

# A recipe to support research and innovation

## Developing a European Food, Nutrition and Health Research Infrastructure

Anne-Charlotte Hoes, Trond Selnes, Jos Versteegen, Pieter van 't Veer, Karin Zimmermann, Krijn Poppe, Hennie van der Veen



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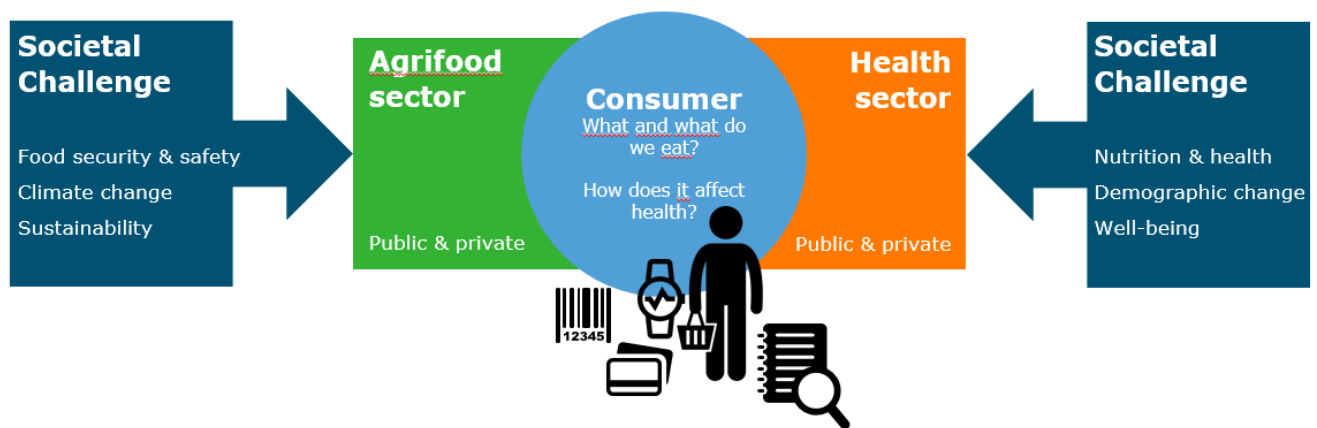
### 1. Introduction

To provoke breakthroughs in the domain of food and health a Food, Nutrition and Health Research Infrastructure (FNH-RI) is needed that improves consumer behaviour research. As knowledge production is scattered across organisations and people around the world, a transdisciplinary approach, in which expertise, tools and data from different sources are linked, is vital. This policy brief explores the support needed for an ESFRI proposal and poses potential business model for an FNH-RI (LNV Kennisdesk-vraag DGAN-ANK 17153843). For this policy brief four people were interviewed and thirty-one stakeholders were consulted during two workshops in The Hague and Brussels (see Appendix 1 for the lists with participants).

FNH-RI is an initiative to facilitate research on consumer behaviour, food and health with improved data collection, data management, and other services. FNH-RI can play an important role in the conversion to a more sustainable, healthy, affordable and reliable food system. It will offer shared facilities and tools to collaborate with researchers in Europe and beyond on new ways of generating and using data, developing tools and offering services.

Research on sustainable food consumption and health is costly, complex and, until now, fragmented across Europe. FNH-RI sets out to overcome such problems with an integrating and open transdisciplinary collaboration. Sharing data, facilities, tools and expertise enables breakthroughs in research, thereby supporting policy and innovations in the field of sustainable food, nutrition and health (see Figure 1). The momentum for an FNH-RI is driven by:

- Societal challenges related to food and consumption, such as sustainability and security issues, climate change and the increase in lifestyle diseases (linked to preventive health)
- Rapidly developing ICT technology which offers new opportunities for consumer research through the development of electronic devices such as wearables, sensors, RFID chips, etc. that generate detailed data on consumers and their behaviour, nutrition and health, and an increased computing power which allows the analysis and interpretation of big data, making use of e.g. data-mining techniques, artificial intelligence, machine learning, and advanced algorithms
- Emerging data hub expertise, which enhances our know-how on how to combine data from different sources and formats
- The emergence of citizen science, in which citizens provide data and are actively engaged in research, partly linked to the issue to improve the credibility and effectiveness of nutrition science. The recently introduced GDPR empowers consumers in the ownership of their data, which makes a citizen science approach feasible.
- The EU strategy that promotes collaboration in Research Infrastructure settings.



