

# European Food, Nutrition and Health Research Infrastructure



**1) Pieter van 't Veer; 2) Karin Zimmermann; 3) Paul Finglas; 4) Krijn Poppe; 5) Sabato D'Áuria, and 6) Giuditta Perozzi.**

**Consortium: 1) Nutrition, Public Health and Sustainability, Wageningen University (NL), 2) Wageningen Economic Research, 3) Quadram (UK), 4) Institute of Food Science (ISA-CNR) and 5) Centro di Ricerca per gli Alimenti e la Nutrizione (CREA)**

## **Introduction**

Based on the roadmap developed in EuroDISH (EU FP7; 2012-15 – [www.eurodish.eu](http://www.eurodish.eu)) and European Strategy Forum on Research Infrastructures (ESFRI) recommendations (2015) for a food and health research infrastructure (RI), the Food, Nutrition and Health Research Infrastructure (FNH-RI), (<https://www.fnhri.eu/about/>) will bring together existing food- and health-related RIs at different stages of development and maturity including:

- RIs originating from previous EU-funded projects (e.g. EuroFIR, NuGO, GloboDiet, ISEKI-Food, Food4me),
- on-going EU-funded projects (e.g. iFAAM, REFRESH, SUSFANS and RICHFIELDS),
- the Joint Programming Initiative Agriculture, Food Security and Climate Change (JPI-FACCE) and a Healthy Diet for a Healthy Life (JPI-HDHL with Knowledge Hubs DEDIPAC & ENPADASI).

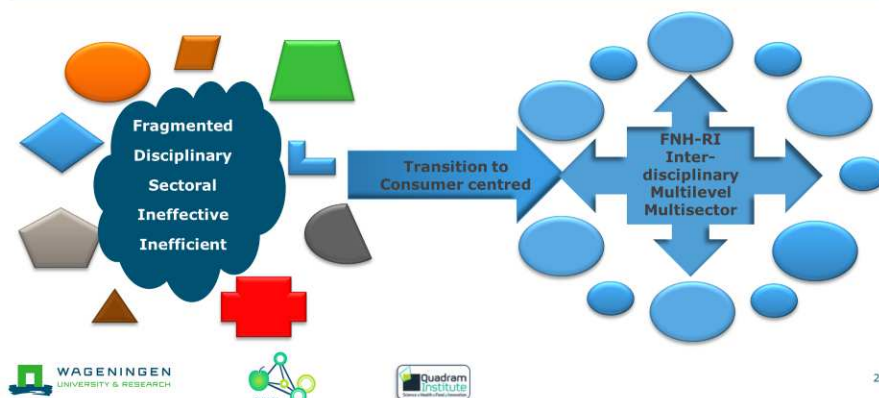
The FNH-RI supports the scientific analysis of the relations between the food system as food supply chain, food innovation, food behaviour and its determinants, consumer behaviour and food consumption as related to nutrients and food constituents, nutritional status, bodily functions and mechanisms and the maintenance and promotion of healthy diets and lifestyles and prevention of diseases and how these relations are or can be influenced by policy and industry.

## **Goal**

The objectives of the FNH-RI are to:

- realise and sustain a European research infrastructure in the domain of food, nutrition and health, which enhances collaboration and translation of know-how along the food chain and consumer including policy and civil society organisations;
- facilitate quality, cost effectiveness, and availability of resources in the research system, and enhance innovation capacity, integrate new knowledge, and deliver environmental and socially important innovations to address research challenges in food, nutrition and health domain;
- bring together expertise across disciplines (trans-disciplinary approaches) and geographical borders (trans-national basis) to support scientific researchers in scientific institutes, civil and policy organizations and businesses and to foster top-level science, innovative research, industrial competitiveness and policies to achieve key societal targets.

## Research Infrastructures: overcome fragmentation



The emergence of big data and open data as well as new generation of data-driven research calls for the development of a digital research infrastructure that enables efficient and effective use of data and tools from different sources and in different formats. Digital research infrastructures are expected to facilitate and accelerate data-driven research in many domains. This is especially the case for emerging cross-cutting domains such as food, nutrition and health where data and tools are collected and stored in disciplinary and sectoral silos. The current state of fragmented data and lack of information results in knowledge gaps that prohibit policy makers and the private industry to develop effective interventions that help shifting current consumption patterns towards more healthy and sustainable diets.

