



# International Center for Food Chain and Network Research

Report Period  
May 2017 - December 2019



## Imprint

International Center for Food Chain and Network  
Research (FoodNetCenter Bonn)  
Rheinische Friedrich-Wilhelms-Universität Bonn  
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# Preface

Prof. Dr. Brigitte Petersen  
International FoodNetCenter Bonn  
Rheinische Friedrich-Wilhelms-University Bonn



*The logo of 200 years of University of Bonn*

Since its foundation as a cross-faculty network in 2006, the 'Bonn International Center for Food Chain and Network Research' (FoodNetCenter Bonn) has activated considerable external funds for the University of Bonn primarily provided through the EU Framework Programmes for Research and Development and through national programmes of e.g. BMBF and BMEL. The funds were used to support young scientists and young scientist teams providing them with the chance for international cooperations and to gain experience with global working groups in their field of research.

Today the FoodNetCenter presents an excellent platform to worldwide networking with international research and higher education groups. Nowadays food chain research at the University of Bonn and its research center has established a recognized and central position in international quality and risk management research. The structure of the FoodNetCenter builds the framework of three

inter-disciplinary focus groups: One Health, Food Waste and Responsible System Innovation.

Between 2006 and 2018 the FNC members participated in public funded projects with more than 800 partners; projects have been or are coordinated by FNC members. 110 graduations and more than 480 master theses were financed by means of third-party funds on a scale of 20 million Euro.

During the last years seven young scientist groups used the interdisciplinary structure of the FNC to build up new working groups. Nearly 2,000 persons participated in the FNC events like the International European Forum on System Dynamics and Innovation in Food Networks (Igls Forum), the Cold Chain Management conferences and the IRIS-Workshops in Bonn.

Globalization and changes in consumer habits have triggered growing consumer demand for a wider variety of foods, resulting in an increasing complexity and longer

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global food chains. Ensuring that EU citizens consume safe and nutritious foods produced from healthy plants and animals is a key public health and economic priority.

In response, the International Center for Food Chain and Network Research together with other local networks have created a joint research agenda covering the whole food chain and supporting EU member states' efforts to contribute to a high level of food and human safety. Addressing food and human safety by the One Health Concept, interdisciplinary collaboration can be considered as an important step in this direction.

The year 2018 was characterized by the celebrations and events in connection to the 200th anniversary of the University of Bonn. The long-standing international cooperation of the FNC members with universities in Europe and world wide were increasingly recognized and used in the region.

On the one hand, the representative speaker of the center was asked to take an active part in shaping the

internationalization strategy of the University of Bonn. On the other hand, the FNC is currently working as an experienced door opener for international research co-operation for the economy in the region of Bonn/Rhein-Sieg-Ahrweiler.

Two bigger network activities have been important in 2018: First, the establishment of an One Health competence center. In summer the One Health & Food Safety Congress took place in Bonn. The participants suggested to start this as a third series of conferences next to the already established International Forum on System Dynamics and Innovation in Food Networks and the International Conference Cold Chain Management. This conference series could take place every three years at the University of Bonn.

Another joint activity is the promotion of the Public Private Partnership Initiative Animal Welfare. This topic is one of the most important extrinsic quality-characters within the marketing of pork beef, milk and eggs. FNC and economy have been working for years on system-

