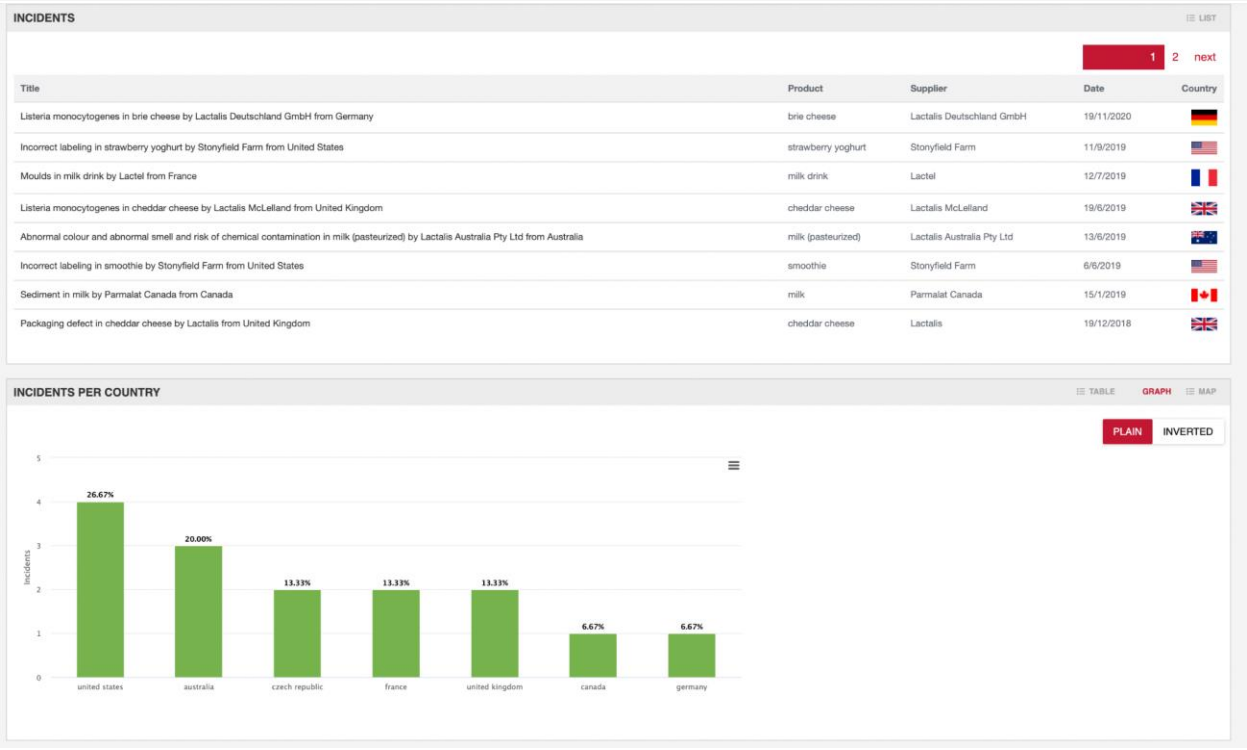
6.6.4. Sourced Ingredients Risk

During the second year, we further enhanced the supplier risk profile and calculations to also include a risk factor relevant to the overall risk of the supplier based on the particular ingredients that the company imports from them. Along with the other risk factors already present, this new feature further enhances the risk profile of each supplier.

