European Knowledge base on analytical methodology and databases for food authenticity

Michèle LEES

Eurofins France

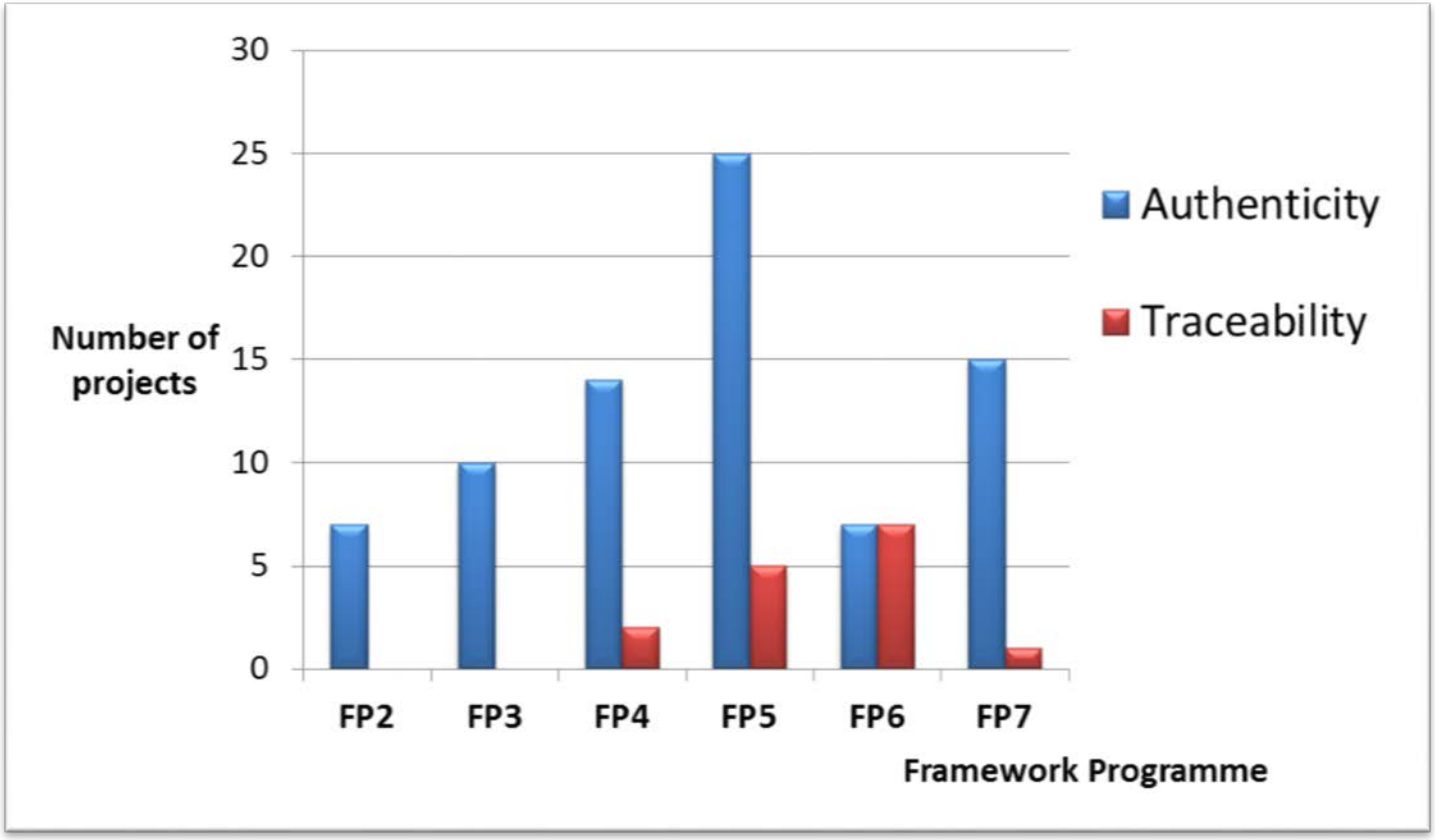
Our starting point

- A considerable amount of information is available on suitable analytical tools and associated reference data for the detection of food fraud
- Often in the public domain, but not always easily accessible
- The development of numerous authentication methods has been financed as part of the EU's RTD programmes
- A plan of action is needed to ensure that they are effectively applied.