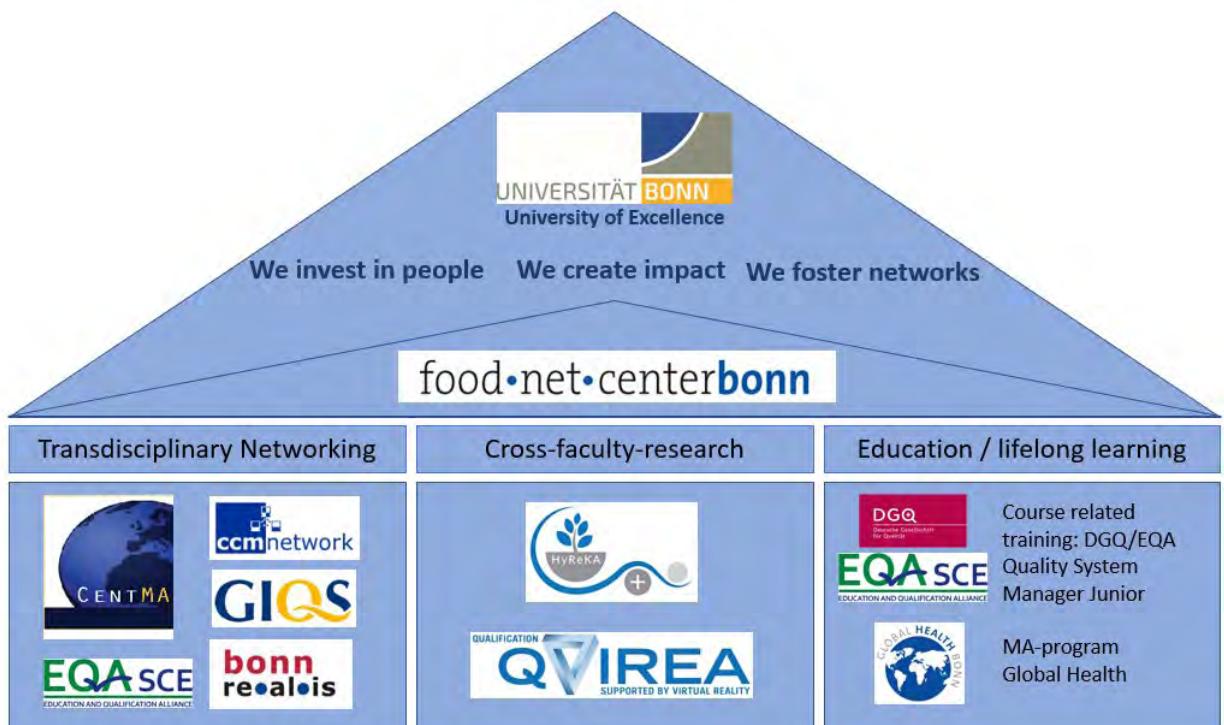


Fig. 1: Different fields of action according to the strategy of excellence of the University of Bonn.

# Preface

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innovations of reasonable combinations: Animal-friendly husbandry, expertise, corporate appointed self-control and benchmarking.

Not only the anniversary has made 2018 a special year: Also the overwhelming success in the DFG excellence-competition contributed to it. In this special year the advisory board has met twice (17th September 2018 & 03rd December 2018) to evaluate the future strategy of FNC.

The FoodNetCenter has also focused on the newly defined excellence strategy goals of the University of Bonn. As it has stated, the university seeks to invest in people, foster its networks and to create impact. All three goals are part of the work of the International FoodNetCenter. In the summer of 2019, the University of Bonn became „University of Excellence“ - being one of eleven within Germany and being one of two within North Rhine-Westphalia. Together with all people at Bonn University and connected to it, the FNC has been very happy about this new status and contributes through its daily work to the overall strategy.

Of course, the International FoodNetCenter helps to invest in people through education programs and additional trainings or course related education with extra degrees. There is cross-faculty research going on which overcomes structural borders and leads to new research groups and better results. Finally, the International FoodNetCenter is involved in many networks and contributes to their existence by supporting and developing new ideas.

Bonn, December 2019

# 1.

# The FoodNetCenter: Mission and Vision

Still six sustainable development goals designed by the UN are a challenge for our research and research cooperation in the 16 working groups of the International FoodNetCenter. To meet the diverse challenges that confront chains and networks the classical single focused research approach is no longer adequate. A multi-disciplinary approach, encompassing side by side economical, social and legal disciplines as well as technological, environmental and natural sciences is required. The Bonn International Center for Food Chain and Network Research (FoodNetCenter Bonn) provides with both research and educational programs, and a close cooperation with businesses a multi-disciplinary platform to investigate challenges in the areas of e.g. food safety, food security, food affordability, new technologies, market access, global logistics, dependencies and cooperation between multinationals and small-scale producers, private and public standards and sustainability.

Citizens of the European Union enjoy one of the highest standards of food safety in the world, yet WHO estimates that every year in the European region 23 million people fall ill due to foodborne diseases, resulting in an increased burden on public health and significant economic implications. Balancing the needs of agri-food industry, whilst simultaneously ensuring consumer protection and encouraging sustainability, is a primary challenge in the contemporary European political climate.