**Figure 1** Scope of FNH-RI, consumer as link between the agrifood and health domain

Icons: Aleksey Popov/The Noun Project, Gan Khoon Lay/The Noun Project, Wageningen University & Research

## 2. The value of an FNH-RI

A successful development, governance and continuation of an RI requires funding and investments in time and effort from both public and private partners over a long period of time. Willingness to invest is determined by the perceived value of the RI and the trust of stakeholders in the feasibility of FNH-RI. Below we address the anticipated gains and solutions that FNH-RI brings for knowledge development, policy, innovation and citizens. Subsequent we discuss the feasibility for a European FNH-RI.

### The next frontier in research and education through an enabling platform

The FNH-RI enables **researchers** to find, access, interoperate and re-use (FAIR) the currently scattered FNH data, tools and services. The FNH-RI platform will offer standards, methods, tools and services/trainings to ensure the quality and sharing potential of (consumer) data for future research. As such, FNH-RI allows researchers to investigate new relationships between new and existing data and to better assess which new data are needed for specific or new research questions. In addition, the FNH-RI will set up a European consumer panel (comparable to the Farm Accountancy Data Network that governments have set up in agricultural policy). For this, consumers are asked to provide access to their data on a consent basis, ensuring complete privacy and control for them.

The idea for the FNH-RI design is that universities, applied research institutes and R&D departments of companies across Europe will join forces in a platform for advancing our understanding of consumer behaviour and determinants related to food, nutrition and health. As such, education and training is an important part of the FNH-RI to, for example, kick-start future PhDs. In addition, dissemination of insights across relevant educations, such as (preventive) healthcare and agricultural economics will also improve education, training, policy and practice on the topic of sustainable and healthy food.

### Towards an improved policy for sustainable and healthy food

FNH-RI will play a role in the needed change towards a more sustainable and healthy society. Accurate monitoring of food behaviour gives **policy** insight into the impact of food on health and the environment. Moreover, FNH-RI furthers our understanding of the underlying psychological and social dynamics that determine food choices. These insights will improve the public debate on food. Also, policy makers can use the insights to define relevant policy objectives and to design effective intervention to e.g. nudge consumers towards healthy and sustainable alternatives.

FNH-RI also allows for data re-use which increases efficiency and effectiveness in research where science policies currently finance data collection on a project basis. The saved resources can be used to expand the field of FNH research or can be allocated to other research priorities.

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### **Strengthened innovation in the food chain and health sector**

Innovations are needed to realise a food system that is more sustainable, fair and healthy. FNH-RI facilitates innovation in several ways. For example, the FNH-RI platform offers an entry for start-ups in the field of (personalised) food, health and nutrition to collect essential information and to seek out potential partnerships. Also, most start-ups and SMEs usually don't have an R&D department. These companies can tap into the FNH-RI and outsource their consumer-research needs to researchers associated with the FNH-RI.

In addition, numerous companies collect a large amount of customer data related to FNH. Large amounts of these data are shelved (i.e. no longer used), among others because big data analytics is not the primary focus of the company. FNH-RI provides a platform for collaboration on a better usage of such data. More specifically, multinationals in food processing, retail and catering that collaborate with FNH-RI can improve their consumer research and thereby acquire a deeper understanding of the needs and desires of specific customer segments. This information is essential for innovations or improvements of products and services enhancing healthier and more sustainable alternatives.

### **Engaging empowered citizens**

The FNH-RI offers citizens opportunities for more informed food choices and participation in scientific research (citizens science). In the future, FNH-RI enables insight that can provide (evidence-based) information to citizens about the impact of their food choices on their health and the environment (or broader sustainability). This empowers citizens to make an informed food consumption decision as they know the possible (positive or negative) side effect of their eating behaviour. Also, citizens might volunteer to share their own data that they collect with sensors, wearables and by filling in questionnaires or logs using ICT. In return for donating data, citizens get a reliable and independent platform in which they can safely store data. Moreover, the platform will provide tools to analyse and benchmark their FNH data. As such, FNH-RI offers opportunities for a more citizen-driven and responsive food chain, where consumers not only consume but are part of the development of products and services (co-creation).

## **3. Guiding principles for a FNH-RI**

Although the above benefits are highly important to get support from stakeholders to start an FNH-RI endeavour, it is not a sufficient condition to realise the FNH-RI. Experiences in other research fields show that, after the initial budget is depleted, a struggle arises to maintain and further develop the research infrastructure. A sustained FNH-RI requires an early engagement of clients and stakeholders and a prompt demonstration of the added value of FNH-RI. For this, a viable business model needs to be developed and tested. Several challenges must however be taken into account:

- A trusted and sustained governance and data management
- Creating volume for the network effect, and
- Establishing a joint public private collaboration.