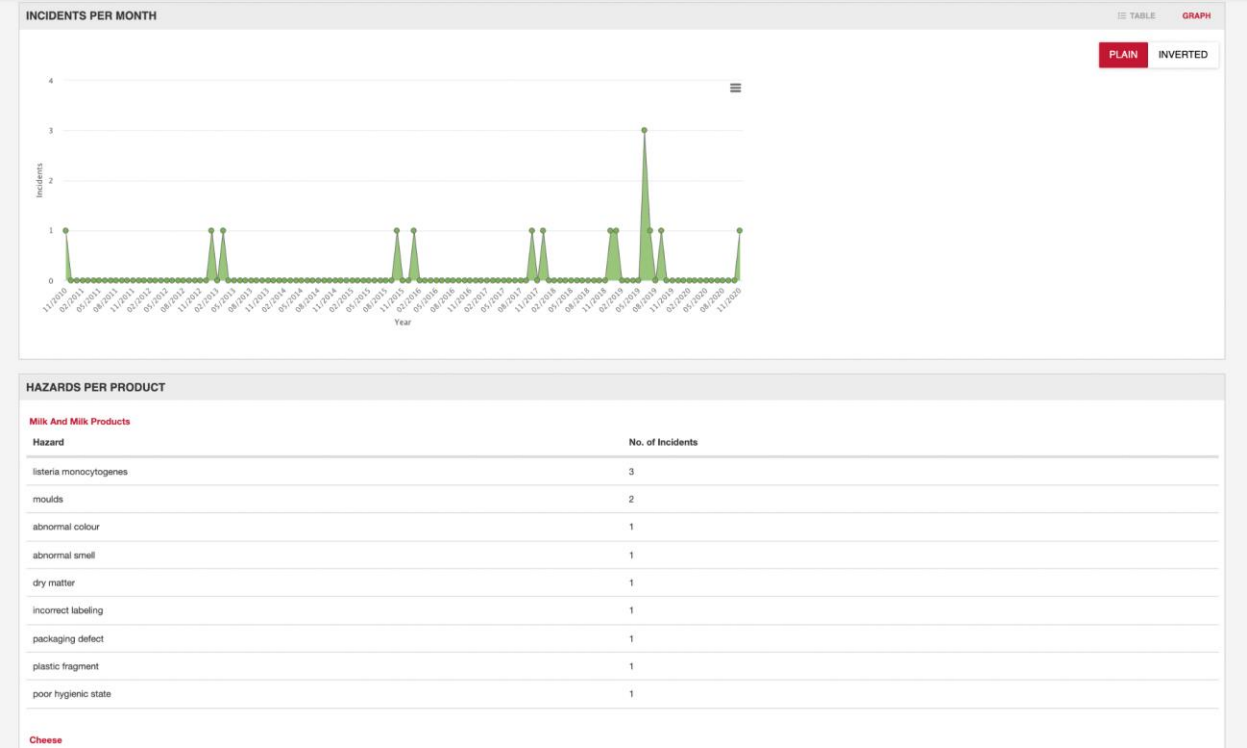
6.6.5. Supplier Reports

This feature allows an interested user to get a thorough numerical report of the company's suppliers per type (e.g., Milk Suppliers). The comprehensive report generated includes a wealth of information on historical incidents and their grouping into country of origin, hazard categories, and timeline evolution. The report can also be exported as a pdf for use in subsequent work in outside applications (e.g., to support a presentation).


REPORT
MY INGREDIENT GROUPS
Create here the tailor-made reports that you need for your supply chain, save them and share them with your colleagues.
My reports:
Sort By...
Search
My Categories
tags
groups
my suppliers
Milk Suppliers
FOODAKAI Categories
origin
Product
Hazard
announced by
incident types
From
To
If you have selected suppliers, include their subsidiaries, altnames and parents in the report:
CREATE REPORT


INCIDENTS
LIST
1 2 next
Title
Product
Supplier
Date
Country
Listeria monocytogenes in brie cheese by Lactalis Deutschland GmbH from Germany
brie cheese
Lactalis Deutschland GmbH
19/11/2020
Incorrect labeling in strawberry yoghurt by Stonyfield Farm from United States
strawberry yoghurt
Stonyfield Farm
11/9/2019
Moulds in milk drink by Lactel from France
milk drink
Lactel
12/7/2019
Listeria monocytogenes in cheddar cheese by Lactalis McLelland from United Kingdom
cheddar cheese
Lactalis McLelland
19/6/2019
Abnormal colour and abnormal smell and risk of chemical contamination in milk (pasteurized) by Lactalis Australia Pty Ltd from Australia
milk (pasteurized)
Lactalis Australia Pty Ltd
13/6/2019
Incorrect labeling in smoothie by Stonyfield Farm from United States
smoothie
Stonyfield Farm
6/6/2019
Sediment in milk by Parmalat Canada from Canada
milk
Parmalat Canada
15/1/2019
Packaging defect in cheddar cheese by Lactalis from United Kingdom
cheddar cheese
Lactalis
19/12/2018
INCIDENTS PER COUNTRY
TABLE
GRAPH
MAP
PLAIN
INVERTED
Incidents
26.67%
20.00%
13.33%
13.33%
13.33%
6.67%
6.67%
united states
australia
czech republic
france
united kingdom
canada
germany


INCIDENTS PER PRODUCT CATEGORY
TABLE
GRAPH
milk and milk products
dietetic foods, food supplements, fortified foods
fruits and vegetables
INCIDENTS PER PRODUCT
cheddar cheese
cheese
brie cheese
dairy products
edam cheese
infant formula
milk
milk (pasteurised)
milk drink
mozzarella cheese
smoothie
soy yoghurt
strawberry yoghurt
yoghurt
INCIDENTS PER HAZARD CATEGORY
biological
fraud
foreign bodies
organoleptic aspects
allergens
chemical
food contact materials
other hazard
INCIDENTS PER HAZARD
listeria monocyt.
incorrect labeling
moulds
abnormal colour
abnormal smell
dry matter
milk and products thereof
packaging defect
plastic fragment
poor hygienic state
risk of chemical contamination
salmonella agona
sediment
spoilage
unfit for human consumption

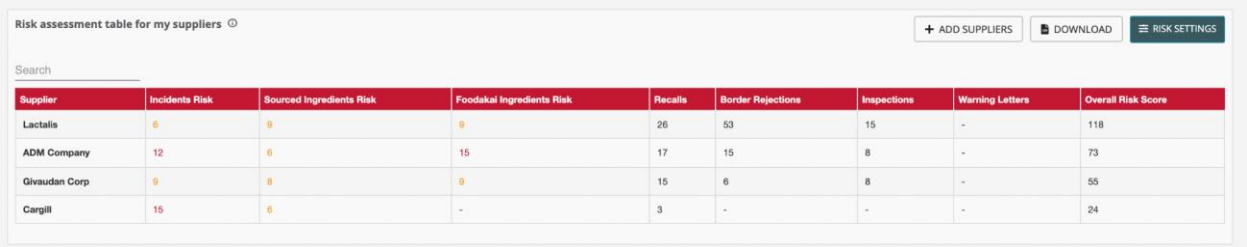


6.6.6. Supplier automated risk assessment

During the second year, the Agroknow team further developed the beta version of the supplier automated risk assessment feature. Using this feature, the estimation of the suppliers' risk can be automated, resulting in speed up of the supplier verification process. This helps the user save time from doing all the manual work to combine information from several systems. Thus, the user can focus on the suppliers susceptible to risk and prevent incidents in a more targeted manner.

FOODAKAI supplier risk estimation includes the following parameters

- **Ingredients risk** that is estimated using the Risk Assessment module. This parameter corresponds to the risk of the ingredients that are used by the specific company. The score is the risk that was estimated for the ingredient with the highest risk.
- **Sourced Incidents risk:** this is the risk that is estimated based on the frequency and severity of the incidents (recalls and border rejections) that were reported for this supplier and are relevant to the ingredients that the user's company imports from it
- **Recalls:** The number of food recalls that were reported for the specific company and its subsidiaries by National Authorities from all around the world.
- **Border rejections:** The number of border rejections (import refusals) that were reported for this company and its subsidiaries by National Authorities from all around the world.
- **Inspections:** the number of inspections that the supplier had in which an action was indicated.
- **Warning letters:** the warning letters that were announced by the National Authorities for this company.



