Sourcing food components from co-products: What is the Food Waste Compositional Database and how can it can help you?

REFRESH Food Waste, 18 May 2017, Berlin

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Outline

- Aims, objectives and tasks
- Identified waste streams
- Development of waste composition database
  - Data collection and coverage
  - Current and future plans
- Demonstration
- Round table Q&A

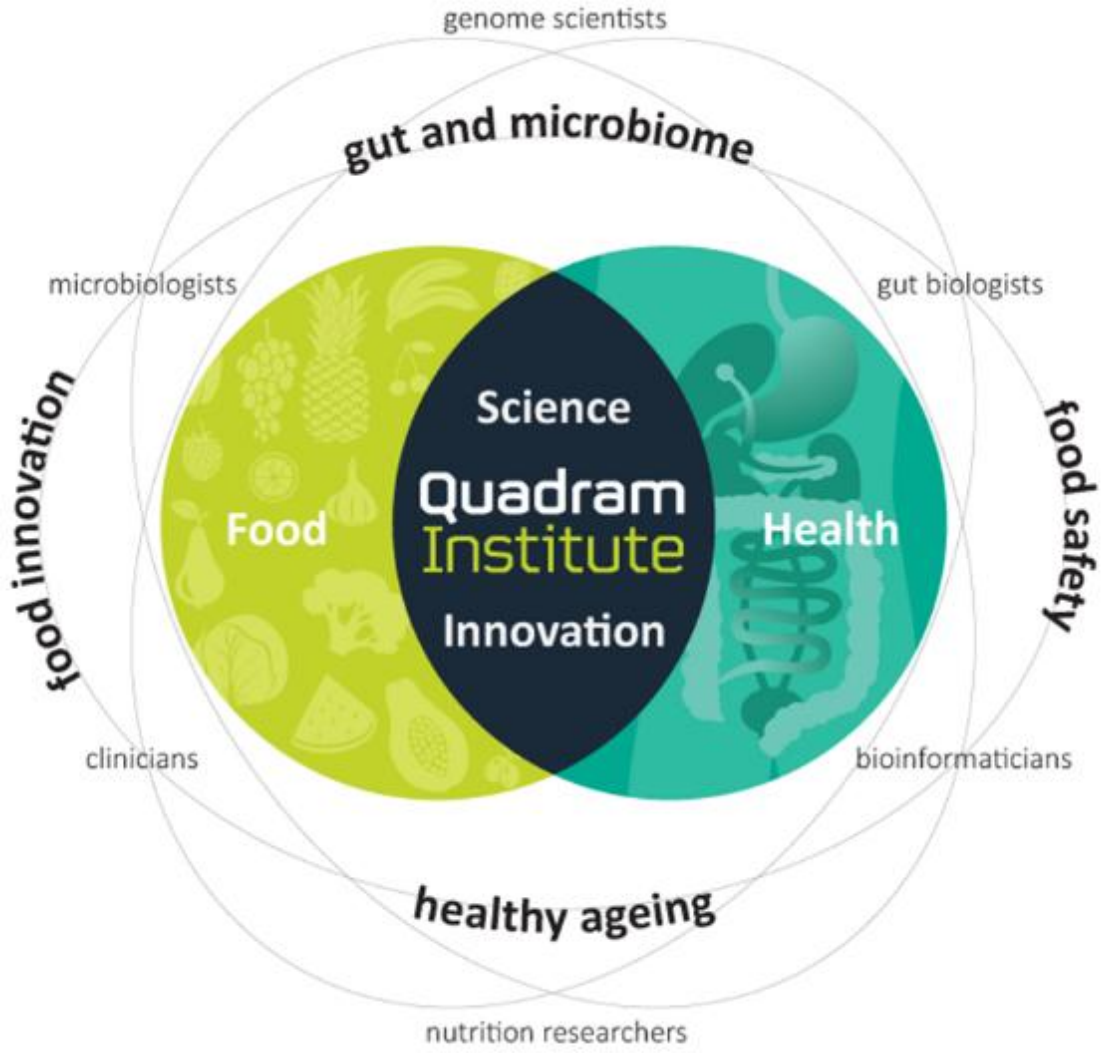
Norwich Research Park

- One of Europe's largest single-site centres in research in plant and microbial genomics, food and health and environmental sciences
- 3,000 scientists, 4 world leading institutes, a university and a large teaching hospital
- An international hub for food & health research

The Quadram Institute

- An interdisciplinary hub to maximise the unique cluster of academic excellence and clinical expertise working alongside the food and pharma industries
- Accelerated innovation of food & related products & therapies to address major health issues

How food interacts with the microbiome and human health



Quadram Institute Science Health Food Innovation

Aims & objectives

To increase the exploitation of UN-AVOIDABLE food chain waste by:

- **helping business stakeholders** to identify waste streams that are appropriate to valorize
  - **Helping innovators** to accrue appropriate waste-related knowledge e.g. composition, technology available;
- Valorising post-consumer **perishable waste;**
- **helping policy makers** to identify and implement improvements to the legislature (special reference to feed production restrictions whilst ensuring safety and quality)

This is resulting in a strong focus on wastes & co-products from the food processing sector which possess the necessary scale and traceability to be able to considered for existing and novel valorisation solutions.