### **A trusted and sustained governance and data management**

It is of vital importance for the development of the FNH-RI to ensure a trusted and sustained governance and data management in consumer research. This enhances the advantages of the FNH-RI for consumers, companies, researchers and policy makers. It will ensure a high level of trust in the FNH-RI, prevent legal and ethical problems and it should motivate stakeholders to participate further and support the platform. Working together on both the human and the technical infrastructure with a high security level through appropriate governance agreements will be pivotal for arranging a solid authentication and authorisation of users. With this, FNH-RI will prevent privacy incidents and breaches in data confidentiality.

### **Creating volume for the network effect**

For the development of the FNH-RI, it is important to achieve an early bundling of many initiatives, data, and tools into the FNH-RI. This may ignite the network effect: parties with data

or tools will become interested in exposing their work or products on the portal and this again may trigger others, and so on. It would be very helpful if some influential parties, e.g. a big user of data, commit to the FNH-RI. In addition, research funding agencies could kick-start FNH-RI by demanding researchers for proper data management and to suggest, or actively steer, to connect to the FNH platform. Investment in data management and membership of FNH-RI can be declared as one to the research budget components (similar to lab equipment).

### Establishing a joint public-private collaboration

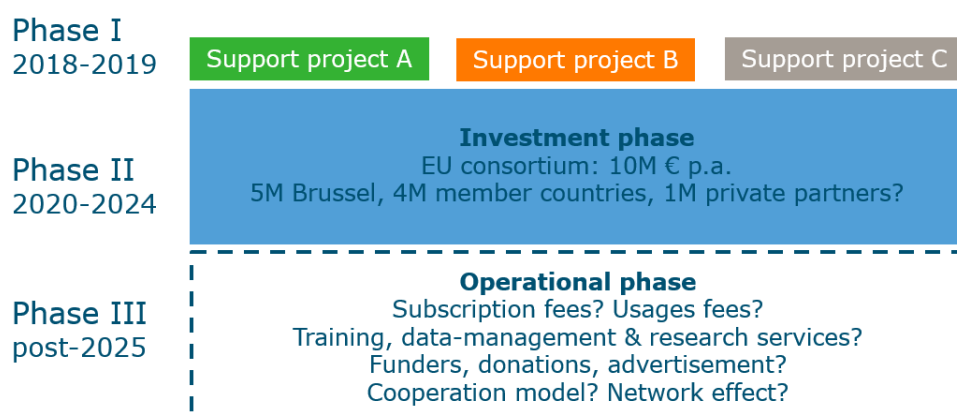
Establishing a joint public-private facility for international research is very important. In contemporary research, single countries and research facilities are unable to cope with the interdisciplinary and transboundary challenges we are facing. Being part of a larger community is essential for achieving results. Involving many stakeholders from the start is important to build commitment. Furthermore, making long-term agreements for public private collaboration through a good governance structure is crucial to ensure compliance with legal demands as the General Data Protection Regulation (GDPR). The FNH-RI will stimulate an active contribution and prevent free-riding behaviour by establishing conditions for participation during the next steps to come.

## 4. The next steps

The FNH-RI does not start from scratch. There are already FNH-related research initiatives that can be brought together in the FNH-RI or from which FNH-RI can learn. Examples are:

- RIs originating from previous EU-funded projects (e.g. EuroFIR, NuGO, GloboDiet, ISEKI-Food, Food4me, EuroDISH and DISH-RI)
- ongoing EU-funded projects (e.g. iFAAM, REFRESH, SUSFANS FIT4FOOD2030, RICHFIELDS and Internet of Farm and Food (IoFF))
- the Joint Programming Initiative Agriculture, Food Security and Climate Change (JPI-FACCE) and a Healthy Diet for a Healthy Life (JPI-HDHL with Knowledge HubsENPADASI)
- new research projects/programmes such as PPS Smart Food Intake, PPS Personalised Nutrition & Health and the Wageningen Economic Research tool FoodProfiler, DataFair, IoF2020
- private initiatives such as the cooperative firm JoinData, a datahub for sharing farm-level data, and public private partnerships such as Trusted Source
- new initiatives such as CENTRAL, co-creating platform on personalised nutrition and Food Cloud Demonstrator, next step in connectivity on food-related RIs, among FNH-RI, including ENPADASI, E-ROSA and Emphasis

The FNH-RI will be developed in three phases (see Figure 2).