### **Science case FNH-RI**

#### *Current situation*

Europe is faced with a range of food and health related challenges. Current levels of food production and consumption are unsustainable (e.g. pollution, depletion of natural resources). In addition, dietary quality of current consumption patterns is paired with socio-economic disparities in health. Obesity levels and chronic diseases such as type II diabetes, cardiovascular diseases, and certain forms of cancer are alarming. Demographic trends such as the ageing population and urbanisation make these issues even more urgent. Therefore, there is growing interest in public health, and environmental sustainability as related to food, behaviour and well-being of consumers throughout the life cycle.

## Consumer: Food System & Preventive Care

### **Agri-Food System**

- Food reformulation (salt, saturated fat, sugar), breeding 'better' varieties
- Food safety and circular production system
- Environmental sustainability, animal welfare, zoonoses
- Economic sustainability of SMEs, food companies, livelihood farmers, fair-trade

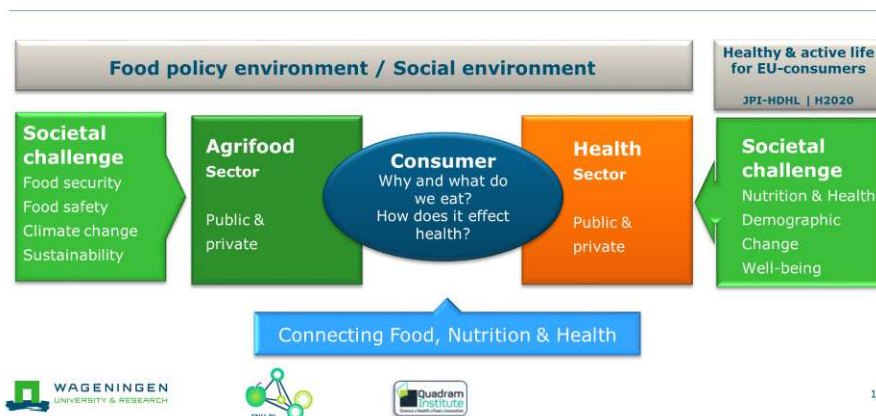
### **Preventive Health Care**

- Health - physical, social, mental; as ability to adapt, fitness, well-being
- Functional markers & health status: Macro & micronutrients, bioactives
- Physiology and rewards of consumption, food matrix, digestion, energy balance
- Metabolism of nutrients, genetic make-up and disease pathways
- Nutrient adequacy and prevention of chronic diseases

## Integration into a food systems approach

The transition of our present food system to a future-proof healthy, sustainable and circular system is one of the grand societal challenge for the next decades. This transition requires a food systems approach that accounts for the intertwined supply chains and that balances multiple societal impacts; moreover, a systems approach internalizes the interests of public and private societal actors, including farmers and citizens. The food systems transition requires excellent science for societal impact, i.e. top-level research at the cutting-edge of food and health sciences. Interdisciplinary food systems research can set the principles for optimizing the food system as a whole instead of subsystems that are governed by societal actors or disciplinary scientists alone. To this end, big data and data platforms are instrumental as enablers of interdisciplinary collaboration and societal innovation. For its scientific underpinnings, the food systems transition can be accelerated by digitalization of our society. A food systems approach: "The challenge is to come up with a data-driven information system which will structure and standardize sustainability information across the food production system. Specialized data security and anonymization approaches will have to be developed, keeping in mind that such systems must be fully accessible to the many SMEs of the food sectors as well. This will need to be coupled with research that determines what information would be suitable to engage and not just inform consumers." The food system approach integrate three pillars, 1) determinants and intake, 2) health and wellbeing and 3) the food supply chain, that links, standardizes and harmonizes all kinds of data collected by a broad range of actors. This integrated system will make it possible to do top level research as foresights, study trade-offs and synergies and develop policy scenarios that help support policy making towards more healthy and sustainable diets.

## The consumer as link between the agri-food and health sector



Consumers collect a lot of information through the adoption of mobile apps and tech-wear. In addition, more and more data becomes available in the private sector, such as purchase data, and in the public sector, such as medical data or demographic data. We envision a research infrastructure that advances understanding and creates new insights and opportunities for scientific breakthroughs and societal and technical innovations by connecting this scattered food, health and lifestyle data. This research infrastructure will bring together transdisciplinary expertise across the food and health domain and will enable sharing, harmonization, integration, and standardisation of data. The RI will give insights in trends and underlying factors. These insights leading to scientific breakthroughs and innovation, in turn, can help in the adoption of more healthy and sustainable diets by consumers.