Tasks

- Selection of the **top waste streams**
- Development of **compositional database**
- Identify key valorisation capacities, approaches and technologies
  - **incorporation of waste vegetable fibre into food** products and evaluation of product quality;
  - development of the DST for **valorisation of food wastes as animal feed** and development of guidance to policy makers based on expert input on risk mitigation;
  - research on conversion to **fuels and chemicals** leading to report on potential viability.

Final list of priority waste streams

- Includes well-known examples:
  - spent grains (alcoholic beverages)
  - press cakes from vegetable oil processing
  - meat & dairy side-streams - slaughter by-products and whey protein

- List of **75** priority waste streams used for:
  - Food Waste Compositional Database
  - Ensure a higher level of granularity

Food group	Food product	Waste stream	% solid waste in weight	Current m
Fruit and vegetables	Apples	Pomace (single pressed)		Productio
Fruit and vegetables	Apples	Pomace (double-pressed)		Productio
Fruit and vegetables	Apples	Pectin-extracted fruit (outside UK)		Productio
Fruit and vegetables	Juices	Juice pressings (pits, seeds, pulp, grape lees, peel)	80 - 90 %	Composti peptines, r vinegar, r feed for (essential antioxida digestion
Fruit and vegetables	Oranges	Peel, seed, membrane residue after juice extraction	[illegible]	Cattle fee
Fruit and vegetables	Oranges	Citrus peel and peel		Food ingr
Fruit and vegetables	Oranges	Citrus molasses		Cattle fee
Fruit and vegetables	Tomatoes	Pomace (skin, pulp & seeds)		Animal fe
Bread, rice, potatoes, pasta and other starchy foods	Potatoes	Fibre from potato starch production	2%	Productio
Bread, rice, potatoes, pasta and other starchy foods	Potatoes	Protein from potato starch production	< 6%	Protein ex
Bread, rice, potatoes, pasta and other starchy foods	Potatoes	Concentrated fruit juice from potato starch production	< 70%	Protein ac
Bread, rice, potatoes, pasta and other starchy foods	Potatoes	Peelings		May be u with potat
Bread, rice, potatoes, pasta and other starchy foods	Frozen potato products	Peelings (steam-peeling)		Productio
Bread, rice, potatoes, pasta and other starchy foods	Frozen potato products	Peelings (abrasion peeling)		Productio
Bread, rice, potatoes, pasta and other starchy foods	Rice	Rice husks		Filler in p bioenergy
Bread, rice, potatoes, pasta and other starchy foods	Wheat milling products	Wheat middlings		Feed for u
Bread, rice, potatoes, pasta and other starchy foods	Wheat milling products	Wheatfeed		Feed for u
Milk and dairy foods	Cheese	Whey	80 - 90 %	Productio domestic lactose, R animal fe productio culture m fermentat transform
Milk and dairy foods	Cheese	Whey concentrate		Liquid fee
Milk and dairy foods	Cheese	Whey permeate		Animal fe

Citrus pulp

Apple pomace

Images: KW Alternative Feeds

Development of compositional waste database

- **AIM:** to produce a database and a database management tool to easily maintain and access data on waste streams