**Figure 2** Three phases to develop FNH-RI: Phase I, start-up by aligning projects; Phase II, building the infrastructure and consortium, and; Phase III, operational with a validated business model.

### Phase 1: start-up phase - aligning projects into a value added network

We are now in Phase I in which twelve European member states and one non-EU state collaborate to raise support for FNH-RI. Moreover, these partners link ongoing FNH-related

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initiatives and research to further develop the FNH-RI community. At this moment partners are already motivated, well informed and aligned. This will facilitate the move towards a functioning FNH-RI with facilities, resources and services.

It is important that FNH-RI demonstrates its value at an early stage. Therefore new projects are formulated that make FNH-RI concrete and test the ideas of FNH-RI. Potential projects or demonstrators can include topics such as: the green protein transition, personalisation in food and nutrition, and healthy aging. Initial ideas for projects with demo users include: researchers aiming to maximise healthy and sustainable food purchases, preparation and consumption and/or people with high risk for diabetes type II who aim to change their eating behaviour.

### **Phase 2: investment phase - building a consortium**

In Phase II larger investments are sought to build a central FNH-RI hub for international collaboration. The FNH-RI governance structure will include a foundation which provides conditions for access such as membership, ownership, privacy, and trust, and organises centralised and distributed activities. Such a central coordination hub has advantages in terms of data handling (avoiding data redundancy), authentication and authorisation. It will enable effective decision making and a One Stop Shopping enhances the efficiency. In addition, the FNH-RI will make it easier to establish national nodes and it will also strengthen the collaboration with other RIs. To generate these investments, an ESFRI application is needed in combination with public and private investment in each member country. The exact required budgets need to be calculated but the first estimates are around 10 million euros per year, for a period of four years in which ESFRI will invest half and the participating member countries and companies the other half (see Figure 2).

### **Phase 3: Operational phase – a validated revenue/business model**

In Phase III a validated revenue model will be in place to ensure continuity. This policy brief already shares some ideas about the overall business model, which will be further elaborated in Phase I. Experimentation with the overall business model takes place in Phase II. The central parts of the business model are the value proposition (types of data, tools and services), the choice and detailing of the key partners, main users, and other stakeholders, the key activities and resources in combination with the revenue model for clarifying how to acquire sufficient income based on all the products and services that FNH-RI offers. These returns are necessary to keep FNH-RI operational for a longer period of time and to invest in continuous improvements to adhere to new societal challenges, underlying RQs, and the booming ICT/data management development, such as the Open European Science Cloud. Below we address the following revenue models to pursue for FNH-RI:

- Subscription, licensing, pay per use and/or freemiums
- Training, data-management and research services; funders, donations, advertisement.

#### *Subscription, licensing, pay per use and/or freemiums*

The investment period will lead to tools and services that generate income from for instance subscription fees to gain access to the FNH-RI platform or licensing where companies pay FNH-RI to use the platform of FNH-RI in their own company. It is also possible with a pay-per-use-model, where for example an app developer want to use the FNH-RI to build a product. This could be an innovative collaborative business model between (food) industry and start-ups. In addition, a freemium model is also possible, i.e. a basic version of FNH-RI free to use by the public. In general, we emphasise that we aim for a broad usage and broad group of users.

#### *Training, data-management and research services, funders, donations, advertisement*

The FNH-RI platform can also make revenues through FNH-RI services such as training, data-management and a range of research services from the FNH-RI platform and its network. This includes services related to know-how concerning data collection, data access, protocols, methodologies, algorithms, etc. It can also be many other research services such as on-demand research from policy makers, innovative stakeholder interaction and engagement, or dealing with

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big data analytics. Funds can also be obtained by charities (donations) and or interest groups (such as patient organisations) who support FNH-RI.

## 5. Concluding remarks

For the Netherlands the emerging FNH-RI is a logical continuation of research that is already internationally oriented and interested in collaboration. But the Netherlands is too small on its own and for the economy of scale we strive for further collaboration in an international collaboration on cross-disciplinary and cross-sectoral challenges. Dutch companies are however exporters and very much interested in consumer behaviour on sustainable products in other countries. The Netherlands have in general many assets to offer for an FNH-RI: public policy organisations are used to look beyond national borders, we have a food industry willing to participate, a strong ICT and app industry, citizens ready to engage and a strong research community. The Netherlands is a leading country in research on food, nutrition and health. Besides, we have a culture for public-private collaboration. In short, we are already taking steps and the FNH-RI will provide the platform we need to improve our research that is needed to address societal challenges related to public health and a sustainable food system.

