The EuroFIR Food Platform: Further integration, refinement and exploitation for its long-term self-sustainability

Reporting

Project Information

EUROFIR-NEXUS

Grant agreement ID: 265967

Project website

Project closed

Start date
1 April 2011

End date
31 March 2013

Funded under
Specific Programme "Cooperation": Food, Agriculture and Biotechnology

Total cost
€ 1 117 387,40

EU contribution
€ 999 998,00

Coordinated by
QUADRAM INSTITUTE BIOSCIENCE
United Kingdom

Final Report Summary - EUROFIR-NEXUS (The EuroFIR Food Platform: Further integration, refinement and exploitation for its long-term self-sustainability)

Executive Summary:
EuroFIR NEXUS aimed to develop, implement and refine the European Food Information Platform (EuroFIR FIP) to improve European research into the relationships amongst food, diet and health. In the

long term, these enhancements will facilitate better access and, therefore, use and exploitation of national food composition data and supporting information for EU diet and health research and monitoring. The aim was advance the integration and connectivity between available food composition data and its use by stakeholders (e.g. policymakers) and users (e.g. research) for the benefit of European citizen. To this end, activities were focussed on three strategic themes, namely access to food composition information, application by users and understanding of the inherent value of these data in facilitating health-eating choices by consumers. NEXUS objectives included: (1) Compilation, storage and sharing of high quality food composition data and information; (2) Development and maintain user-friendly food information tools; (3) Reinforcement of organisational commitment to the EuroFIR goals; (4) Spread excellence and training; (5) Communication and stakeholder engagement; and (6) Cost-effective management bringing added value to EC investment.

NEXUS activities were organised under six Work Packages (WPs): Quality Standards, Certification and Thesauri Support (WP1); System Integration and Operation Support (WP2); Integration and Business Development (WP3); Training and Spreading of Excellence (WP4); Dissemination and Communication (WP5); and Management. The consortium comprised of 35 partners including 18 Third Parties. The General Assembly represented all beneficiaries, promoting real and durable integration, whilst the Executive Board was tasked with promoting integration between research activities and stakeholder engagement. An External Advisory Board ensured EuroFIR AISBL products and services were fit-for-purpose and met user and stakeholders' needs, ensuring Europe remained at the forefront of this area.

By building on partnerships and strategic alliances to deliver products and services in diet and health research and healthcare as well as policy and supporting regulations, NEXUS has strengthened the scientific and technological excellence in the European Research Area. EuroFIR AISBL will continue to support better coordination of national/ regional (especially in CEEC and WBC) funding for food composition research and extend critical mass by collaborating with international partners, reinforcing Europe's role in overcoming global diet and health challenges and limiting costs by avoiding duplication at a time of worldwide economic austerity.

By focussing on further application/exploitation, NEXUS extended the reach of previous activities. Partners were encouraged to share knowledge and expertise within the network and beyond. As a result, the food industry and consumer organisations have a better understanding of food composition data and its role in making healthier choices. NEXUS has supported application of food composition data in product reformulation and development, and helped ensure information supplied to consumers via food labels is of the highest quality. Links with ETP Food for Health and UEAPME have helped engage the food industry more effectively at national and European levels, and globally through FAO INFOODS and existing collaborators. In addition NEXUS has facilitated the delivery of data to EFSA to support exposure assessment in Europe.

NEXUS has enabled data to be compared globally for the first time, and contributed to the provision of future food information. EuroFIR AISBL has some members from outside Europe, notably Canada, Australia and New Zealand, and interacts with many more either directly or through FAO INFOODS. These users and experts will continue engage in activities supporting health and nutrition claims, validation of data for exploitation of non-nutrient bioactive compounds in plant foods in human health as well as

forming strategic alliances and dissemination routes for public health applications, and providing expert advice and training, which are beyond the scope of the original proposal.
Project Context and Objectives:
Overall project concept and objectives
EuroFIR NEXUS (NEXUS) aimed to develop, implement and refine the European Food Information Platform (EuroFIR FIP) to improve European research into the relationships amongst food, diet and health. In the longer-term, these enhancements will facilitate better access and, therefore, use and exploitation of EU national food data as well as the tools developed by the EuroFIR Network of Excellence (NoE) via the EuroFIR FIP for EU diet and health research, and implementation of standards and best practice in food composition information. Together, these form the basis for the long-term survival and financial independence of the legal entity EuroFIR Association Internationale Sans But Lucratif (EuroFIR AISBL); a non-profit, international, member-based association established in 2009 by nine EuroFIR NoE partner organisations, which is Brussels.

The overarching strategic aim of NEXUS was advance the integration and connectivity between available food composition data and its use by the scientific community, regulators, policy makers and the food industry for the benefit of European citizen. To this end, activities were focussed on three strategic themes, which related directly to public health challenges faced by Member States and the role of these stakeholders in addressing / resolving them (see Section 3.2 for further details): Strategic Theme 1 provide access to high quality, validated food composition data to address food quality, nutrition and public health challenges; Strategic Theme 2 work with the food industry (especially SMEs) in Europe to address these challenges
Strategic Theme 3 increase understanding of the value of food composition data and its importance in helping consumers make healthier dietary choices.

There were six key objectives associated with these strategic themes, to:
• Ensure a sound and coherent quality and technical approach for food data collection, storage, handling sharing and publication and increasing the visibility and implementation of the CEN Standard on food data and its application
• Refine, develop and maintain a diverse set of food information tools and repositories available on the EuroFIR Portal in order to facilitate the exchange of standardised food information including food composition data across Europe and the World, which will empower the entire community of food information users to improve the quality and thus also the meaningfulness of their specific products and services;
• Strengthen further EuroFIR’s existing institutional commitment to durable integration via the expansion of the core FCDB compiler organisation network (to include new FCDB compiler organisations from non-EuroFIR countries from within and outside Europe), new users and stakeholders, and refine strategy to attract new future income streams from a wide range of sources;
• Spread excellence, training and skills enhancing the impact of EuroFIR in the development, management and exploitation of food composition data and new research tools for public health nutrition research beyond the network through training, and sharing of knowhow and facilities;
• Build on the successful approaches to dissemination, communication and stakeholder engagement, to provide targeted resources to support food data use by the scientific community, regulatory bodies, policy makers and industry, and by the general public, and to maximise the effectiveness of dissemination and

potential uptake of tools and “best practice” procedures within both the scientific and end-user stakeholder communities;
• Direct and execute all management activities described in the Consortium Agreement and oversee the development and implementation of the long-term sustainability strategy by ensuring that EuroFIR Food Data Platform is embedded in the European research community, and is connection to all major stakeholders in the food and health area in close collaboration with all other WPs.