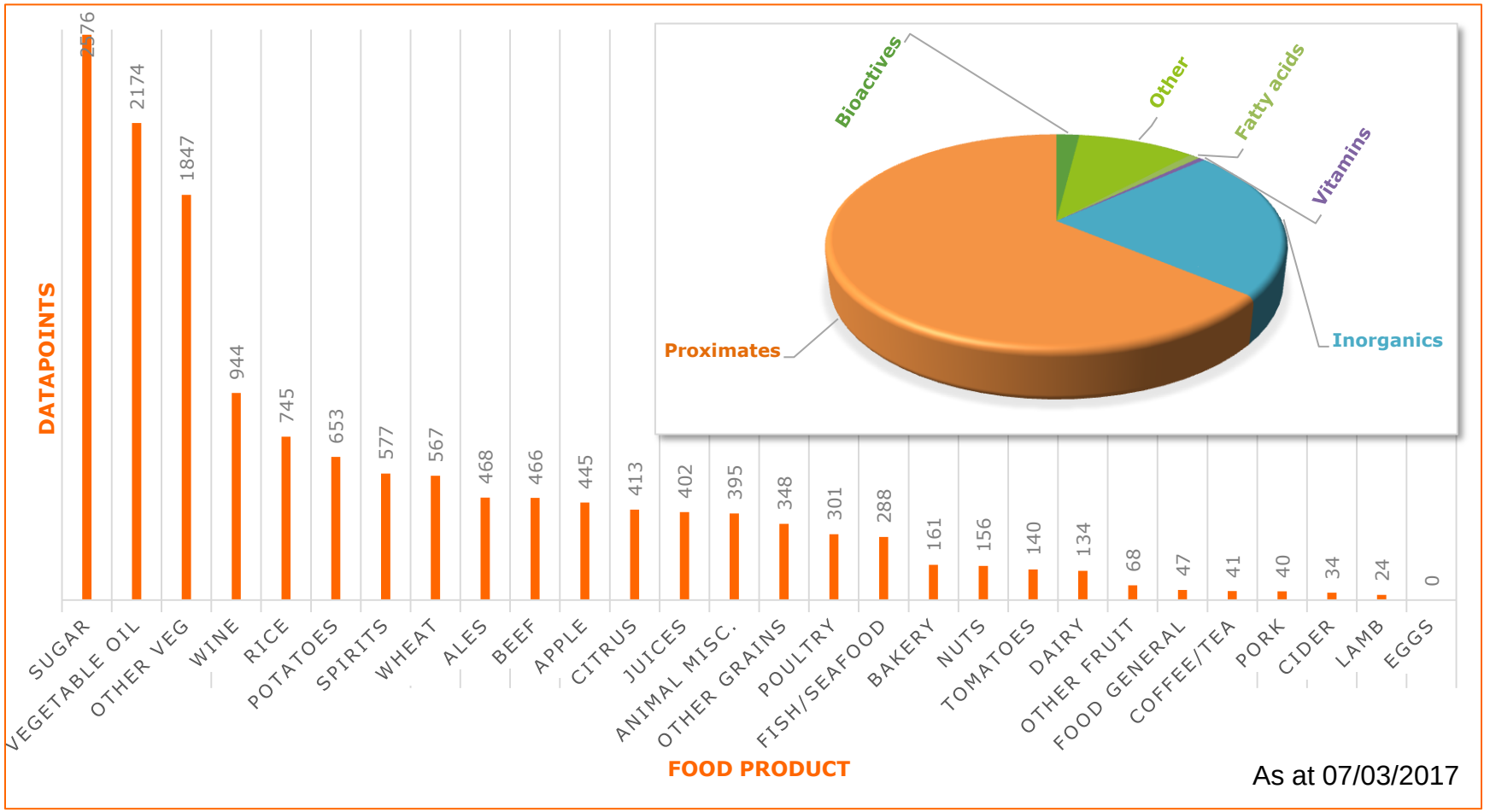
- Work being undertaken by EuroFIR, Quadram Institute & JSI
  - Population of database covering 75 key waste streams identified in REFRESH
  - Currently over 14,000 data points have been added
  - Represents a key resource for both the food processing industry and academics