Supplier	Incidents Risk	Sourced Ingredients Risk	Foodakai Ingredients Risk	Recalls	Border Rejections	Inspections	Warning Letters	Overall Risk Score
Lactalis	6	9	9	26	53	15	-	118
ADM Company	12	6	15	17	15	8	-	73
Givaudan Corp	9	8	9	15	6	8	-	55
Cargill	15	6	-	3	-	-	-	24

Figure 25: Supplier risk assessment matrix

The automated risk assessment module includes a feature which allows the users to adjust the contribution of each factor to the overall risk score for a supplier.

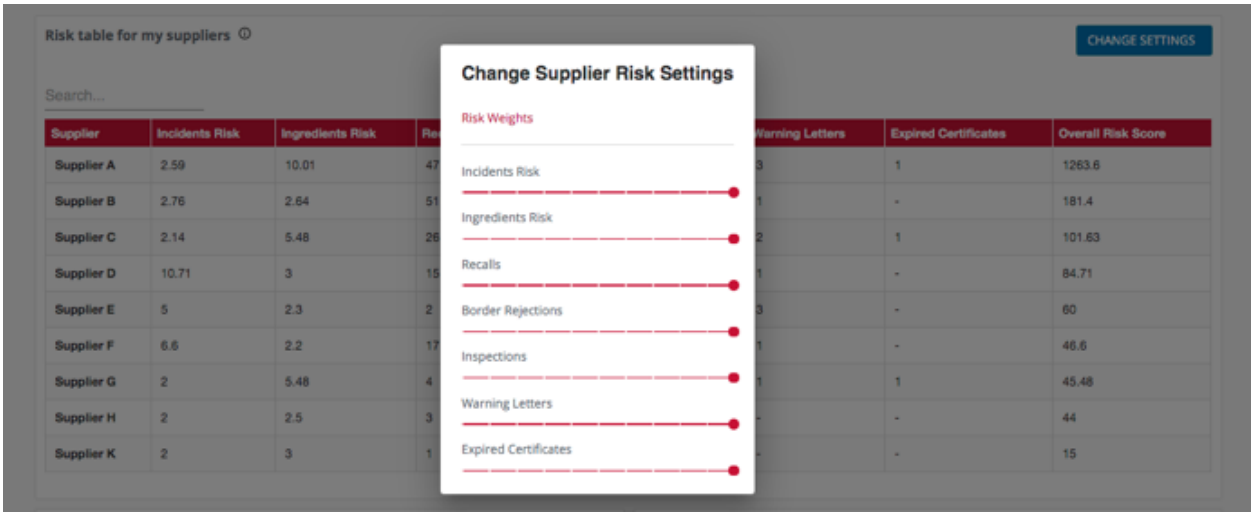


Figure 26: Suppliers' risk weighting feature

6.6.7. Add a Supplier risk factor

Within the context of TheFSM, we developed a feature that allows the integration of a new parameter for the supplier's risk calculation. This can be done by adding a new column and uploading the data for the suppliers e.g. upload the number of expired certificates.

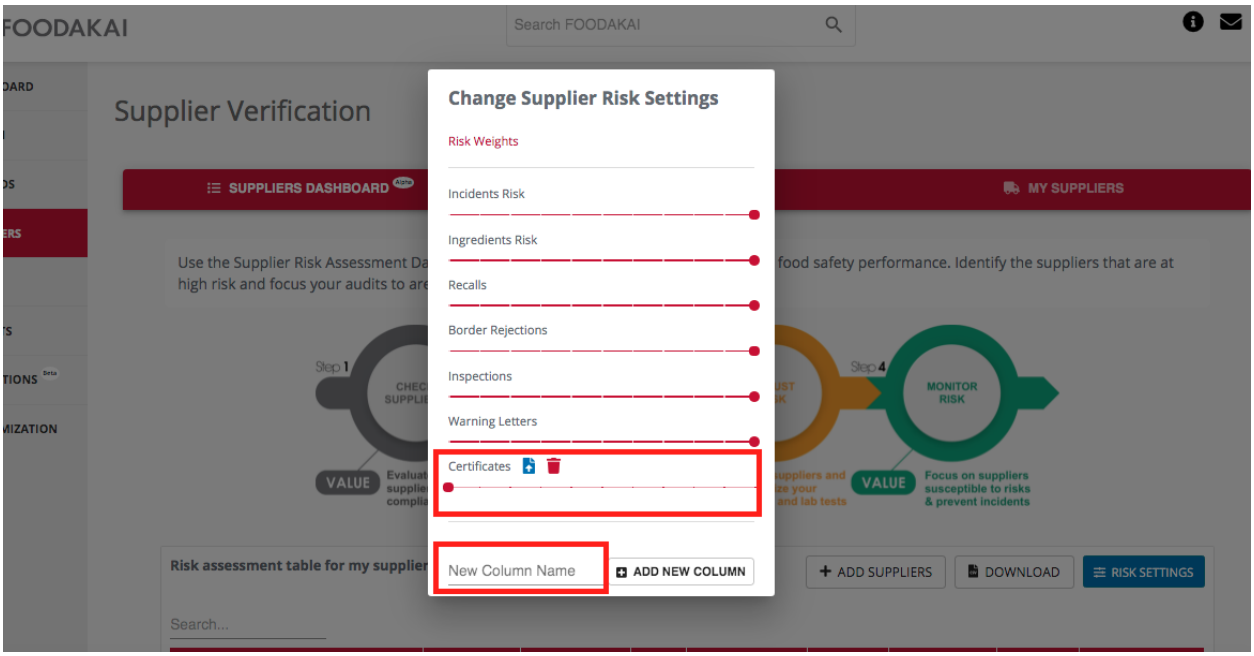


Figure 27: Add a new factor for the supplier risk estimation risk weighting feature

In addition, the user can download the risk assessment matrix for its suppliers and use it in internal food safety systems.

