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FoodAuthent – Developing a System for Food Authenticity by Collecting, Analyzing and Utilizing Product Data

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ABSTRACT

The research project FoodAuthent aims at providing the technical framework and incentives for the routine use of "fingerprinting" to secure and monitor food quality. The planned system captures, analyses and processes data on the chemical fingerprint of food and can prove its authenticity. For this purpose, cloud-based fingerprinting databases are combined with methods of data analysis and batch-specific product information. The project focuses on proof of origin and fraud detection of food as well as on analytical methods for the product categories cheese, oil and spirits.

Keywords: *Authenticity, Integrity, Transparency, Traceability, EPCIS*

1 Introduction

As consumers' trust in the food sector increasingly depends on the provision of authentic product information, companies as well as governmental bodies are required to develop solutions to address that need. The research project FoodAuthent develops a system for collection, analysis and utilization of analytical food fingerprints (Ellis et al., 2012; Esslinger et al., 2014) based on standardized interfaces and a modular design concept to enhance transparency of product flows for different stakeholders, such as consumers, retailers, producers and public authorities. Moreover, it creates the conditions and incentives for routine use of fingerprinting methods in quality assurance, quality control and food inspection.

2 Collection, Analysis and Utilization of Product Data for Authenticity

The planned FoodAuthent-system links cooperatively used, cloud-based fingerprinting databases with open, reproducible pattern recognition/data analysis methods (Wiswedel et al., 2010; Eliceiri et al., 2012; Beisken et al., 2013) as well as IT-systems to batch-related product information (GS1 Global, 2017a; fTRACE, 2017). Its functionality is going to be demonstrated taking the example of cheese, oil and spirits. The solution will be

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based on EPCIS (Electronic Product Code Information Service), an open standard of GS1/ISO/IEC, which defines interfaces for the capturing and sharing of visibility event data (GS1 global, 2017b; see figure 1).

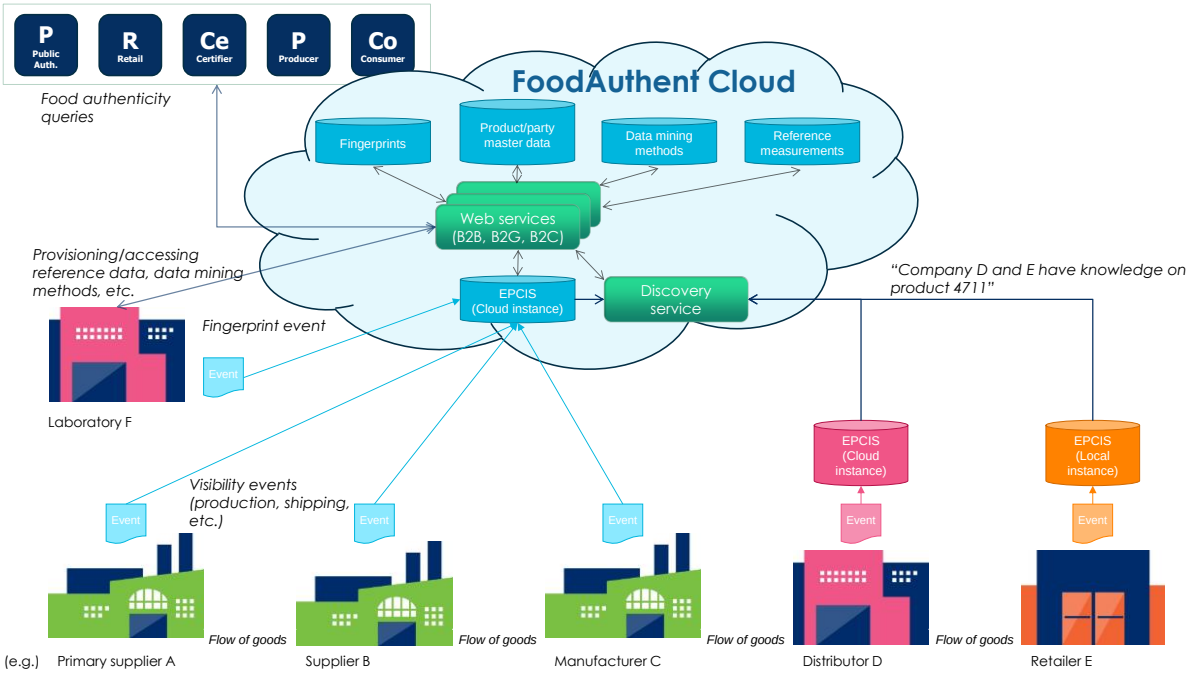

Figure 1: Conceptual illustration of the FoodAuthent system

The integration of the aforementioned components into a standards-based solution allows exploiting the potential of fingerprinting analysis for the food sector. The project focuses on the following three aspects of food authenticity:

- Food regio detection: Proof of the geographical origin of food.
- Food fraud detection: Identification of prohibited and unwanted additives.
- Analytical methods: Direct rapid tests by chemical analysis and chemo-metrical data evaluation (i.e. procedures).

The key elements of the solution are analysis and data standards (lab-focus) as well as cloud-based systems (IT-focus), which in combination enable an assessment of the authenticity of food. Comparable holistic approaches exist neither in Germany nor in other countries. So far, fingerprinting analysis methods are only used to a very limited extent. Compared to fingerprinting analyses, the classic, purpose-oriented authenticity and quality control of food consists of a large number of specific analytical methods investigated for individual components, contaminants or residues. The methods used in this process are able to deal with already known problems effectively and efficiently, and thus form the basis for routine analysis and public food control.

However, the increasing complexity of products and product chains entails the danger of novel, hitherto unknown falsifications and contaminations, thus posing increasingly greater challenges to these procedures. The resulting need for the use of flexible and innovative analytical strategies is the main motivation and driving force for the establishment of fingerprinting techniques in the area of food analysis. After performing each

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measurement, these offer the possibility to process a multitude of questions, e.g. retroactive recognition of previously unknown deviations from the expected product profile.

The integration of publicly accessible fingerprinting databases with standardized protocols for sample analysis, validated statistical data analysis methods, uniform data exchange formats and a connection to privately operated product databases offers the opportunity to utilize the full potential of fingerprinting analysis for the first time.

3 Summary and Conclusion

The project develops a new system for collection, analysis and utilization of product data for authenticity in the food sector. For this purpose, the system integrates new (open-source) software tools for the analysis of analytical data, standardized data analysis methods, cloud-based and cooperative product fingerprinting databases as well as software solutions for, e.g., consumers, companies and public authorities. The scientific and technical results of the project will be provided to the stakeholders in the food industry as open and standard-based solutions, including open-source software.

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