The consortium comprised of 35 partners including 18 Third Parties. The General Assembly represented all beneficiaries, promoting real and durable integration, whilst the Executive Board promoted integration between research activities and stakeholder engagement. An External Advisory Board ensured EuroFIR AISBL products and services, arising from EuroFIR NoE and NEXUS, met user and stakeholders’ needs, keeping Europe at the forefront of this area. The activities were organised under six Work Packages (WPs):

Quality Standards, certification and thesauri support (WP1): Food data – structure and interchange format EN 16104:2012 was published in November 2012 whilst ‘Guidelines for assessment of analytical methods’ (GAMA) were trialled by the EuroFIR Compiler Network. Work promoting the use of European Standards (CEN) amongst key users and stakeholders, and a revised edition of GAMA (supported by UHEL) will continue under EuroFIR ASIBL. GAMA is being used as a foundation for the Methods Wiki in TDS-Exposure (289108). Certification audits were completed for 18 organisations and recommendations made for further harmonisation. EuroFIR Thesauri were extended to provide access to the thesaurus manager reports; forums were used to support discussions about proposed amendments. A robust quality evaluation system within FoodCase (QE scirep) for data from scientific literature and other reports was established. Although different components and foods were assessed, feedback was largely consistent. Some terms were confusing or subject to interpretation, and the links between criteria for quality assessment and LanguaL were unclear but user friendliness scored highly; EuroFIR AISBL will undertake future amendments. MoUs with in the fields of metrology (IMEKO), global standards (GS1) and food composition in WBC, Cyprus, Ukraine and Russia will support further future collaborations, capacity development and training.

Systems integration and operation support (WP2): Activities focused on the maintenance and development of food information tools and repositories. Particular attention was given to FoodEXplorer and FoodBasket, increased functionality and publication of a new e-learning module, FoodCase (food composition database management system), and an Open Platform for Clinical Nutrition (OPEN). FoodEXplorer was revised based on past experience with eSearch. The innovative new interface allows users to search information from most EU Member States as well as Australia, Canada and USA, simultaneously. Users have access to a wide range of data, linking foods and nutrients through harmonised data description (LanguaL), standardised components and value description founded on the EuroFIR thesauri (standard vocabularies) and associated nutrient value information. FoodBasket supports users, particularly dieticians and SMEs, with the calculation of composite and prepared foods. The user-friendly, multi-lingual interface enables selection of any food composition dataset linked within FoodEXplorer. FoodBasket runs on mobile devices (e.g. smart phones and tablets) as well as desktop computers, and is fully integrated with other EuroFIR FIP resources. Recipes calculated in advance can be used as ingredients in new meals, and the results can be exported as text as well as XML-files. These and

other tools have enabled delivery of food information to other European projects (e.g. PlantLIBRA, TDS-Exposure, BACCHUS, DIETS2), and facilitate pan-European dissemination for food composition information. The potential for future harmonisation of food composition (EuroFIR) and food consumption data (IARC EPIC-SOFT), for improved dietary assessment, has also been considered and is being explored further in EuroDISH (311788). In addition, the online tools will be tested in the clinical environment in QuaLiFY, a proposed FP7 project currently under negotiation, which will bring together research developments from EuroFIR AISBL (NoE and NEXUS), NuGO (FP6), EURRECA (FP6), EUROGENE (FP6) and Food4Me (FP7).

Integration and business development (WP3): Effective delivery of technical support and shaping products of products and services were the focus of activities. EuroFIR AISBL has 23 compiler member organisations and access to 28 national food composition datasets. Collaboration with SMEs through EU-funded projects (e.g. RFID-F2F, PlantLIBRA, Pleasure, TDS-Exposure, BACCHUS) has strengthened and three more start in 2014 (QuaLiFY, ODIN and Precious). Compiler activities were re-constituted as working groups (WGs) in 2013 because of need for their input in specific areas, and collaboration with INFOODS continued with a new joint WG on Methods and organisation of the 10th IFDC (Granada, ES - September 2013). The National Institute for Health Development (NIHD, EE) joined as Associate Member Compiler in 2012 and other potential new members have been identified. Marketing for four ebooks (English, English and Greek, Slovak or Swedish) was refined; negotiations continue with other compiler organisations to publish additional languages with the Dutch NEVO dataset scheduled for December 2013. EuroFIR AISBL vision and mission were revised, the Strategic Activity Units (SAU) re-structured, and new models/ prices for membership launched. An Open Platform for Clinical Nutrition (OPEN - JSI, SI) was developed in collaboration with the European Federation of Associations of Dietitians through cooperation with the DIETS2 Thematic Network. Interviews were conducted with both scientific and marketing personnel across a range of food companies to determine how eBASIS might meet industry needs. Improvements to eBASIS facilitated a higher number of users after the minimum of training, and a pilot study showed assessment of exposure to bioactives could be achieved with this tool. BACCHUS (312090) will add data on polyphenols and bioactive peptides.

Training and spreading of excellence (WP4): The 11th post-graduate course on food composition was delivered by WU in Istanbul (TR), together with TUBITAK and EuroFIR AISBL. Although the current, limited training programme is successful, future training needs and the capacity of ASIBL members to deliver a wider programme was explored. Outcomes suggest the existing training opportunities may not be fit-for-purpose in the future as it is largely unrecognised as benefit and training is a low priority amongst members as a result of the wider economic climate. EuroFIR AISBL may develop a new programme of training modules in the future. A new elearning module on vitamin analysis was launched, and the functionality of this and the previous module enhanced. These modules have been integrated into the post-graduate course on food composition and WU Bachelors' Programme, and were used by the EU-funded project SMILING. A MoU has been signed with Balkan and EECA countries supporting the Balkan Food Platform and regional capacity building. Considerable effort has been expended in establishing this FCDB with data from regional foods and recipes, using web-based management software developed by a local partner (IMR). The first symposium on Capacity Development was organised in Belgrade (RS – January 2013) to promote cooperation.