6.6.8. Personalised Weekly Insights

Based on the suppliers that a company uses in its supply chain, FOODAKAI sends out a personalized weekly email containing relevant insights. More specifically, the insights include: (a) currently trending hazards for the industry the company is active in, (b) supplier countries that supply ingredients relevant to the company's supply chain and who report an unusually high number of incidents, (c) new and emerging hazards relevant to the company ingredients.

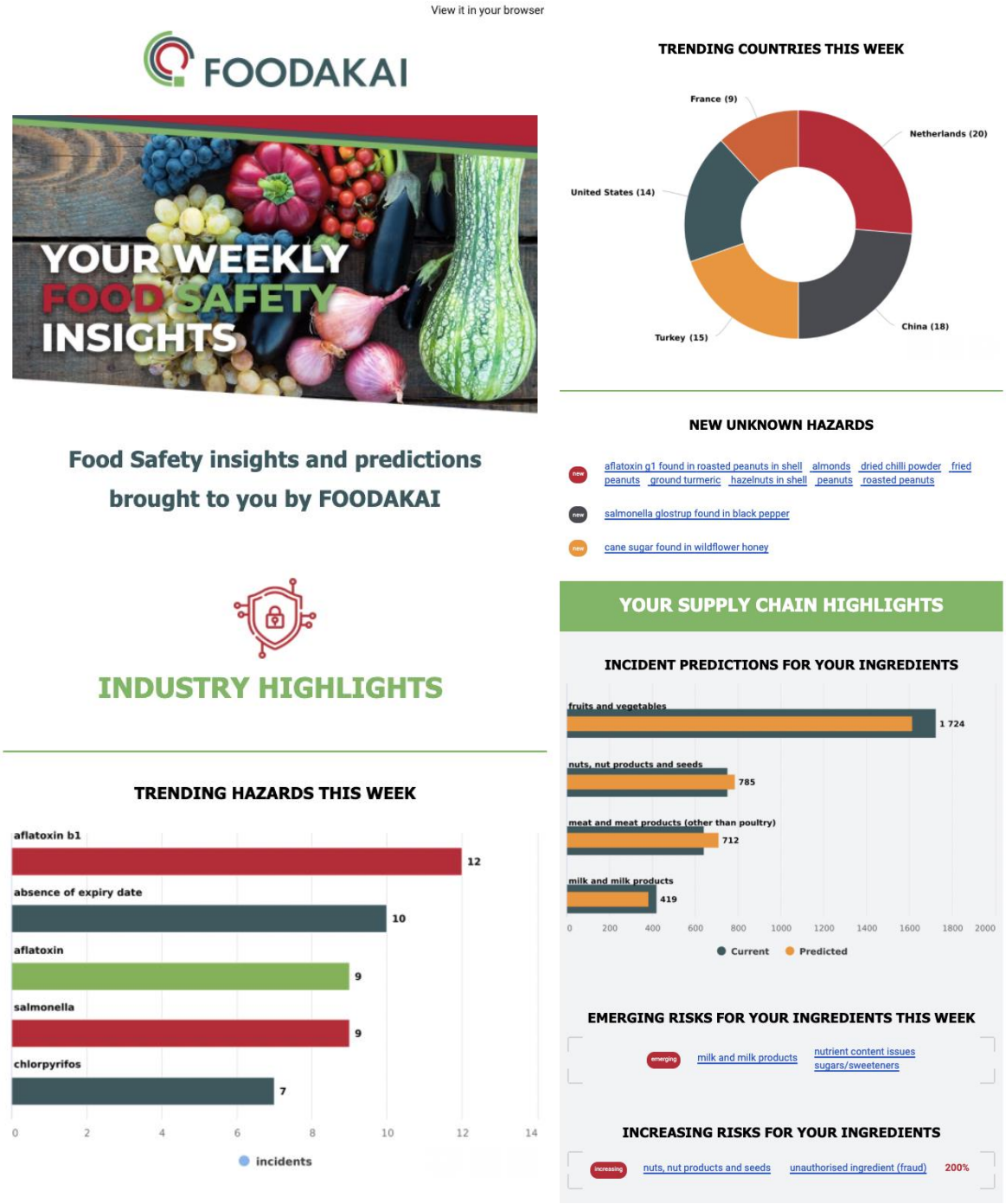


Figure 28: Add a new factor for the supplier risk estimation risk weighting feature

6.7. AGRIVI 2.0

The main goal is to further extend and validate the AGRIVI software application that food processors and their contracted suppliers will use in the context of supplier data sharing scenarios.

6.8. Application development plan (Gantt Chart)

The development plan for the Agrivi 2.0 that we followed during the second year within the context of the TheFSM project is presented in the following table.

Table 6: Development plan for the Agrivi 2.0 application

Task	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24
User roles and permissions improvements												
Documents improvements												
Further API improvements												
Weather provider change												
Improvements in FieldOps module												
Scouting and traceability improvements												
Product database development												
Beta release and Pilot Testing												

6.9. Developments status

During the second year, we will focus on extending our API capabilities, to further support seamless The FSM platform integration with AGRIVI, and to enable data exchange that covers all business scenarios. User authentication and a complex user permission set-up that supports creation of multiple different user roles that cover all business requirements was our focus in the first year. In our second year, the main focus is going to be on changing the weather provider, to provide our users with an undisturbed service and high quality weather data that supports their

daily operations and decision making. Improvements on data visualization and simplification on data entry are going to be made in terms of improving AGRIVI FieldOps module. That way, users will be able to have data important for short-term decision making available from the AGRIVI home screen.