Previous EU Research Projects – a wealth of information

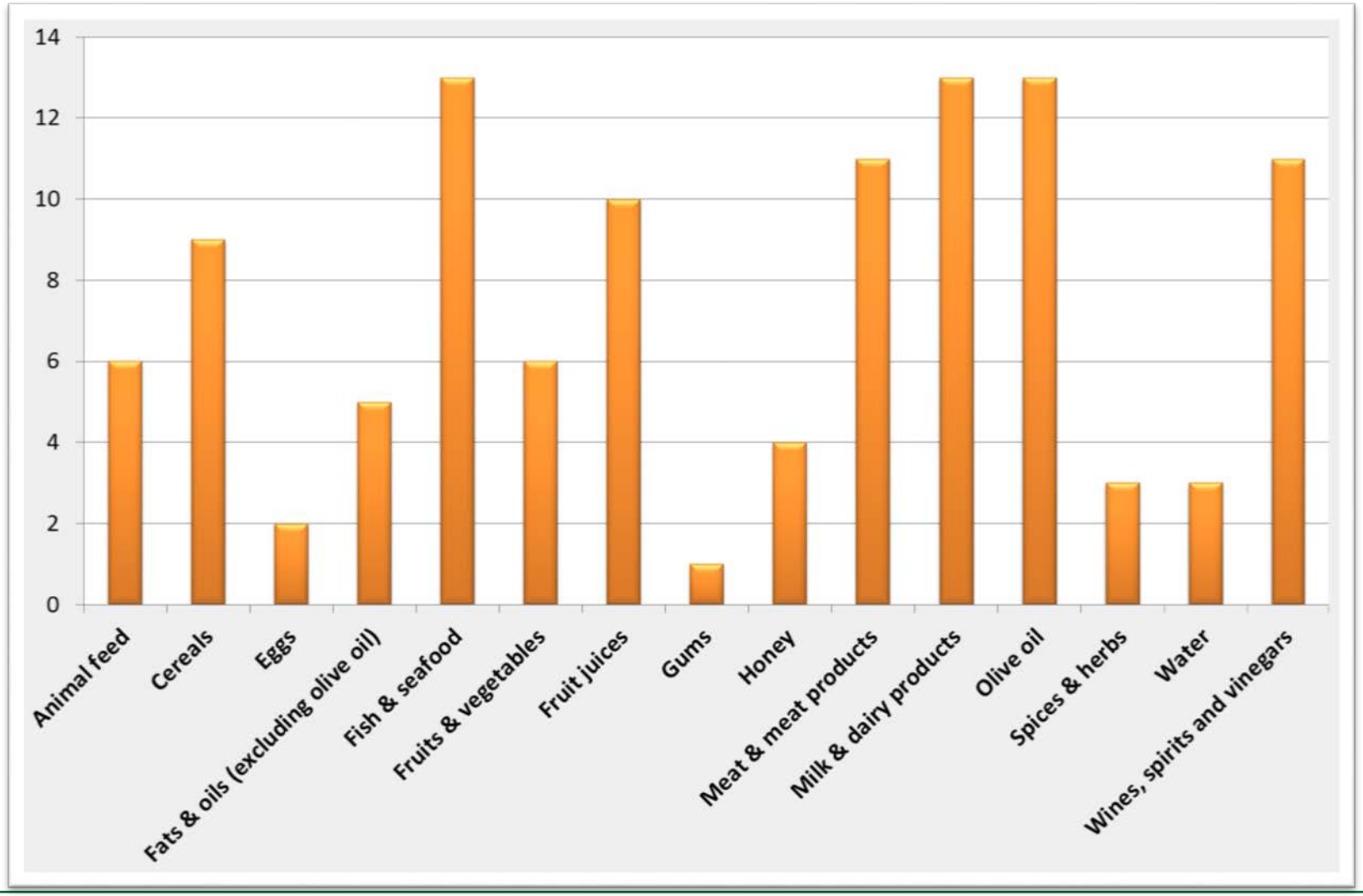
Previous EU Research Projects – a wealth of information