Dissemination and communication activities (WP5): www.eurofir.org has been essential for dissemination. Following an overhaul in Year 1, new pages and updates were added and visits increased by 39%. It also performed well in search engines, coming second in Google ('food composition'). Links with EFSA and FP7-funded RTD projects have provided many opportunities for dissemination and networking, and NEXUS has worked closely with CommFABnet. Documents on healthy eating have been translated into Slovakian, and pages about food composition and EuroFIR published on Wikipedia (http://bit.ly/13YsuNQ) in Danish, Dutch, English, Finnish, German and Icelandic. There have been 15 peer reviewed publication and 144 publications. Dietitians and nutritionists were engaged specifically via DIETS2, and an oral presentation at WONCA 2013 (Prague, CZ) provided access to healthcare professionals (general practitioners) not reached previously. Links with the food industry and SMEs, frequently established through RTD projects, have been consolidated by membership or bilateral activities. A presentation about the OPEN was given at an event organised by BSH Hišni aparati, d.o.o. in Nazarje (SI). There has also been targeted dissemination at the national level promoting the ebooks. Tailored information about FoodEXplorer for all sectors has been disseminated. The 2nd Annual Meeting (March 2013, Ljubljana, SI) consisted of a project meeting and open congress on traditional and ethnic foods; 62 delegates attended the event from 20 different countries. Posters (24) were presented on a variety of topics including food data management systems and quality, new food composition data and research on traditional and ethnic foods. The posters were evaluated for content and accessibility (science communication) and a prize (bursary to attend 10th IFDC, Granada, ES) awarded (Agnes Kadvan, IMR, SI).

EuroFIR NoE demonstrated the need for a coherent pan-European food composition databank, and the commitment of partners to potential benefits from global cooperation with the creation of EuroFIR AISBL. NEXUS built on these partnerships and strategic alliances, and the application of EuroFIR AISBL products and services (e.g. EuroFIR FoodEXplorer) in diet and health research and healthcare. NEXUS has strengthened the scientific and technological excellence at the European level and contributed to the European Research Area by supporting better coordination of national and regional funding for food composition research and extending critical mass. EuroFIR AISBL will continue to collaborate with international partners to reinforce Europe's role in overcoming global diet and health challenges, and reduce costs by avoiding duplication and promoting collaboration at a time of worldwide economic austerity. By focussing on exploitation high quality food composition data, NEXUS extended the reach of NoE activities disseminating information about state-of-the-art European food composition databanks, tools, standards and codes of practice and participating in EU-funded research.

NEXUS partners were encouraged to share knowledge and expertise within the network and beyond. As a result, the food industry including European SMEs increasingly has an understanding of the value of food composition data and its importance in helping consumers make healthier choices. Nutrition labelling is mandatory in Europe, but research continues to show that consumers are confused about the information provided and struggle to apply it properly. NEXUS has facilitated consumers-friendly, scientifically accurate information through relationships with national consumer organisations and BEUC.

The link between EuroFIR eSMP (hosted by IARC) Food Composition Exchange Platform (FIP) has established a framework for standardising dietary consumption methodology in Europe, addressing the needs of national food consumption data managers and others (e.g. EFSA) to understand the impact of diet, food composition and lifestyle on healthy living. In addition to providing new tools and methods,

NEXUS has enabled data to be compared globally for the first time, and public health recommendations to be refined for specific European populations. NEXUS has contributed to future food information including health and nutrition claims, validated data for the exploitation non-nutrient bioactive compounds in plant foods in human health, and formed strategic alliances and dissemination channels for public health application as well as provided expert advice, training and support using targeted resources, which are beyond the scope of the original proposal. For example, because the food industry has a pivotal role in shaping food supply, NEXUS has helped ensure food composition data used by SMEs and the larger food industry during the reformulation of existing products and the development of new ones, and the information supplied to consumers via food labels is of the highest quality. NEXUS has also provided targeted support for SMEs, which have particular needs because they lack the technical expertise available to large companies. Links with ETP Food for Health and UEAPME have helped engage the food industry more effectively at national and European levels, and globally through FAO INFOODS and existing collaborations.
Project Results:

Food Composition Data: Quality Standards and Certification Framework

CEN/TC 387 finalised the Food Data Standard in March 2012 was sent them to CEN for formal vote (April 2012). The draft was submitted for the final vote by the CEN member countries in August and finally accepted and published as a European Standard on 3 November 2012. This European Standard (1) specifies requirements on the structure and semantics of food datasets, and interchange of food data for various applications. Food data comprises information describing various food properties and includes steps in the generation and publication of such data, e.g. sampling, analysis, food description, food property and value description. The standard regards food data as datasets covering identification, description and classification of foods including food ingredients, qualitative and quantitative food properties that can be measured, calculated or estimated, data quality values and other metadata, specifications of methods used for obtaining these values, references to sources for the information reported.

The standard includes requirements on: semantics and data structure for food data, content of referenced controlled vocabularies, XML encoding for interchange of food data. This standard does not include: food description methods, quality assessment methods, content of controlled vocabularies, for example controlled vocabularies for nutrients, database implementation. It is also the national standard in all CEN member countries and, together with EuroFIR technical specifications, will be used as the basis for all national food databases in Europe. EuroFIR AISBL and its compiler members, other national and international branch organisations, professional organisations and scientific networks in food and nutrition area will carry out further promotion and implementation of the standard.

An extended Quality Evaluation system for food composition data from scientific literature and reports (QE scirep) was developed and extended under EuroFIR NoE (2). A questionnaire was designed to collect general satisfaction levels concerning the FoodCASE quality module, and to store any problems and suggestions for improving QE scirep. Despite the requirement for improved quality assessment globally,

FoodCASE is the only database management system to have implemented this capability. Nine food database compilers took part in the assessment exercise. Although different component and foods were assessed, compilers reported very consistent remarks on several points. Some terms used in QE scirep (e.g. “if relevant" and "not applicable") were confusing, or revealed variable interpretations. Seven compilers used FoodCASE directly; their overall view was one of a user-friendly system with QE scirep scoring highly in this area (8-10/ 10). To encourage the use of FoodCASE QE scirep on a larger scale, the functionality will be modified to allow QE scirep answers to be copied to other data points.

EuroFIR Guidelines for the Assessment of Methods for Analysis (GAMA; see below) were given to the compilers during this exercise. It was not clear to what extend the compilers made use of this document because very few comments were received. The lack of key method steps in GAMA made it difficult for compilers to score one of the analytical criteria; this criterion was ultimately deleted for other reasons. But, none of the compilers used the EuroFIR Quality Assessment Forum to discuss any problems or potential solutions. It may be there were no issues to discuss, or the compilers were not comfortable using this tool or they found an alternative method preferable (e.g. email). Regardless, remarks and questions collected from this exercise were evaluated and described for each QE scirep category. A list of proposed modifications to QE scirep is given in the Deliverable, specifying in detail how the QE scirep guidelines need to be updated. Some modifications correspond to the addition of examples or precision in language for improved understanding, which will lead to robust assessment. Improvements and recommendations included:

• Reorganisation of assessment criteria for analytical quality control category and analytical method category with analysts. The absence of key method steps in GAMA for all possible methods also suggests this criterion is redundant since the QE scirep criteria deal with the description of key method steps in the data source;
• Update of the current QE scirep guidelines using the information in this deliverable;
• Replacement of “known” and “indicated” by “provided”. The general principle being that data on which compilers make their assessment should be “provided”, i.e. provided in the data source or inferred from information provided in the data source;
• Deletion of “if relevant” since there is no requirement for if relevant/ relevant or satisfactory where the answer NOT APPLICABLE can be selected;
• Removal of NOT APPLICABLE where possible to avoid misunderstanding/ errors
• Investigation of the potential for compilers to begin quality assessment only after having indicated if the food is manufactured, which will quality assessment to be more consistent and standardised. FoodCASE can then ‘choose’ the appropriate next question.