### **Impact**

It is foreseen that the FNH-RI can contribute to the Food2030 agenda, facilitate in underpinning of the member states' food and agriculture and (public) health policy, contribute to the national research budgets to stimulate collaboration between research and companies, the knowledge agenda and contribute to the food and agriculture knowledge and innovation systems. In addition, Food NEXUS and in lesser extent, the FoodKIC consortium EIT Food, representing large industry and SMEs initiated is already a close collaboration with FNH-RI. Regarding trends as consumer-driven and responsive chain approach, co-creation and consumer-led innovation we foresee FNH-RI as a great opportunity to link researchers and citizens: the consumer as data provider supporting breakthroughs in life-style and well-being. Specific impact are:

- European and global top level research on food-nutrition-health: The FNH-RI focuses on food and nutrition security and health and governs data, tools and services to facilitate top level research on the food chain, food behaviour and consumption, nutrition and health by standardization and harmonization of data, data interoperability and -management, e-interfaces, data access policy, ethical and IPR requirements and trans-disciplinary and trans-national governance. This fosters

cooperation with aligned RIs as ELIXER and BBMRI and stimulates participation of third countries e.g. Australia, Kenya and Ghana as well as the food industry;

- Addressing user needs: The FNH-RI will enable researchers and other users to address key research challenges, encompassing the wider the food and health challenges security under framework research programmes as FOOD 2030, as well as helping to contributing to the proposed KICs, which will support research, training and entrepreneurship in Europe;
- Paradigm shift in food research: The FNH-RI will facilitate new data collection tools as e.g. sensors, wearable tech, to stimulate citizens data collection and science by using e-science to link data sets. The European citizen will be the main data provider and, excitingly, the main user, enabled by a data platform for researchers to generate new insights from the data.

#### *Examples of added value for facilitating breakthroughs*

The sharing, integration and standardization of data and the development of standardized tools will lead to improved insights in the what, when, where, why and how of food consumption. It will enable researchers to conduct top-level research and gain the necessary insights. The RI will foster innovative research, industrial competitiveness and policies to achieve key societal targets in the food and health domain. The RI will lead to breakthroughs in the area of:

#### **Example 1: Systems approach: Linking sustainability and public health to the food chain.**

### Potential impact and Breakthroughs

#### **Food system – Protein shift**

- Goal: to shift consumer behaviour towards more sustainable, healthy and affordable protein choices
- The ambition of FNH-RI is to facilitate to extend existing and new data to improve previous approaches towards sustainable food choices
- FNH-RI facilitates to combine consumer and food system actor focus to increase sustainability in food production and consumption



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Consumers can benefit from linking the food supply chain, because it can help to empower them to make informed choices, for example through systems enabling to conduct a query (e.g. barcode scanning) to retrieve relevant information on products and the underlying food chain. Data on the production, conversion and nutritional profile of foodstuffs needs to be made available and continuously updated, since product lifecycles are often quite short. Data anonymization and data security strategies, as well as competition issues need to be considered. This requires collective action by producers, retailers and many other participants. Ideally, such action would be coordinated by an EU-wide organization. This improved information can help consumers in trade-offs between different sustainability and health dimensions.

#### **Example 2: Personalization: Dietary Lifestyle advice relevant to consumers.**

The consumer-centred data platform can empower consumers to consume healthy and sustainable diets adapted to their lifestyle. Personalised advice can be generated based on a combination of data sources, and could be linked to recipes, shopping lists, online supermarkets etc. Contextual factors and food preferences can be taken into account.

## Potential impact and Breakthroughs

### Consumer – Smart kitchen

- Goal: Empowered consumers able to make sustained, healthy and sustainable dietary choices
- The ambition of FNH-RI is to facilitate to extend new and existing tools to increased consumer trust by standardize, harmonize and integrate data for evidence based feedback structures
- FNH-RI facilitates to combine consumer and Internet- of Things technology e.g., 3D printing and open internet food apps, to personalized his food and health profile



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The consumer can easily get insight in his or her food intake and other food-related behaviour. The increased insights in and understanding of food intake can help the private sector to develop and market new products that better match the needs and wishes of consumers. Training can be provided for product developers in the use of consumer insights. Finally, policy makers will be enabled to develop more effective food policies by a better understanding of determinants of food intake.