- An inventory of past/current EU-funded projects carried out through an investigation of Cordis.
- 95 projects selected, 83 authenticity and 15 traceability



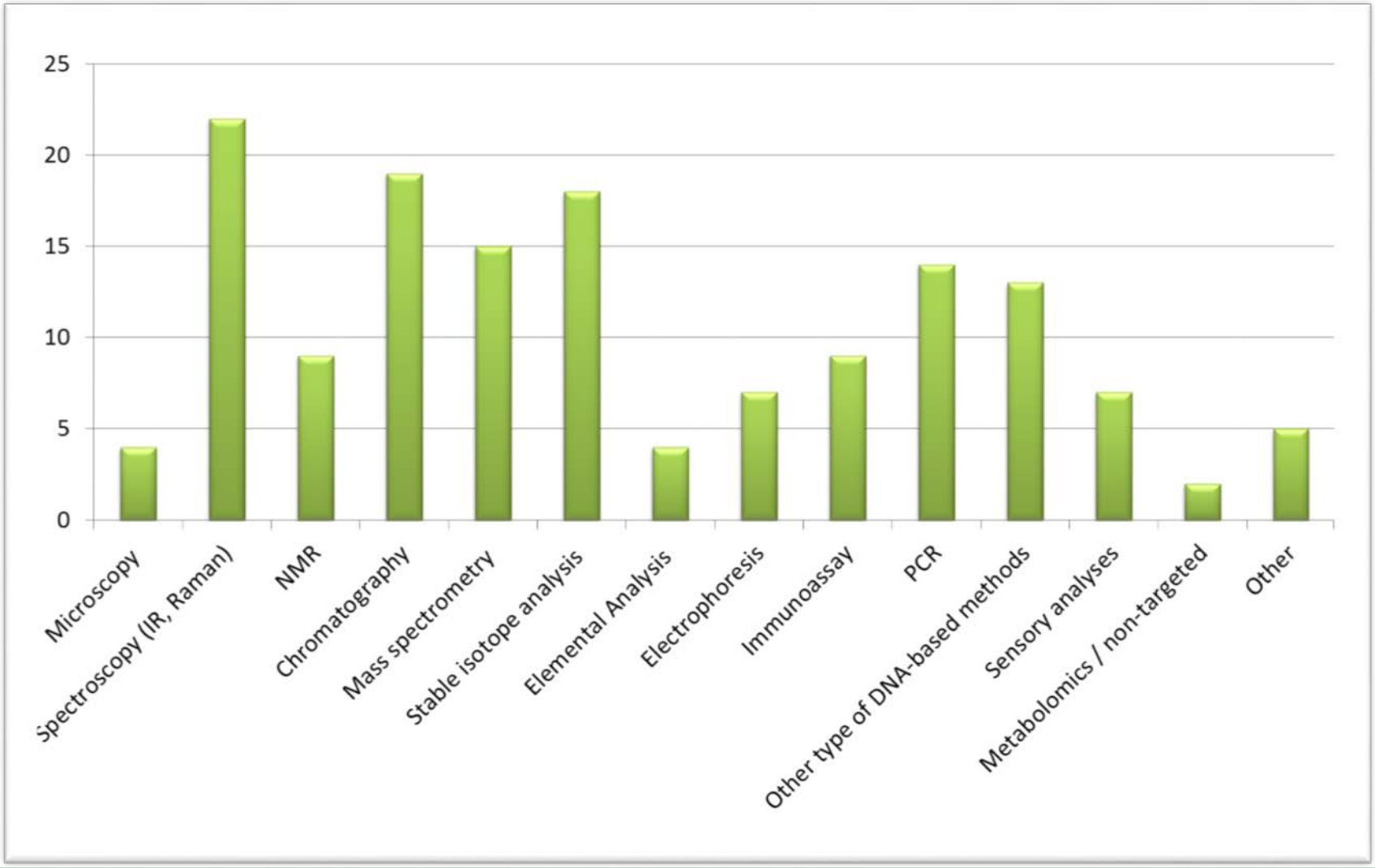
Previous EU Research Projects – a wealth of information