Improvements for scoring QE scirep and recommendations were also identified including:

• Exact formulas for scoring per category in detail to improve understanding
• Modification of the scoring algorithm to make it similar to scoring food descriptions
• Modification of the scoring algorithm to match the QE scirep guidelines
• Potentially, building a new scoring algorithm although no modification is needed in QE scirep or in FoodCASE for total scoring

In order to promote QE scirep more widely, two fact sheets (see Figures 1 & 2) have been produced, one aimed at national food database compilers (see Figure 1) and the second at users of food data generally. The latter includes an explanation of quality index scoring. The fact sheets need to be reviewed by EuroFIR members prior to more widespread publication. In addition, the QE scirep approach was presented and tested at the International Postgraduate Course on the Production and Use of Food Composition Data in Nutrition (Gebze-Kocaeli, 2012).

Other recommendations on how to continue quality work have also been identified, and will be passed to the newly established technical WG on Quality and Compiler Support including:

• Use existing EuroFIR Forum to keep compilers informed and provide them with the opportunity to share and resolve issues associated with using QE scirep;
• Create a sub-groups to pilot updates including those linked to understanding GAMA;
• Update FoodCASE based on changes made to QE scirep and NEXUS recommendations
• Disseminate QE scirep more widely (e.g. via INFOODS food compilers network)

EuroFIR compilers tested GAMA and a revised version was produced during NEXUS. Previous investigations have identified that analytical methodology is a key factor in data quality and specific criteria at the component level are needed for comparison of analytical data from different sources, especially by food composition data compilers that are often not experienced analysts. This deliverable describes how GAMA were created and made available to users to support EuroFIR data quality evaluation system. GAMA is a valuable tool for compilers and users to access information about analytical methodology for a range of components in relation to analytical data quality. GAMA has been relocated to UHEL (https://wiki.helsinki.fi/) as part of the overall sustainability plan. It will also be extended to include a list of contaminants selected as part of the on-going FP7 TDS-Exposure project (www.tds-exposure.eu).

Analytical methods used for the production of food composition data include those for analysis of vitamins, minerals and trace elements. Comprehensive information on all aspects of relevant analytical procedures was obtained from international standards, quality control procedures and scientific literature. The information provided for each micronutrient includes: background information on the component, description of reference methods of analysis and critical steps, available reference materials, proficiency testing schemes, description of other analytical methods available and relevant references. Information for each nutrient has been collated, edited and presented with hypertext links to other sources where more detailed methods can be accessed. EuroFIR compilers tested the effectiveness of the analytical method information for selected micronutrients to test and improve quality assessment of data from publications.

Certification of food composition database (FCDB) compiler organisations was a key part of the overall quality framework (3) developed in EuroFIR NoE and extended by NEXUS (see Figure 3). The aim was to identify strengths and weaknesses for each FCDB compiler organisation, specifically in management processes and technical capacities, and make recommendations for improving quality systems through ‘best practice’. A team of six experienced FCDB compilers, with a sound knowledge of quality systems and laboratory analytical methods, carried out the work. The process of reviewing food composition activities at 16 FCDB compiler organisations was useful for these organisations and NEXUS.

Typical recommendations included:

• Introduce an integrated database management system for compilation procedures including internal validation checks to reduce reliance on manual checking, and systems to import data and avoid manual data entry;
• Scan and save copies of archived documents (e.g. analytical reports) and make these available to other compilers and users;
• Add country-specific process SOPs based on individual country needs and working practices;
• Obtain more user feedback to improve data presentation and usability, and consider forming an advisory group to help shape the future development of the national FCDB to better meet user needs and requirements;
• Develop a website to enable users to access and search published data easily
• Extend data for traditional and ethnic foods commonly consumed in each country building on work initiated in EuroFIR NoE.

Overall, the reviews identified areas for improvement within organisations and identified 'best practice' procedures that could be adopted by other compilers. The review process encouraged compilers to focus on and improve quality systems, wherever possible, but the FCDB compilers were found to be making good use of standards and guidelines produced by EuroFIR already. Some organisations were encouraged to compile process documents and country-specific SOPs in a local 'food composition quality manual'. The newly formed WG Quality and Compiler Support will support continued sharing of key process documents and best practice amongst compilers in the future. It is clear from these exercises that for many compiler organisations the major constraint for implementing quality standards is limited funding, particularly for development of systems and staff resources. WG QSC can help compilers by addressing future needs and making available best practice guidelines as well as continuing the certification programme.

Food Composition Interchange Platform and associated tools
The activities focused on the maintenance and further development of food information tools and repositories available on the EuroFIR FIP (see Figure 4). Particular attention was given to FoodEXplorer and FoodBasket, elearning modules, FCDB management system (FoodCASE, Thesauri manager, Food Product Indexer and FoodTransporter), and Open Platform for Clinical Nutrition (OPEN).

FoodEXplorer, available via the EuroFIR FIP, helps users browse and retrieve food composition data (FCD). It was developed with feedback from the pilot tool, eSearch. Whilst still a web-based tool, its functionality, user interface and underlying database were completely reconstructed and recoded in a collaboration involving IMR, THL and EuroFIR AISBL [JSI] with input from IFR and EuroFIR AISBL on usability testing. FoodEXplorer supports simple and advanced searches and provides detailed food information for a wide spectrum of users from laypeople to experts, and supports food descriptions based on LanguaL, comparison of data from different food composition datasets, and data exports in EuroFIR Food Data Transport Package.

FoodEXplorer has been integrated with other tools on EuroFIR FIP such as FoodCASE and FoodBasket. Moreover, the food composition databases behind FoodEXplorer are being used to deliver information for

other European projects. Thus, integrated EuroFIR tools are facilitating the pan-European dissemination routes envisaged by NEXUS. More specifically, FoodEXplorer is an innovative interface for food composition data, which allows users to search information from most EU Member States as well as Australia, Canada and USA, simultaneously. Users have access to a wide range of data, linking foods and nutrients through harmonised data description (LanguaL), standardised components and value description with the use of EuroFIR thesauri (standard vocabularies) and associated nutrient value information.