To support multiple different user roles, mainly the certificator role and access to the right documents, AGRIVI will focus on improvements to our documents module.

Improving traceability is really important. That is why AGRIVI will focus on improving our traceability and scouting features.

Development included extending the AGRIVI software with new options and functionalities in the beta version, namely to:

- Further improvements on the user roles and permission setup
  - New layers of control
- Traceability report and tracking improvements
  - New data available on Reports
  - Ability do to specific traceability reports

- Documents feature improvements
  - Sorting, labelling, filtering, API access
- Field Ops improvements
  - Data for immediate decision making available from the home screen
- Weather provider changes
  - Changing the provider of weather data

- Scouting feature improvements, to support pest and disease tracking with precise location.

6.9.1. Roles and Permissions Administrative Panel

Roles and permissions administrative panel serves the AGRIVI support staff to create a new role for the software. Through the administrative panel, administrator is enabled to:

- Create a new role
- Name the new role
- Select to which AGRIVI accounts this role should be activated (i.e. specific food processing company and farms)
- Define which user permissions should the new role contain
- Enable/disable the new user role

- Edit/delete the new user role

This administrative panel can only be accessed and managed by AGRIVI staff supporting the project.

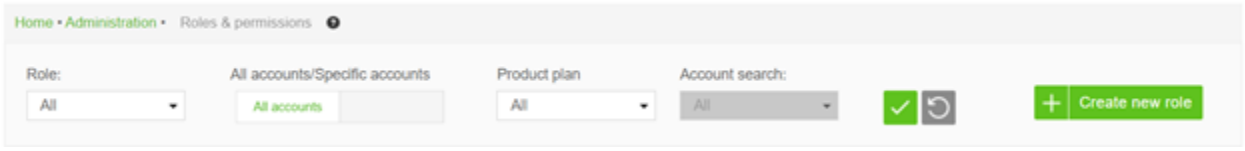
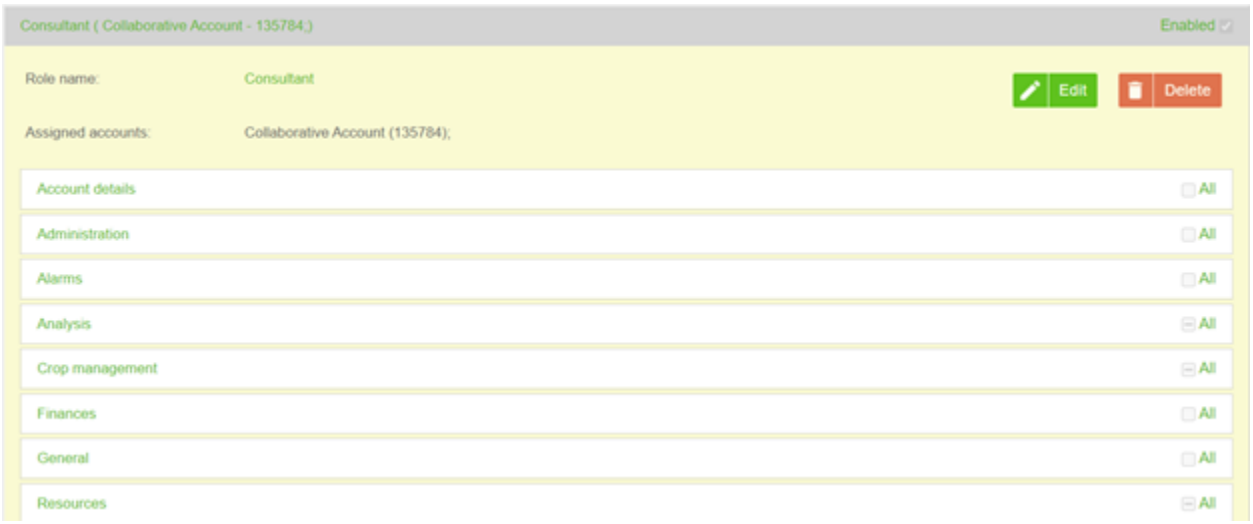


Figure 29: Administrative panel



6.9.2. Add User with New Role

This feature enables the end users to create a new user to which the newly created role through the administrative panel will be assigned.

This user will contain only the permissions which were enabled to the new user role to ensure that the new user with access can only see the parts of the software they need to.

This feature is managed by the end user.