Current status of data

	A	C	D	AK	AI	AM	AN	
1	ID	Food Product	Food Product Waste	Nitrogen digestibility, ruminants (%)	Nitrogen digestibility, growing pig (%)	Nitrogen digestibility, rabbit (%)	Nitrogen digestibility, salmonids (%)	
2								Immedia
820	927	Ales	Brewers grains, ensiled	78.3				
821	928	Rice	Rice grain, polished	86.6	89.5			
822	929	Rice	Rice grain, polished, parboiled					
823	930	Rice	Rice grain, brown	68.5	87.7	89		
824	931	Ales	Barley rootlets, dehydrated	70.2	74.5			
825	932	Spirits	Maize distillers dried grains and solubles	77	83			
826	933	Spirits	Maize distillers dried grains and solubles, high protein	78.7	79.5			
827	934	Spirits	Maize distillers dried grains and solubles, fat <6%	81.2	73.7			
828	935	Spirits	Maize distillers wet grains and solubles	78.7				
829	936	Spirits	Thin stillage					
830	937	Rice	Rice bran, fibre <4%	75.8				
831	938	Rice	Rice bran, fibre 4-11%	68	79.5			
832	939	Rice	Rice bran, fibre 11-20%					
833	940	Rice	Rice bran, fibre >20%	39.6				
834	941	Rice	Rice bran, defatted, fibre <11%	72.7	62.7			
835	942	Rice	Rice bran, defatted, fibre 11-20%	71	55.6			
836	943	Rice	Rice bran, defatted, fibre >20%	26.8				
837	944	Rice	Rice hulls	7.4				
838	945	Rice	Rough rice, paddy rice	76				
839	946	Ales	Sorghum bran and milling offal					
840	947	Ales	Sorghum brewers' grains, dried	76	80.7			
841	948	Ales	Malted sorghum sprouts		72.8			
842	949	Ales	Sorghum distillers' grains (with or without solubles), fresh	78.3				
843	950	Ales	Sorghum distillers' grains (with or without solubles), dried	78.2	61			
844	951	Ales	Sorghum gluten feed					
845	952	Ales	Sorghum gluten meal					
846	953	Ales	Sorghum germ oil meal					
847	954	Ales	Sorghum grain (all types)	68.4	70.6			
848	955	Ales	Sorghum grain, high tannin	66.8	63.5			
849	956	Ales	Sorghum grain, low tannin	70.5	83.4			
850	957	Ales	Sorghum grain, red varieties	67.5	67.4			
851	958	Ales	Sorghum grain, white varieties	68.3	75.5			
852	959	Wheat	Wheat starch					
853	960	Wheat	Wheat bran	68.2	64.9	74		
854	961	Wheat	Wheat distillers grain with solubles, starch <7%	77.1	71.4			
855	962	Wheat	Wheat distillers grain with solubles, starch >7%	76.3	76.1			
856	963	Wheat	Wheat germs			88.3		
857	965	Vegetable oi	Almond hulls					

... | Properties | Proximates | Inorganics | Vitamins | Vitamin Fractions | (SFA per 100gFA) | (SFA per 100gFood) | (MUFA per 100FA) | (MUFA per 100gFood) | (PUF ...

Data coverage



Data coverage

Coverage of dataset for top eight food products*

	Food product							
	Sugar	Vegetable oil	Other veg	Wine	Rice	Potatoes	Spirits	Wheat
Proximates	1859	1389	1164	700	398	480	358	204
Inorganics	542	482	477	198	199	104	134	157
Other	141	261	159	46	88	69	73	126
Bioactives	27	4	6	0	32	0	12	80
Fatty acids	0	11	29	0	14	0	0	0
Vitamins	7	27	12	0	14	0	0	0

Key: **GREEN** >=100 datapoints, **AMBER** 10 - 100 datapoints, **RED** <=10 datapoints

* As at 07/03/2017

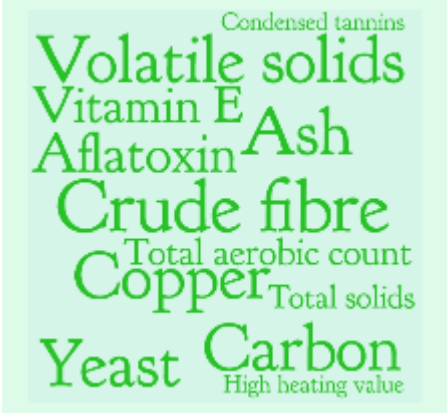
Data sources

Publication / source	Number of data points*
2012 Feed Compendium	1838
Wet explosion pretreatment of sugarcane bagasse for enhanced enzymatic hydrolysis	1726
CROPGEN database	1720
Online European Feedstock Atlas basis version	902
Feedipedia	>750 (ongoing)
Conversion of olive wastes to volatiles and carbon adsorbents	565
NOSHAN project	501
Citrus by-products as ruminant feeds: A review	451
Digestion kinetics of neutral detergent fiber and chemical composition within some selected by-product feedstuffs	371

* As at 07/03/2017

Current plans

- **Aim –** to develop a 'front-end' of the database management tool
  - Test 'front-end' of database for usability against stakeholder requirements
- Develop a flexible tool and upgrade with a statistical tool as well as with web services to support its connection with other information systems, including FoodCASE
- Usability testing
- Sustainability of the database