FoodBasket provides an interface for the calculation of composite and prepared foods. The user-friendly, multi-lingual interface enables selection of any food composition dataset linked within FoodEXplorer. It runs on mobile devices (e.g. smart phones and tablets) as well as desktop computers, and is fully integrated with other EuroFIR FIP resources. Recipes calculated in advance can also be used as ingredients in new meals, and the results can be exported as text as well as XML-files.

FoodCASE (www.foodcase.ethz.ch) is an information management system for foods and nutrient values as well as calculation of aggregates and recipes, which is used by compilers in Switzerland (Swiss Society for Nutrition; www.5amtag.ch) and under testing and/ or implementation in the Netherlands, Portugal, UK and Germany. It was developed by ETHZ (CH) outside EuroFIR NoE, but based on many of the recommendations made by that project. FoodCASE consists of three levels. In the single-value level, data such as those found in laboratory reports or scientific publications are entered. In the aggregated level, single values are aggregated and, in the recipe level, nutrient values of recipes are managed. Wizards and automatic aggregation and recipe calculations support transitions from one level to another, much like any modern user interface (e.g. installing hardware). FoodCASE offers all the required fields defined in EuroFIR standards and necessary for comprehensive value documentation. It supports pre-defined thesauri such as LanguaL, the EuroFIR thesauri, and/or Food EX2 and can be extended with other thesauri such as INFOODS tag-names, or country-specific thesauri. It also offers a variety of interfaces (including web services) on the basis of which data can easily be imported and exported. There is also a website for uploading data. A unique feature of FoodCASE is the so-called quality framework. EuroFIR QE scirep helps food compilers control and improve data quality by undertaking quality audits and providing various tools for quality analysis; these data can be published for other users.

The Thesaurus Manager, developed by EuroFIR AISBL [Polytec] and DFI (DK), is used to maintain, view and report the content of the EuroFIR thesauri. Both are freely available from the LanguaL website. Detailed information can be obtained at: www.langual.org/langual_Literature.asp. Responsibility for maintenance and content reside with EuroFIR AISBL [supported by Polytec (CH) and DFI (DK)]. The EuroFIR thesauri consist of eight controlled vocabularies for the description of compositional values of a component in a given food. Thesaurus Manager allows users to view the thesauri directly and/ or produce reports. Some individuals are able to edit the thesaurus content in Thesaurus Manager.

EuroFIR Thesauri have been managed and maintained in collaboration with the EuroFIR Compiler Network (CN), now organised into WGs. Progress has been slow but work on further developing information in the Component and Method Indicator Thesauri, which associates EuroFIR terms with corresponding INFOODS tag-names is advancing.

EuroFIR AISBL [JSI] developed the Open Platform for Clinical Nutrition tool (OPEN). This web-based

application (www.opkp.si) was designed for (patient) meal planning, but can also design and calculate recipes and nutrient intakes for individuals and/ or groups using any FCDB, which complies with EuroFIR standards facilitating access to and exchange of comparable, high quality FCD for industry, regulators and researchers across Europe.

The Balkan FCDB was established during NEXUS and will be linked to EuroFIR FIP in the future. It is the first online Balkan FCD platform and uses Serbian food database management software (FCDM), which is compliant with CEN Food Data Standards and EuroFIR Technical requirements. It currently contains data on 1938 foods (ca 15 nutrients per food) and 149 traditional recipes from 7 CEEC/WBC countries including Croatia, Slovenia, Macedonia Serbia, Moldova, BiH, Cyprus and is hosted and maintained by IMR. It was built with cooperation from these countries, based on a MoU signed with EuroFIR IMR and CAPNUTRA (Capacity Development Network in Nutrition in Central and Eastern Europe), and each national representative is responsible or represents their 'food compiler organisation' albeit they may not be called such.

NEXUS has advanced two other technical developments since 2011:

1. An initial evaluation for future harmonisation and linking of food composition (via EuroFIR) and food consumption platform (via IARC EPIC-Soft Methodological Platform [eSMP]) for improved dietary assessment was completed. This work will continue in EuroDISH (www.eurodish.eu) and pilot an interface between the two platforms as well exploring possible longer-term governance.

2. The harmonisation and compatibility with other relevant international organisations involved with data management was key to the overall quality framework undertaken. GS1 (Global Standards), EuroFIR and INSA (PT) signed an MoU in September 2012 allowing development of a pilot connecting PortFIR (Portuguese FCDB) and GS1 Portugal certified data pool using GS1 standards so nutritional values for GS1 tagged products can be exchanged between these databases; a pilot exercise is on-going (see Figure 5). Primarily, this aims to support the food industry especially SMEs implement Regulation (EU) No 1169/2011, which comes into force in December 2014 and requires significant amounts of food information to be available to the consumer prior to purchase online.

Overall, NEXUS has delivered an integrated set of advanced tools that enable users to access, store or browse harmonised data. Moreover, the tools are easily accessed online (EuroFIR FIP www.eurofir.org) depending on user rights, which are managed centrally.

Dissemination, Training and Stakeholder Interactions

Dissemination and communication plans were developed in response to most recent public health and related policies with the aim of maximising the impact of products and services. The initial dissemination strategy was revised and updated to take account of progress, after EuroFIR NoE, and integration and business developments including:

• Continued widespread dissemination of information to users and stakeholders about the benefits of harmonised and state-of-the-art food composition data, and its application using new and established

online tools, European standards and codes of practice;
• Promotion of validated food data and application of online tools in combination with consumption data to create a single resource for food and nutrient intake assessment in Europe as a part of a wider food and nutrition research infrastructure, and,
• Raised awareness of EuroFIR AISBL, and increased income from membership and other sources including RTD funding to assure the longer-term sustainability of the Association.

The website has been essential for communication and delivery of resources for stakeholders. Updates on the public website were added including tailored information for researchers, post-graduate students, health professionals, policymakers, the food industry including SMEs and software developers. These provided general information about NEXUS as well as EuroFIR AISBL and the potential benefits of membership. The website was also used to highlight EuroFIR AISBL participation in other projects including PlantLIBRA, DIETS2, Pleasure, TDS-Exposure and BACCHUS. Collaboration with BaSeFood on traditional foods continued, and links to the project website and other news maintained.