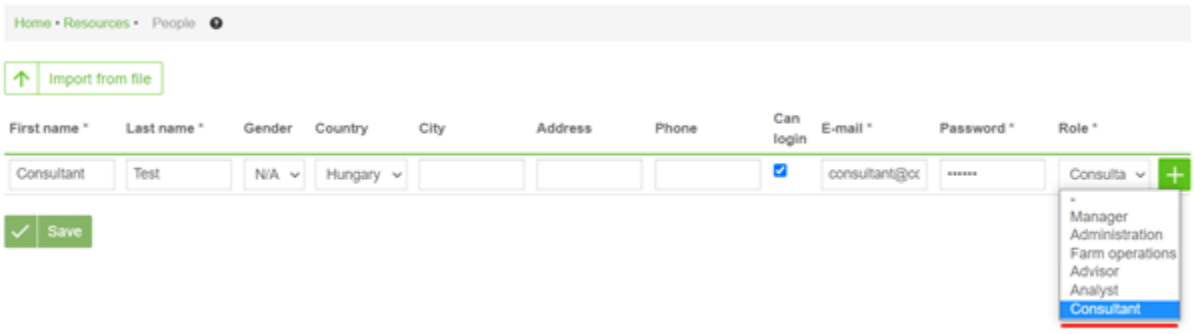


Figure 30: Add user feature

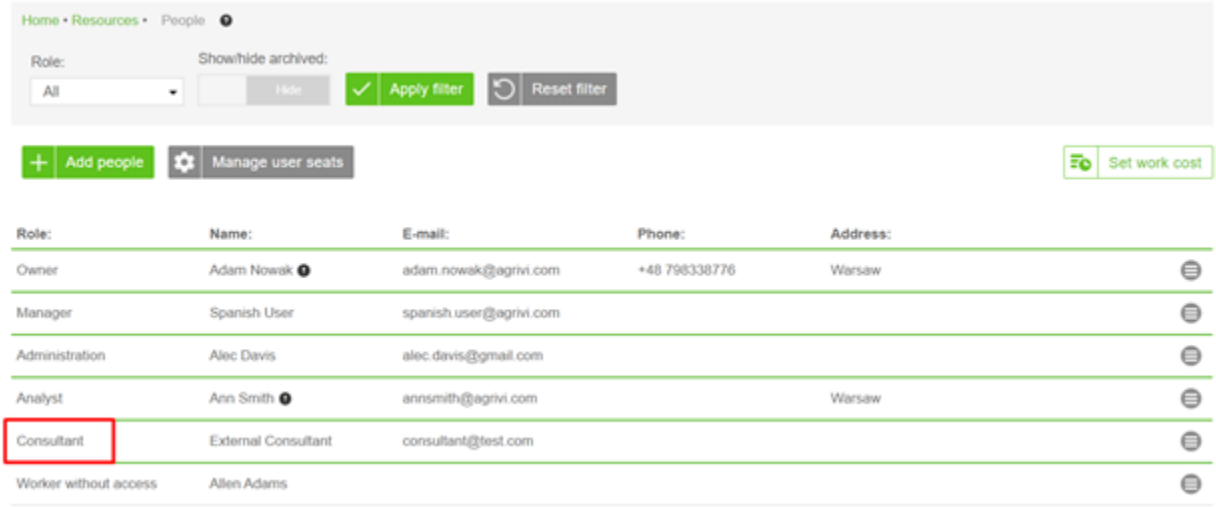


Figure 31: Manage user feature

6.9.3. Documents feature improvements

To improve access to documentation from users with different user roles, changes will be made to existing documents features.

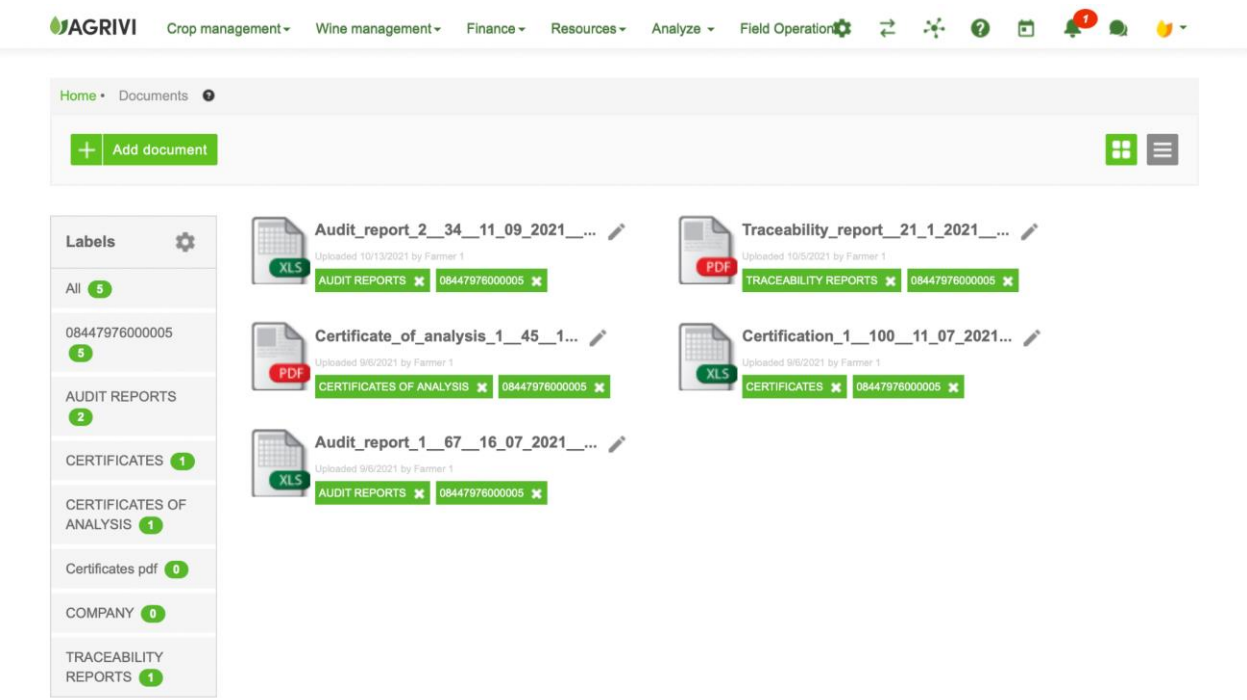


Figure 32: Current documents feature

Additional labelling options will be added to the documents feature, to simplify documents filtering and sorting.

API improvements will be done to support the changes made to the module UI.

6.9.4. Field Ops improvements

To support our users in decision-making, we will be making changes to our existing Field Ops module, to provide our users with a more visual data representation that will help them in the decision making and data overview.