The main product types studied:



Previous EU Research Projects – a wealth of information

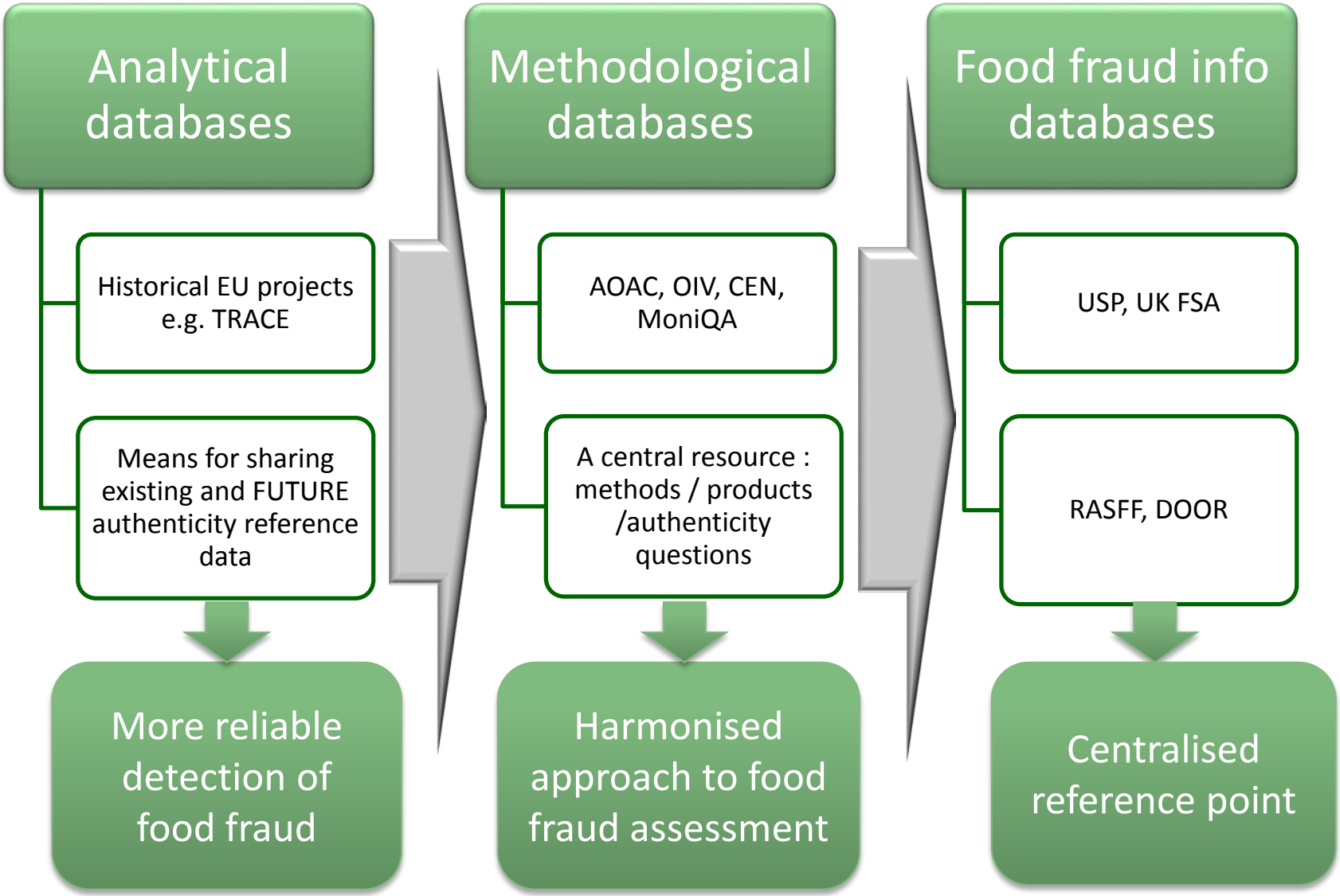
The analytical methods used:



Creation of a FoodIntegrity KNOWLEDGE BASE

- To act as a European focal point for the vast array of existing information on analytical methods for food integrity testing
- To establish the state-of-the art as regards existing reference data sets and published analytical methods
- To facilitate the sharing of existing and future authentic reference data via harmonised guidelines
- To provide access to information on food integrity and authenticity questions through an online Web tool.