Targeted dissemination to other compilers, users and stakeholder groups:
Links and activities with FAO INFOODS have been maintained with several experts involved in the joint method expert WG and planning for the 10th IFDC (Granada ES, September 2013). A joint WGs has continued with work on tag-names and component identifiers for complex nutrients such as carbohydrates, lipids, fatty acids, vitamins, and other bioactive compounds to promote greater harmonisation amongst systems. INFOODS and EuroFIR AISBL proposed changes to existing identifiers prior to a publication promoting dialogue, and EuroFIR AISBL is responsible for managing the agreed updates via the EuroFIR Component Thesauri. Editing these thesauri has been achieved using the Thesauri Manager, which permits read-only access by the wider scientific and user communities for discussion and sense-check. NEXUS also contributed to the consultation within INFOODS regarding handling of food composition data, which led to the publication of global guidelines www.fao.org/guidelines.

Funded originally by the UNU, the Network for Capacity Development in Nutrition for Central and Eastern Europe (NCDNCEE-CAPNUTRA) has been extended during NEXUS with the signing of MoUs between IMR/CAPNUTRA and EuroFIR AISBL, and representatives of several WBC/CEEC countries (including Federation of Bosnia & Herzegovina, Cyprus, Croatia, Republic of Macedonia, Republic of Moldova, Montenegro, Russia and Ukraine and EuroFIR AISBL). The aim is to develop and apply food composition data for nutrition and public health research in this region. Workshops held in May 2012 and January 2013 (IMR, RS) identified training needs in FCDB management as well as analytical methods. Coordination of potential funding opportunities in Horizon 2020 and regional initiatives will continue through these agreements and the emerging relationships.

EuroFIR has engaged with dietitians and nutritionists through DIETS2, and via scientific publications and presentations. Peer reviewed papers have been published on dietary strategies to maintain vitamin D status (4), mineral composition of ethnic foods (5 & 6) and the EuroFIR FIP (7). EuroFIR presented posters for other healthcare professionals at the Pioneers in Health Conference (Brussels BE, June 2013) and the final DIETS2 conference (Non-communicable diseases: Dietitians' response to Health 2020, Lake Garda IT, November 2013) as well as an oral presentation at WONCA 2013 (World Organisation of Family Doctors, Prague CZ, June 2013), all of which offered an excellent platform to disseminate to healthcare

professionals besides dietitians and nutritionists.

Links with the food industry and SMEs, frequently established through RTD projects, have been consolidated with uptake of membership or bespoke bilateral activities. A presentation about OPEN was given at an industry event organised by BSH Hišni aparati, d.o.o. (Nazarje, SI) and, at the national level (GR, SK, EI and SE), the availability of bi-lingual ebooks has been promoted amongst the industry including SMEs and higher education. EuroFIR AISBL also published a summary of the food composition tools in the CommFabNet Innovation Catalogue (8) presented at the 2nd Bioeconomy Forum (Brussels BE, September 2013); PlantLIBRA published information about the plant-food supplements database (ePlantLIBRA) at the same event.

Engaging with consumers is important albeit difficult to achieve. Information about FoodEXplorer, based around nutrition labelling and the changes arising from new regulations, has been developed and will be published in the future (online). Information will also be sent to BEUC and national consumer organisations as it become available/ perceived to be relevant.

EuroFIR AISBL members at the 10th IFDC in Granada presented several talks and posters in September 2013 highlighting key NEXUS developments, including FoodEXplorer and FoodBasket, food composition work on-going in other FP7 projects (e.g. PlantLIBRA) and wider, more strategic efforts such as the activities in EuroDISH. A workshop on food components (tagnames) was organised with FAO INFOODS and attended by EuroFIR experts.

Nutrient analysis for non-chemists elearning module, developed by WU, was installed on the EuroFIR NoE website (9) and, through this collaboration, made available to the EuroFIR partners and subsequently EuroFIR AISBL members. This module has been integrated into the WU BSc curriculum and EuroFIR AISBL has used this example to demonstrate how EU-funded elearning modules can be incorporated into higher education and be maintained in the longer-term. A second module, Vitamins, was developed based on nomenclature from published work and includes the identity and function, occurrence in foods, dietary sources, data in FCDB, importance of modes of expression, distinction between water- and fat-soluble vitamins, and general issues surrounding vitamin analysis. The elearning modules are SCORN 1.2 compliant allowing them to be shared via different learning management systems (e.g. Blackboard, Moodle) or the digital learning environment of Topshare International BV (NL). Access has been optimised for Microsoft Internet Explorer (6 and higher) and Mozilla Firefox (1 and higher). The only plug-in/add-on needed is Adobe Flash player. Both modules are can be accessed using mobile devices (e.g. smart phones and tablets). Nutrient analysis for non-chemists has been used by SMILING (EU GA 289616) in Hanoi (VN) in parallel with EuroFIR ‘Guidelines for Quality Index Attribution’ to explore the value of original data from scientific literature, demonstrating the usefulness of tools developed by EuroFIR in food composition-related education globally. The modules were also presented by WU at the 1st Australian Food Metrology Symposium (Melbourne AU, October 2012) arousing the interest of several participating members of OceanaFoods and AsiaFoods.

The Mamara Research Centre (TR) hosted the 11th International Postgraduate Course (October 2012): Production and use of food composition data in nutrition, which was delivered by WU in cooperation with TUBITAK and EuroFIR AISBL. There were 15 participants, two of whom (RS) received NEXUS bursaries.

The programme consisted of: Introduction and overview of food composition; Food and nutrition priorities and sampling issues; Recipe calculations; Analytical methods; e-learning /data quality; Database management; and Food description: principles of compiling, using LanguaL and Application. Participants were given the opportunity to evaluate the course. Participants rated the course as very good. As most participants were compilers, they expressed their intentions to bring the course issues into practice as: “improve food composition database” and “advocate FCTs in developing countries”.

Future sustainability and new developments

One of the key NEXUS objectives was to establish medium to longer-term sustainability plans for via EuroFIR AISBL. Belgium law on International Associations (as set out in the AISBL Articles of Association) determined the legal structure of EuroFIR AISBL. In practice, however, there is some flexibility in how the organisation is managed and the location of the Office.

The vision and mission of EuroFIR AISBL were refined and refocused during Year2 (2012-2013). More specifically, as EuroFIR AISBL became an independent broker of validated food information, the number and aims of Strategic Activity Units (SAU) were restructured, and new model for ordinary membership developed with greater flexibility and lower costs for existing and potential members.