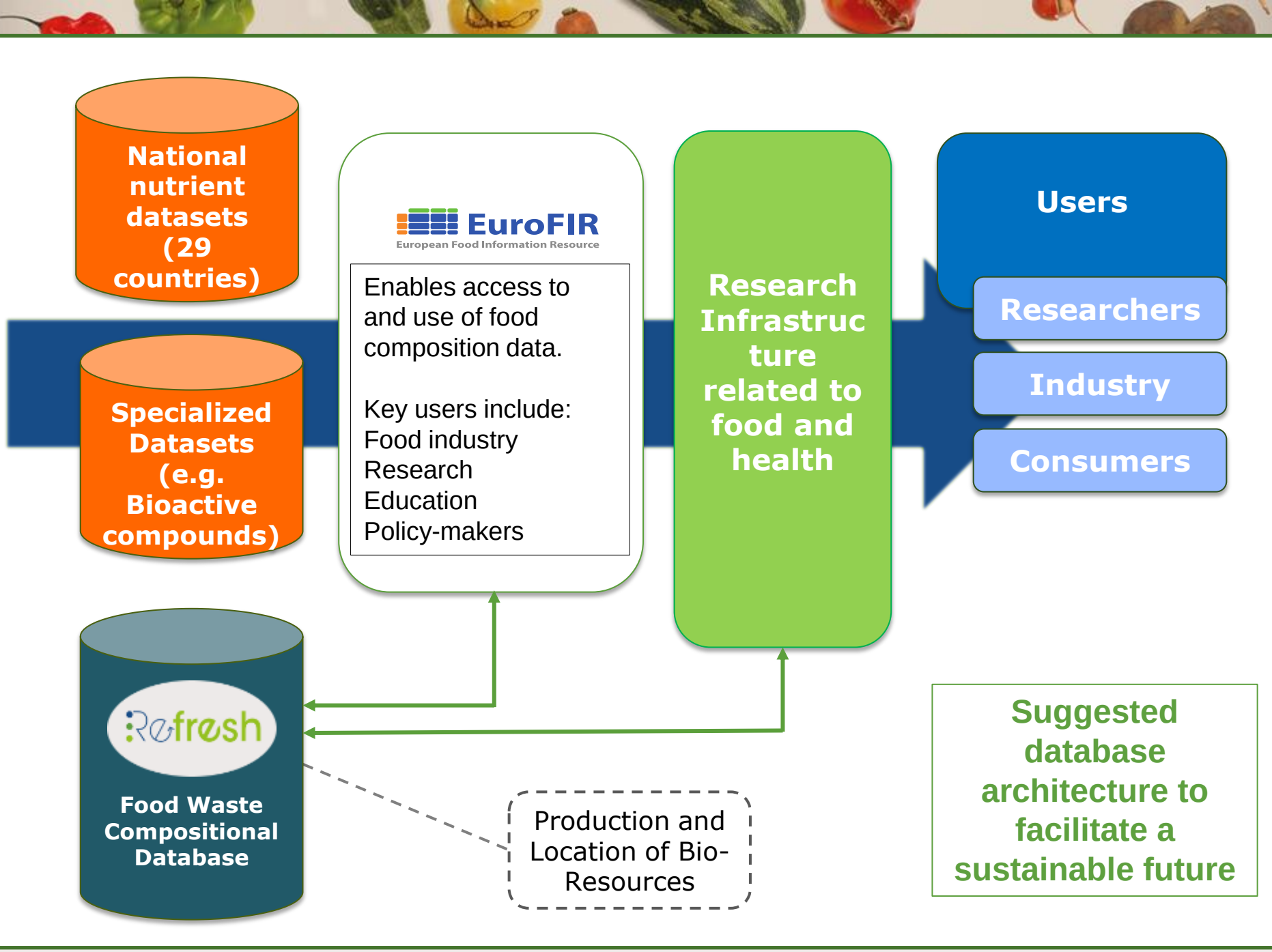


Development

- Feedback/ideas from interested parties welcome
- Data sources/publications/references welcome, especially for meat waste streams
- If you would like to be involved in assessing the current data collected or are able to suggest any data sources, please contact Hannah.Pinchen@quadram.ac.uk

Next steps for database

- Finalise development of back end of waste database
- Design front end look of waste database
- Continue collection of top 75 waste stream data
- Pilot - Database evaluation by industry
- Receive data evaluations from any other interested parties


National nutrient datasets (29 countries)
Specialized Datasets (e.g. Bioactive compounds)
EuroFIR
European Food Information Resource
Enables access to and use of food composition data.
Key users include:
Food industry
Research
Education
Policy-makers
Research Infrastructure related to food and health
Users
Researchers
Industry
Consumers
Refresh
Food Waste Compositional Database
Production and Location of Bio-Resources
Suggested database architecture to facilitate a sustainable future

Demonstration of the waste database tool

Demonstration by Tome at JSI

Acknowledgements

- Development of the tool – Barbara Korousic Seljak, Tome Eftimov
- Composition data experts - Paul Finglas, Mark Roe
- Food waste experts – Keith Waldron, Graham Moates
- Data collectors – Angelika Mantur, Hannah Pinchen

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Round table Q & A