Current AGRIVI Field Ops module:

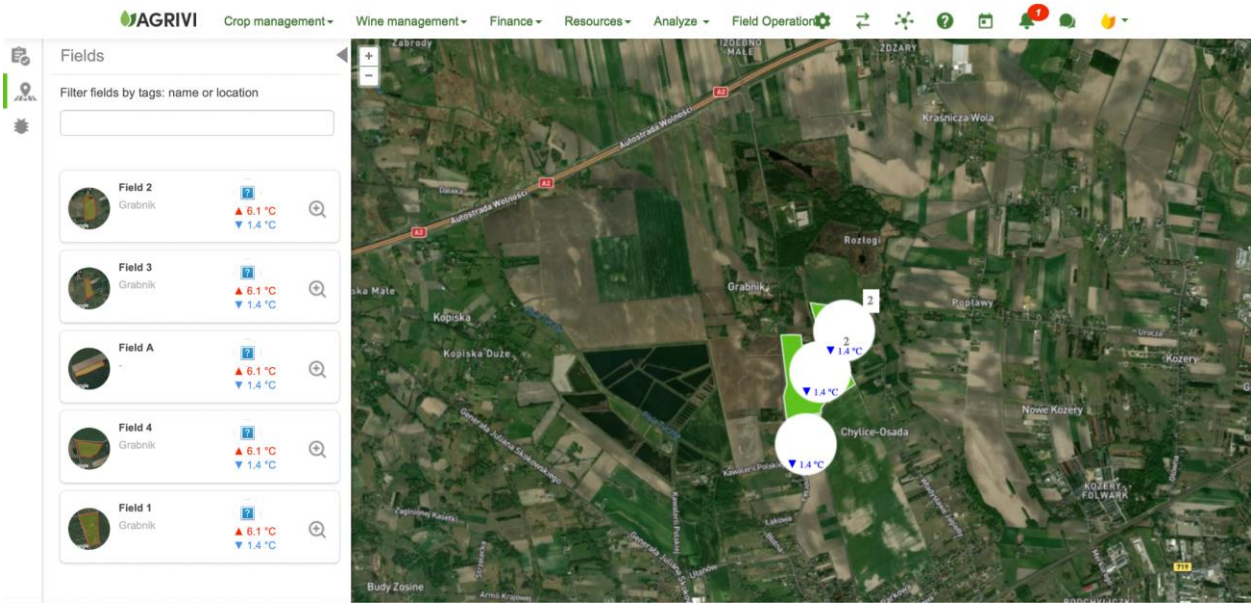


Figure 33: Current Field Ops module

Design for improved AGRIVI Field Ops module:

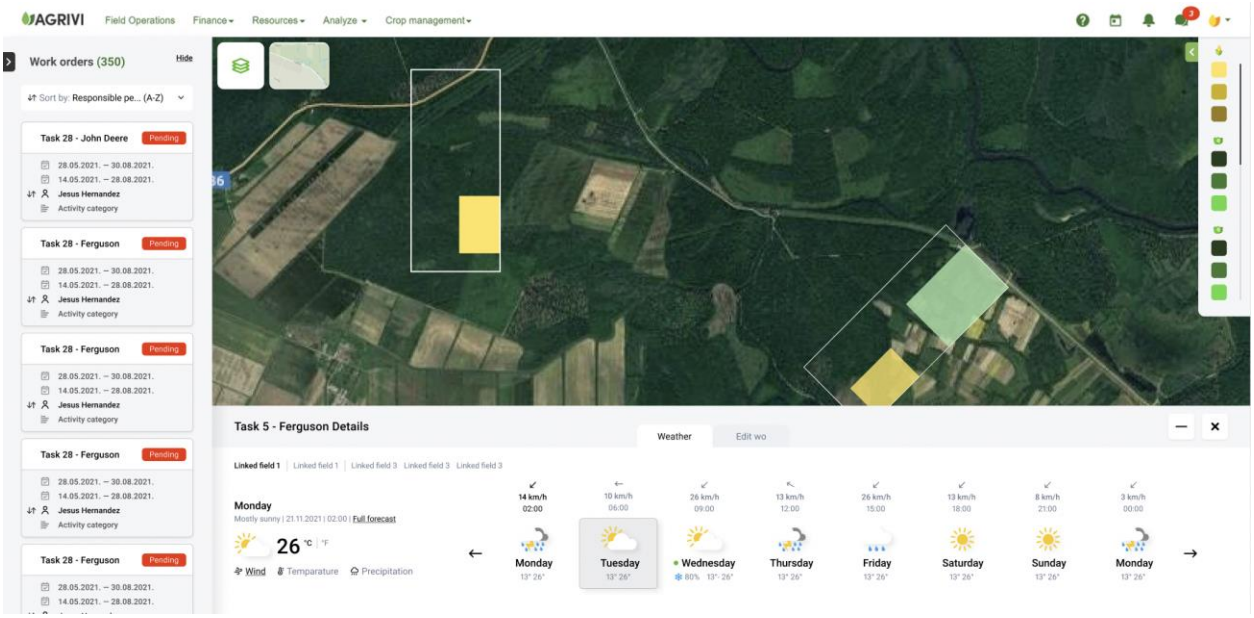


Figure 34: Improved Field Ops module

6.9.5. Weather provider changes

As AGRIVI current weather data provider DarkSky is shutting its services down at the end of 2022, we are determined to provide our users with an undisturbed service and will be switching our weather data provider to ClearAG.

With this change, we will:

- change our weather provider
- update and consolidate weather information UX
- enlarge our pool of relevant weather data
- ensure that weather IoT data is matching weather data

6.9.6. Scouting feature improvements and Field Ops integration

We will be focusing on improving our scouting feature, mainly to be able to assign exact coordinates (location) to scouting activities, directly from the map in AGRIVI.

Our goal with this feature is to achieve insights with recommendations and scouting records which are easy to record and document.