Merging and Mapping relevant information



The structure of the FoodIntegrity Knowledge Base:

FoodIntegrity Knowledge Base

Food Product

- Commodity
- Detailed product description
- CN code

Food Integrity Issue

- Type fraud (dilution, substitution, enhancement..
- Issue (composition , geographical origin, …
- Location in supply chain
- Incidence

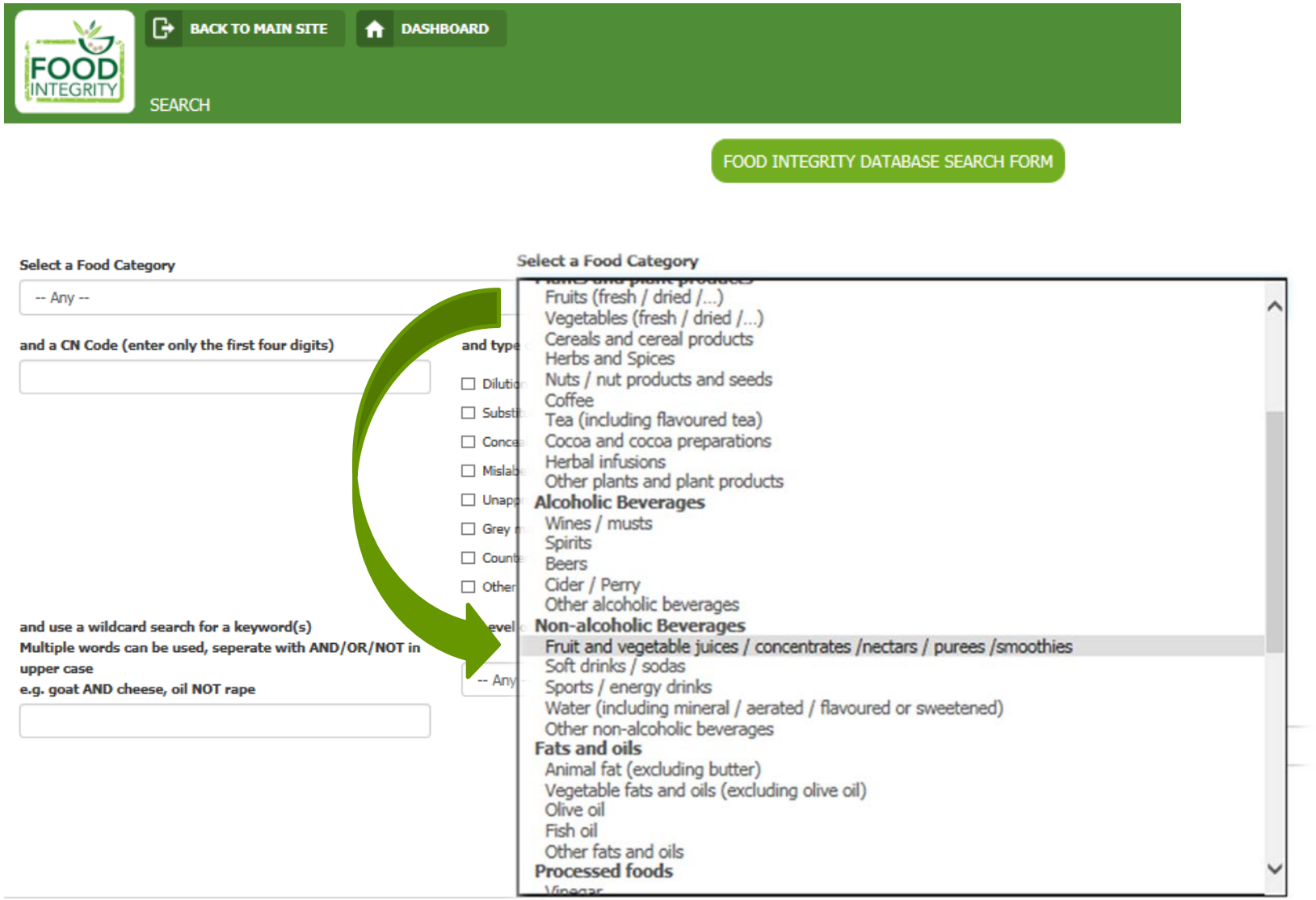
Analytical Strategy

The structure of the FoodIntegrity Knowledge Base:

Analytical Strategy

- Method (Chromatography, Molecular spectroscopy, NMR, Stable Isotopes, DNA-based…)
- Method status (Standard, official use, validated…)
- Method performance (precision criteria, response time, estimated cost)
- Additional information on interpretation rules, available reference materials
- Useful analytical data, link to existing databases or expert contact

The FoodIntegrity Knowledge Base – An example:



The FoodIntegrity Knowledge Base – An example:

RESULTS TABLE

Commodity Detail	CN Code	Description of Issue	Analytical Strategy	Level of Use
Fruit juices (single strength concentrate)	2009	Addition of undeclared beet sugar	Marker-oriented	Used routinely in contract laboratories
Fruit juices (single strength concentrate)	2009	Addition of undeclared sugar	Marker-oriented	Used routinely in contract laboratories
Fruit juices (single strength not from concentrate)	2009	Detection of undeclared addition of water to single strength not-from-concentrate (NFC) juices	Marker-oriented	Used routinely in contract laboratories
Fruit juices (single strength and concentrates)	2009	Addition of carbohydrate-derived sugar syrups (IS from beet or cane HFS from corn/maize inulin)	Fingerprinting	Used routinely in contract laboratories
Fruit juices - concentrates/ nectars/ purees	2009	Undeclared addition of sugars acids. Misrepresentation of fruit type and/or variety. Geographical origin.	Profiling	
Apple juice (single strength and concentrate)	2009 70	Addition of pear juice	Marker-oriented	Used routinely in contract laboratories
Orange juice (single strength concentrate)	2009	Addition of vitamin C (ascorbic acid) from an external source	Marker-oriented	Used routinely in contract laboratories
Strawberry and raspberry puree	2007	Adulteration of sulphited strawberry and raspberry purees by inclusion of apple puree	Fingerprinting	
Fruit juices	2009	Adulteration with undeclared fruit juices	Marker-oriented	

The FoodIntegrity Knowledge Base – An example:

The FoodIntegrity Knowledge Base – An example:

RESULTS FROM EU PROJECT N°: GRD1-2001-41818

ACRONYM: PURE JUICE

TITLE: "Detection and prevention of adulteration on the EU fruit juice market by investigation of the isotopic and compositional profile of minor components"

Difference between $\delta^{13}C$ of total ascorbic acid and $\delta^{13}C$ at C1 (in ‰ vs. VPDB) for natural and synthetic samples supplied in 2003-2004

Ascorbic acid	Natural from juice	Synthetic
N	57	19
mean	4.89	-7.66
SD	1.80	0.67
min	0.78	-9.08
max	10.86	-6.47
mean – 2 SD	1.29	-9.00
mean + 2 SD	8.49	-6.32

The FoodIntegrity Knowledge Base – Next steps:

Establish guidelines for consistent reporting of future data

Investigate existing open-source tools for data sharing

- Isa-tools.org
- The FAIR Guiding Principles for scientific data management and stewardship*

Investigate existing standards

- eg. ISO 12099 (2010). "Animal feeding stuffs, cereals and milled cereal products. Guidelines for the application of near infrared spectrometry", http://www.iso.org

Define minimum reporting guidelines

- In association with CEN, IUPAC, ISO, AOAC….

*Wilkinson, M. D. et al.. Sci. Data 3:160018 doi: 10.1038/sdata.2016.18 (2016).

Acknowledgements

The FoodIntegrity Knowledge Base – Next steps:

www.foodintegrity.eu

The project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement No. 613688.