### Example 3: Healthy life and Wellbeing

## Potential impact and Breakthroughs

### Preventive health care system – Smart home for elderly

- Goal: to reduce the preventive health care cost of moving people to elderly homes. Ageing in place is the mantra.
- The ambition of FNH-RI is to facilitate to extend existing and new services and knowledge to improve business models and social innovation.
- FNH-RI facilitates to combine consumer and preventive health care system by provide connect big data and new data to create opportunities for new algorithms, to find patterns for advance predictions.



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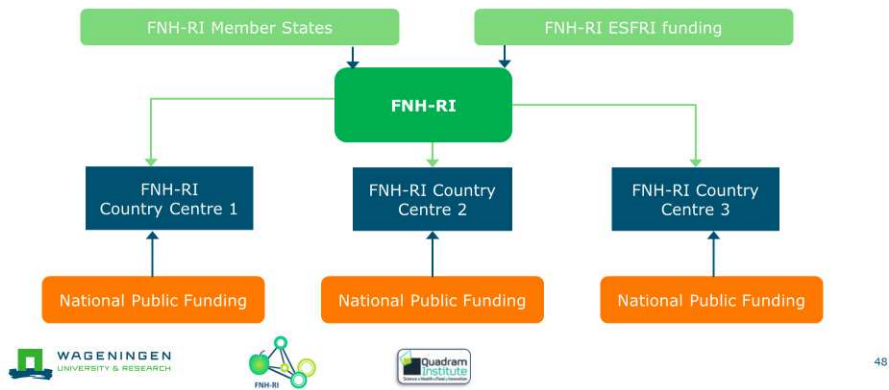
The consumer can easily get insights in his or her own health parameters and the link with food consumption. Also, the effect of a range of lifestyle factors on his or her wellbeing can better be monitored. In addition, personalized food advice can be improved by including health parameters. The private sector can better develop products that contribute to public health when the health-food link becomes more clear. Also, products can better be targeted to consumers. Finally, policy makers can develop policy interventions that contribute to public health, when insight in the food-health relationship are more clear. Also, education and information can be improved when this link becomes more clear.

The private sector can benefit by an increased trust of consumers in the supply chain, through a perception of consumers of the food sector as being more transparent. Also, product failure rates could be lowered by increased consumer engagement. Bidirectional and interactive communication through new platforms that can increase consumer trust and can provide valuable insights in trends, needs and wishes. This can help to better match product offerings/availability with consumers needs and wishes. Finally, policy makers can develop measures that are aligned with those of the retail, catering and food industry, which can have a stronger effect on consumers behaviour change.

## Investments

The business plan of FNH-RI presents the budget to implement and operate the research infrastructure after the design and preparatory phase. The costs for construction and operation of the FNH-RI is based on the network that starts with six MS (NL, UK, DK, SK, FR and IT), and expands in 2020 to at least 6 followed by at least two MS (or Associated States or Candidate Countries, e.g. Sweden and Spain) joining thereafter per year.

## FNH-RI Funding scheme



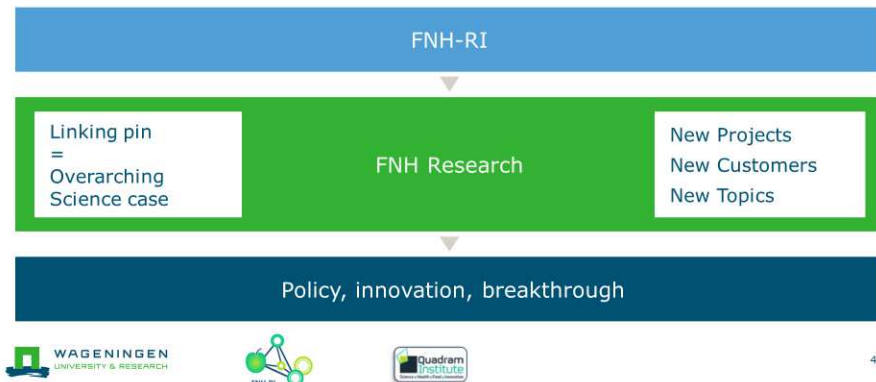
The business plan (to be further developed in detail during the preparatory phase) is based on an overall cost estimate of €2,800k per year for operational phase for the FNH-RI that is divided into:

- Costs for the central executive management office (FNH-RI Hub) covering personnel costs, rent, consumables, travel, assembly of members, scientific conference, office, education and training, and specific outsourcing. This amounts to €800k in the first year of the start-up phase, and rising to €1,000-1,500k covering four FTEs and raising to between 7-12 FTEs in future years of operation. The FNH-RI Hub may not all be in one MS as we will have a distributed RI with each country taking responsibilities for specific blocks/roles.
- Costs for the common services (for ethical, legal and societal issues) that the RI provides to its users: €120k in the first year rising to €200-300k in subsequent years.
- Costs for the common IT-services (IT-personnel costs, rent, consumables, meetings, travel, outsourcing): €500k in the first year and rising to €1,000-1,500k in subsequent years. This would apply to our standardized FNH-RI design and ICT infrastructure of FNH-RI as well links to other ICT platforms.
- Costs of the users and stakeholder forum: €80k in the first year rising to around €150k. This would apply to adapt DISH-RI to all stakeholder and to establish one or more public-private cooperation.
- Costs of the common data banking and resource services in FNH-RI as linking and standardizing the data and its use in common tools and giving users access to all the data sources. Training and consultancy services would also be developed alongside the standardized FNH-metric and ICT infrastructure of FNH-RI: €600k per year.
- This budget does not contain hard infrastructure yet (such as new buildings, new labs etc.), as FNH-RI will be mainly a distributed, virtual RI. However the part of hard infrastructure is under construction as the FNH community strongly supports the strategy to include them. The costs of this kind of facilities are limited as all are exciting facilities that need to be connected to FNH-RI.

For the NL, UK, DK, IT, SK and FR this means an initial support of maximum of €700k per year per MS.

The FNH-RI will fully engage with the European funding organisations in order to identify common interests, synergies, overlaps between organisations and the FNH-RI, and clustering of interests, and potential for future engagement. This is accompanied by close interaction with funding bodies to ensure that the FNH-RI organisational and governance structure that was potentially acceptable to European funding organisations. Funding organisations are defined as being public sector and charitable research body supporting basic and strategic innovative life science research at university research departments and research institutes. Funding organisations include government departments (e.g. BMBF in Germany), non-departmental public bodies (e.g. UK Research Councils), as well as private companies.

## Business model: science case to innovation



ESFRI (European Strategy Forum on Research Infrastructures) expects WUR to lead a consortium for an ESFRI roadmap application in 2019/20. A successful ESFRI-roadmap application will provide access to EU-based funding of the so-called preparatory and implementation phase, anticipated in the period 2020-2024 and 2025-2028, respectively.

### State of the Art

- To be a foundation in summer 2018, which enables us to build a community, signing of memorandums of Understandings (MoU). Memorandums of Understanding (MoU) are expected in 2017 with ELIXER, BBMRI and ECRIN, and METROFOOD.

## Time line of the Food, Nutrition and Health RI



- 4 member states involved (DK, UK, IT and NL), 2 are rewarded on the national roadmaps for research infrastructures (DK and NL). Italy will apply for this in 2018.
- 3 food industry partners (Unilever, Friesland Campina, Danone) and 2 facilitating industry partners (Philips, Bosch-Siemens) partners co-create a business platform within the FNH-RI.
- New nodes are expected in 2018 Iceland, Norway, Sweden, Finland as in Germany, Poland, Greece and Bulgaria. Preparatory actions to include in the Baltic states are ongoing.
- The science case of the Food, Nutrition and Health Research Infrastructure will be launched spring 2018.
- Full application for the ESFRI roadmap is expected in 2019-2020, kick off meeting at May 2018 in Brussels.
- Building blocks are: [www.eurodish.eu](http://www.eurodish.eu), [www.richfields.eu](http://www.richfields.eu), [www.eurofir.com](http://www.eurofir.com), [www.dedipac.eu](http://www.dedipac.eu), [www.enpadasie.eu](http://www.enpadasie.eu), [www.epic.iarc.fr](http://www.epic.iarc.fr).



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Contact persons: Karin Zimmermann ([karin.zimmermann@wur.nl](mailto:karin.zimmermann@wur.nl)) and  
Pieter van 't Veer ([pieter.vantveer@wur.nl](mailto:pieter.vantveer@wur.nl))

General contact: [fnh-ri@wur.nl](mailto:fnh-ri@wur.nl)