The objectives for EuroFIR AISBL from January 2013 were to:

- Enable compilation and exchange of validated food composition data by national food composition database compiler organisations globally;
- Develop membership benefits including access to data and other tools and services;
- Facilitate bespoke data supply and consultancy services;
- Promote inclusion of high quality, validated food composition data/ information in the wider food and health research infrastructure in Europe;
- Provide a forum for networking and information exchange;
- Retain and expand funding levels (Membership and RTD) and seek new funding streams for users and stakeholders including Research and Technological Development and commercial projects;
- Support relevant training and continued professional development amongst diet and health researchers, national food compilers and graduate students.

Five SAUs have been developed from core competences and form the basis of key activities:

- SAU 1: Membership and membership benefits
- SAU 2: Bespoke data compilation and consultancy services
- SAU 3: RTD projects and tenders
- SAU 4: Training and continuing professional development products
- SAU 5: Stakeholder engagement, advisory and events services

The challenge will be to encourage NoE and NEXUS beneficiary and 3rd parties to continue contribute to EuroFIR AISBL without additional funding (e.g. via the WGs) and, thus, commit to the sustainability of EuroFIR AISBL whether as members or in-kind, both with associated costs. It is essential that compiler and non-compiler members participate, and discuss needs and requirements in relation to future FCD, FCDB and tools. Several EuroFIR AISBL Directors are WG Chairs and provide a direct link to the AISBL mission and future strategy as set out in the 2013 Business Plan, which will be updated and approved

annually.

The Technical WG will be responsible for maintaining and up-grading tools and other technical support as summarised in Table 1. The roles and participants of WGs are summarised:

Technical Working Group (TWG)
Role: provide technical support and know-how to national compiler members, and be an interface between AISBL members, and users and stakeholders whether internal or external.
Chair: THL and EuroFIR AISBL [JSI]
Secretariat: EuroFIR AISBL

Tasks: Tools and repositories:
• Maintain, upgrade and integrate existing EuroFIR tools and repositories in consultation with Quality and Compiler Support WG and users
• Make recommendations for the development of new tools and repositories
• Contribute to the development of new standards for the harmonisation of food composition and consumption data including: open data, web-services, and data exchange (food items, recipes & composite dishes)
• Support EuroFIR AISBL in on-going projects and assist in the development of new project proposals related to food, nutrition, health and ICT
• Provide technical support including EuroFIR AISBL website, webinars and forums
• Support research and technology development including food composition data mining (analysis) and food ontology

Operation: email and online/Go-To-Meetings with at least one workshop per year

Members: THL (FI) and EuroFIR AISBL [JSI] (SI) (co-chairs], DTU (DK), Matis (IS), UGR/BDECA (ES), ETH/Premotec (CH), RIVM (NL), IFR (UK) and EuroFIR AISBL (Secretariat). Other members/external experts will be co-opted as necessary.

Quality and Compiler Support WG (QCS WG)
Role: provide technical support and know-how to AISBL members focusing on data quality systems and certification, analytical methods and thesauri.
Chair: RIVM and IFR
Secretariat: EuroFIR AISBL

Tasks:
• Maintain, disseminate and support data quality assessment procedures
• Develop compiler certification scheme and make recommendations for continuation
• Maintain overview of analytical methods and propose how GAMA wiki can be updated, subject to funding and in-kind support
• Maintain and make recommendations for EuroFIR Thesauri (methods and components)
• Provide an online forum for members facilitating discussion and identification of opportunities for new projects and funding

• Make recommendations for training needs for members and provide input/ support for teaching as appropriate

Operation: email and online/Go-To-Meetings with at least one workshop per year

Members: RIVM (NL) and IFR (UK) (co-chairs), all compiler members, ordinary members, External experts/stakeholders will be co-opted as necessary.

User Groups (UGs)
Currently, there are two user groups planned: FoodCASE (chaired by INSA [PT]) and OPEN (chaired by JSI [SI]). FoodCASE UG will include representatives from IFR (UK), RIVM (NL), MRI (RS) and Swiss Nutrition Society (CH) and will review current best practice among users and identify new modules/ enhancements, which can be recommended for implementation. The OPEN UG will be launched by EuroFIR AISBL (JSI) in 2014.

Current & future developments and new funding
Collaboration with SMEs was enhanced by participation in EU-funded projects such as RFID F2F, Pleasure and BACCHUS and new proposals (e.g. Qualify, ODIN), all of which have several SME partners. It is anticipated these relationships can be translated into bi- or multilateral activities in the future. The National Institute for Health Development (NIHD) joined as an Associate Member Compiler in 2012 and is expected to become a full member in due course.

The Compiler Network has been transformed into two Working Groups and will support data updates, EuroFIR Thesauri as well as Data and Document Repositories, dissemination, greater visibility (e.g. on Wikipedia) and new webpages. These activities will now be translated into outputs via the WGs. The collaboration with INFOODS will continue at all levels.

New potential members have been identified through a number of channels (e.g. email enquiries, activities at events). Stakeholders' and members' needs and requirements will continue to be considered in the refinement of existing and development of new products and services. An external review of EuroFIR membership packages took place in latter half of 2013 with the aim of maintaining and enhancing relationships with members following cessation of EU-funding and, in particular, engage more with members in identify areas that need to be improved or ideas for development of new products or services.

Dissemination and communications channels have been reviewed, and changes are being implemented gradually. EuroFIR NoE or NEXUS did not include any social media. These channels are now sufficiently established in B2B and B2C communications to make them worthwhile (e.g. LinkedIn, Twitter, Facebook). However, many members are still reluctant to use these tools and concerned about potential problems. To begin the process, an account created in LinkedIn (, which has attracted 21 followers without engaging in any (deliberate) publicity. The LinkedIn logo and link has now been added to staff email signatures to promote further interest now the tools have been added to the Products pages. A policy for use of Twitter and Facebook has been drafted for discussion, and the EuroFIR Twitter page will be live before end 2013.

To support the EuroFIR FIP and associated tools as well as Office working/ project management, EuroFIR has further developed its IT infrastructure based on established, open-source software. Secure user data and information with an LDAP (Lightweight Directory Access Protocol), which is an Internet protocol that applications use to look up information on a server, has been created with the additional benefit of single log on to access to all systems. The strategy behind these developments has been to build the application pool from independent, often remote-hosted, building blocks, which together form the EuroFIR FIP. This virtual network is more secure and easier to maintain than WAMP frames (Windows-Apache-MySQL-PHP). Applications such as FoodEXplorer, FoodBasket, elearning and FoodTransport have been developed independently, and integrated with the infrastructure and, to support further development, all documentation has been archived appropriately. Because EuroFIR AISBL is international, all forms of online communication between the association and its members (e.g. email or training for tools) is vital.