Earlier work on FNH-RI (e.g. EuroDISH) concluded that an FNH-RI is expected to support the transition towards a more sustainable and healthy consumption pattern, thereby improving public health. These ideas also came forward in the workshops. To realise the RI, it is necessary that cooperation within the Netherlands from different policy perspectives (sustainability, public health, nudging habits, citizens science, etc) is achieved which leads to a robust (European) food policy. Support for collaboration and interaction on Dutch and European level will foster the ESFRI application aiming the realisation of the European FNH-RI.

## Appendix 1 Participants workshops and interviewees

**Table A.1** Workshop Food, Nutrition and Health Research Infrastructure, Tuesday 17 April 2018, The Hague

Name	Organisation
Ansem, Wilke	Joint Programming Initiative JPI HDHL
Brierley, Chrissie	Joint Programming Initiative JPI HDHL
Hoes, Anne-Charlotte	Wageningen University and Research
Hoving, Saske	Netherlands Enterprise Agency (RVO)
Kwant, René	University Utrecht
Miret-Catalan, Silvia	Unilever (Food Nexus)
Nairi, Khadija	Wageningen University and Research
Nieuwenhuijs, Ismaela	Erasmus MC
Ocké, Marga	Institute for Public Health and the Environment (RIVM) co-coordinator DISH-NL
Pauw, Bea	Netherlands Organisation for Scientific Research (NWO)
Poppe, Krijn	Wageningen University and Research
Selnes, Trond	Wageningen University and Research
Veen, Hennie van der	Wageningen University and Research
Voortman, Trudy	Erasmus MC
Zimmermann, Karin	Wageningen University and Research
Zulim de Swarte, Casper	Ministry of Agriculture, Nature and Food Quality, Netherlands

**Table A.2** Workshop Food, Nutrition and Health Research Infrastructure, Monday 7 May 2018, Brussels

Name	Organisation
Acs, Daniel	European Cluster Collaboration - Bioeconomy Cluster
Angelov, Angel	University of Food Technologies, Plovdiv, Bulgaria
D'Auria, Sabato	CNR, Italy
Giagnocavo, Cynthia	University of Almería, Spain
Gotcheva, Velitchka	University of Food Technologies, Plovdiv, Bulgaria
Gutierrez Arechederra, Biotza	EURECAT, Spain
Hoes, Anne-Charlotte	Wageningen University and Research, Netherlands
Hondo, Haris	Research Institute of Sweden (RISE)
Jonge, Marc de	NWO, Netherlands
Kolesárová, Adriana	Slovak University of Agriculture in Nitra
Lachat, Carl	Ugent, Belgium
Mikkelsen, Bent Egberg	University of Alborg (AAU), Denmark
Nairi, Khadija	Wageningen University and Research, Netherlands
Holm Nielsen, Jacob	Aarhus University, Denmark
Polovka, Martin	National Agricultural and Food Centre, Slovakia
Poppe, Krijn	Wageningen University and Research, Netherlands
Pourabdollahian, Golboo	CNR-ITIA, Italy
Raats, Monique	University of Surrey, United Kingdom
Regouin, Eric	Ministry of Agriculture, Nature and Food Quality, Netherlands
Rodriguez, Àurea	EURECAT, Spain
Selnes, Trond	Wageningen University and Research, Netherlands
Spiroski, Igor	Institute of Public Health of the Republic of Macedonia
Staiano, Maria	CNR, Italy
Torres, Duarte	University of Porto, Portugal
Veen, Hennie van der	Wageningen University and Research, Netherlands
Vorst, Jack van der	Wageningen University and Research, Netherlands
Vries, Jan de	Nutrition Consultancy Cooperative, Netherlands
Williams, Michelle	University of Aarhus (AU), Denmark
Zimmermann, Karin	Wageningen University and Research, Netherlands

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**Table A.3** List of interviewees Food, Nutrition and Health Research Infrastructure

Name	Organisation
Bakker, Martijntje	Deputy director strategy and innovation, ZonMw
Gooijer, Kees de	Director TKI Agro & Food
Greutink, Tonnie	Policy officer Ministry of Agriculture, Nature and Food Quality, Netherlands
Weijtens, Martijn	Deputy director Plantaardige Agroketens en Voedselkwaliteit, Ministry of Agriculture, Nature and Food Quality, Netherlands

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Contact

Wageningen Economic Research    Drs. H.B. van der Veen  
PO Box 29703    Researcher  
2502 LS Den Haag    T +31 (0)70 3358 148  
[www.wur.eu/economic-research](http://www.wur.eu/economic-research)    E hennie.vanderveen@wur.nl

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