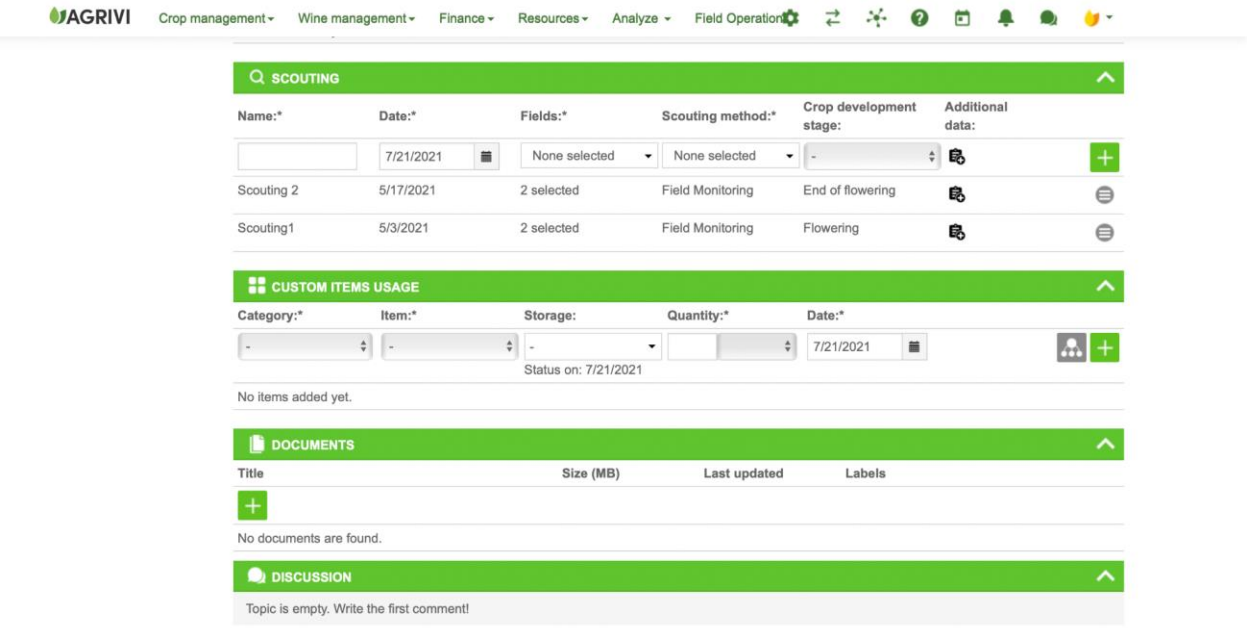


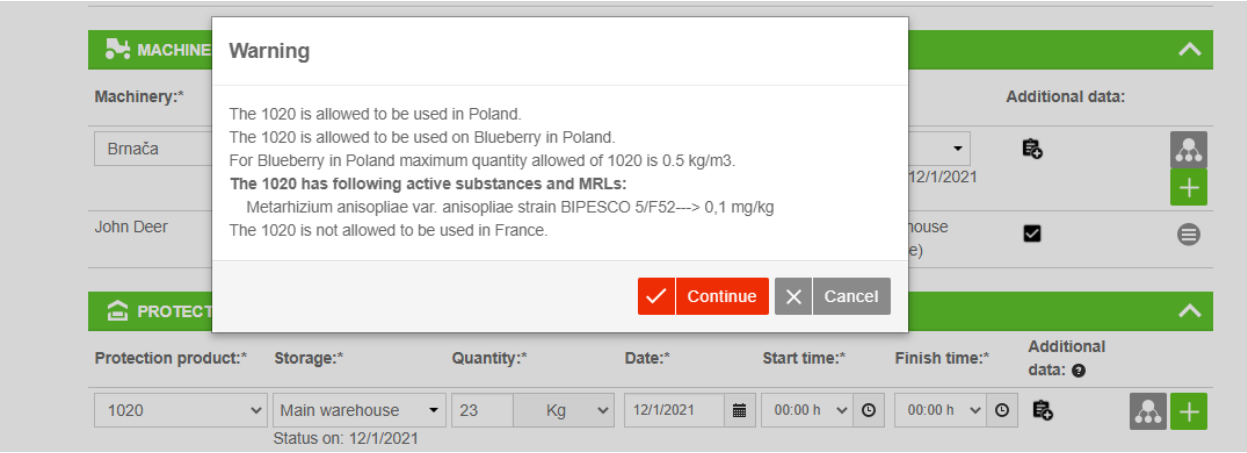
Figure 35: Current Scouting module

Current scouting module in AGRIVI requires a lot of manual data entry, and our aim is to simplify that as much as possible. This is going to be achieved by switching from table-based to map-based data entry.

6.9.7. Product database development

We are working on increasing the product database and general information about usages of products for specific companies, specific countries and organizations like European Union.

This development has multiple phases but the end goal is for the system to prevent users from appllying products not allowed in their respective countries.



7. CONCLUSIONS

This deliverable presented an agile iterative development process that was developed in the context of TheFSM project and it was adopted to develop the three applications, namely Food Inspector, FOODAKAI 2.0 and Agrivi 2.0. The agile process helped the development teams to be focused on developments that address the user and business requirements defined in WP1. The main goal was to prioritize the developments that are the most impactful for achieving the goal of the project.

In addition to that, this document reported the status and the outcomes of the agile development process for each application. In the case of the Food Inspector application, we delivered a first functional version that was also used and evaluated during the pilots. In the case of FOODAKAI 2.0, we further extended the alpha version and delivered updated functionalities that were also tested by end users during the pilots. For Agrivi 2.0, we focused on analyzing and designing the required initial extension of the AGRIVI software that will further extend the flexibility of the software to support the desired data sharing scenarios for different stakeholders in the value chain.