EuroFIR AISBL has secured funding from four RTD projects in 2013 (BACCHUS, EuroDISH, TDS-Exposure and iFAAM). Three other proposals are currently under contract negotiation with the EC (ODIN, QualiFY and Precious) and are expected to commence in late 2013/early 2014. In each case, EuroFIR AISBL activities are core to project outputs, and articles summarising the role of EuroFIR AISBL will be added to the EuroFIR website. Dissemination via existing RTD projects will continue beyond NEXUS. EuroFIR AISBL has worked closely with CommNet (latterly CommFabNet), which supports dissemination by FP6 and FP7-funded projects in the areas of food, agriculture and biotechnology. EuroFIR materials were distributed at the European Science Open Forum 2012 (Dublin IE) and articles continue to be published online (10).
Potential Impact:
EuroFIR NoE demonstrated the need for a coherent pan-European food composition databank, and the commitment of partners to potential benefits of global cooperation with the creation of EuroFIR AISBL, a non-profit association based in Belgium. NEXUS is building on established partnerships and strategic alliances to disseminate nutrition and public health applications of EuroFIR AISBL products and services as well as providing expert advice and support.

The follow-up project, NEXUS has continued some NoE activities and finalised several important tools and datasets for use in food and health research in Europe. Through NEXUS and other EU-funded projects, scientific and technological excellence in food composition and FCDBs is strengthened by EuroFIR AISBL at European level and contribute to the European Research Area through better coordination of various national and regional funding for food composition research and extending critical mass. The collaboration with international partners reinforces Europe’s role in overcoming global diet and health challenges as well as reducing costs by avoiding duplication and promoting collaboration at a time of worldwide economic austerity. By focussing on delivery and exploitation of high quality food composition data, NEXUS is extended the reach of previous activities amongst existing and new users by disseminating information about harmonised and state-of-the-art European food composition databanks, tools, standards and codes of practice.

EuroFIR AISBL members are encouraged to share knowledge and expertise both within the Association and via various project consortia. As a result, the understanding of the value of food composition data is being increased and its importance in helping consumers make healthier choices clearly demonstrated to stakeholders including food industry (especially SMEs), researchers, dietitians and health professionals,

regulators and policy advisers. Nutrition labelling is increasingly common in Europe, and recently adopted European Food Information Regulations make back of pack nutrition labelling compulsory for most packaged foods and drinks as well as setting out requirements for voluntary front of pack labelling. Research, however, suggests consumers are confused about the information provided and struggle to apply it properly. NEXUS has facilitated the use of consumers-friendly, scientifically accurate information through relationships with national consumer organisations and BEUC.

The links between food composition and consumption must be integrated in the future if users are to have a proper understanding of what is being consumed. NEXUS has explored ways to link food composition data (EuroFIR FIP) with the EPIC-Soft food consumption platform. This will be expanded in EuroDISH where a framework for standardising dietary consumption methodology in Europe, addressing the needs of national food consumption data managers and others (e.g. EFSA) regarding the impact of diet, food composition and lifestyle is being developed. In addition to providing new tools and methods, it will also allow data to be compared globally for the first time, and public health recommendations to be refined. Links with JPI's "Determinants of Diet and Physical Activity; Knowledge Hub to integrate and develop infrastructure for research across Europe" (DEDIPAC) were established by NEXUS in collaboration with IARC, and will enhance initial developments linking food composition to food consumption data in Europe. In particular, further development and implementation of the pan-European harmonisation of research and surveillance regarding dietary and physical activity behaviours and their determinants.

Added-value lies in contributing to future food information including health and nutrition claims, validated data for the exploitation non-nutrient bioactive compounds in plant foods and dietary supplements in human health as well as strategic alliances and dissemination channels for public health application, expert advice, training and support for using targeted resources. Because the food industry has a pivotal role in shaping food supply, NEXUS has helped ensure food composition data used by SMEs and the food industry during reformulation of existing products and the development of new ones, and the information supplied to consumers via food labels, is of the highest quality. SMEs have particular needs because they lack the technical expertise available to large companies, and targeted support was provided by NEXUS and will continue through EuroFIR AISBL. EuroFIR AISBL has some members from outside Europe, notably Canada, Australia and New Zealand, and interacts with many more either directly or through FAO INFOODS. These users and experts will continue to in the new WGs and may join the AISBL as members, further strengthening the food composition network and know-how globally.

References

1) CEN. European standard. Food data – structure and interchange format. EN 16104:2012

2) Westenbrink S., Oseredczuk M, Castanheira I. and Roe M. [2009] Food Composition databases: The EuroFIR approach to develop tools to assure the quality of the data compilation process. Food Chemistry, 113 (3), 759-767.

3) Roe M, Castanheira I, Giertlova A, Lindroos A-K, Westenbrink S, Beernaert H and Finglas PM. [2014] Review of quality management and data compilation processes in European food composition data

compiler organisation. Food Chemistry [in preparation]

4) Kiely M, Black LJ. [2012]. Dietary strategies to maintain adequacy of circulating 25-Hydroxyvitamin D concentrations Scandinavian Journal of Clinical & Laboratory Investigation April 2012, Vol. 72, No. S243, 14-23

5) Khokhar S, Garduño-Diaz SD, Marletta L, Shahar DR, Ireland JD, Jansen-van der Vliet M, de Henauw S. [2012] Mineral composition of commonly consumed ethnic foods in Europe. Food Nutr Res. 2012; 56. doi: 10.3402/fnr.v56i0.17665. Epub 2012 Jul 3

6) Khokhar S., Ashkanani F., Garduno S.D. and Husain W. [2013] Application of ethnic food composition data for understanding the diet and nutrition of South Asians in the UK. Food Chemistry 140 (3), 436-442

7) Bell S, Pakkala H, Finglas PM [2012]. Towards a European food composition interchange platform. International Journal for Vitamin and Nutrition 83 (3), 209-215

8) 2013 Innovation Catalogue published by CommNet, the network of the FP7 project CommFABNet, CSA GA289699. www.commnet.eu

9) Busstra MC, Hulshof PJM, Houwen J, Elburg L, Hollman P CH [2012]. Nutrient analysis explained for non-chemists by using interactive e-learning material. Journal of Food Composition and Analysis. 25, (1), 88–95

10) Gibson-Moore H. [2013]. EuroFIR: Where we are now? Nutrition Bulletin: 38 (3), 358–362, Article first published online: 16 AUG 2013 DOI: 10.1111/nbu.12049

List of Websites:

www.eurofir.org

Paul M Finglas (paul.finglas@ifr.ac.uk)

Last update: 18 July 2014

Permalink: https://cordis.europa.eu/project/id/265967/reporting