**The mission** of the International FoodNetCenter is to promote chain and network research and to become an internationally acknowledged center of excellence, by establishing a world-wide infrastructure for exchanging, developing and disseminating knowledge and by supporting a public private project development in the field of food chains and networks as well as food and human safety.

To achieve its mission, the FNC will:

- promote multi-disciplinary chain and network research as well as one health approaches – nationally and internationally,
- enhance the international position and role of Bonn University in these research areas and play a key role in strategy formulation and the setting of research agendas,
- strengthen the existing scientific community at Bonn University in the area of the research fields and add value to ongoing research and education by enabling scientists to work with colleagues from other groups and disciplines,
- facilitate and support public private partnerships and projects and provide a research communication platform for national and international businesses, organizations, and public institutions.

During the last years the FoodNetCenter Bonn focused on the following activities:

- Engagement in jointly organized inter-disciplinary and international research in the area of 'Food Chain and Network Research' with a prime focus on system organization, system dynamics, and system innovation in complex interconnected value chain relationships with specific reference to quality, information and risk management.
- Preparation and coordination of European and international research networks directly through the Center or through members of the Center.
- Support of a global dialogue with similarly focused research networks through international conferences and workshops.
- Qualification of young scientists in the research domain.
- Establishment of an international scientific journal and living books in the Focus Groups 'Food Waste' and 'One Health'.



The Center understands its international research orientation as an integral part of the university's orientation as an international research university. With its present and prospective inter-disciplinary research projects it supports the profile of the university and with its cooperative approach the university's and the state's agreement on research goals.

The International FoodNetCenter Bonn has been very successful in the past in activating external funds for the University of Bonn, supporting young scientists in obtaining a PhD and getting involved in international cooperations as well as providing the possibility for students to receive the certificate 'DGQ Quality Systems Manager Junior'. A particular strength of the FNC while establishing and consolidating regional and especially European and global research networks has been the close collaboration with the international public private partnership organization 'GIQS e.V.' in Bonn. The FNC and GIQS are founding members of the regional network Bonn.realis e.V. (Bonn Research Alliance of Innovative Information Systems in International Quality Food Chain and Crisis Communication). Together with the European Qualification Alliance (EQAsce) a FNC-team developed new qualification offers. A key objective of the training philosophy is the long-term capacity building of the participants in the sense of lifelong learning.

### Vision

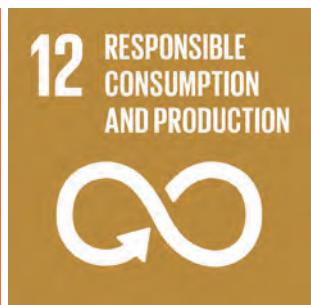
All three sides of the 'Knowledge Triangle', i.e. higher education, research and innovation, are integrated in the FNC concept according to the Global Goals and the EU food safety policy.

In order to minimize the risks to public health and to the wider economic system, the European Union has put in place several legislative tools aimed at enhancing food safety. With a budget of €1.9 million between 2014 and 2020, the first comprehensive Financial Framework Regulation for the Food Chain provides finance for controls, measures to improve

animal and plant health and scientific research, as well as awareness-raising and information programs. Another main goal of EU food safety policy is to ensure sustainability of the food system. To this end, in 2015 the Commission has included the reduction of food waste in its Circular Economy Package, and established a new EU Platform on food losses and food waste to define measures to be adopted.

Besides governance, innovation drives development, but also new technological food contact materials and new smart agricultural techniques. The introduction of digital technologies within agri-food chain is of great promise, but sector-wide inclusion is yet to occur. The FNC has beeen one of the organizers of the first Food Safety and Human Health Congress 2018 in Bonn. The Congress provided an invaluable opportunity for experts, policy makers, NGOs and other key stakeholders to discuss the latest One Health initiatives surrounding food safety, human health, consumer protection and innovation, in order to foster a resilient and sustainable agri-food chain. The Congress also allowed delegates to assess the current and future challenges facing the global food and health system, and to share best practice from across the world.

FNC-Management Board and Council share a commitment with project partners from industry and organisations located in the region to develop the European research area by all means available within the EC-Horizon 2020 Programs, trans-national and trans-regional funding and financial support by DFG, BMEL and BMBF on prioritized topics. FNC as cooperation partner and stakeholder shares the vision of a joint Regional Innovation Center (RIC). Such a knowledge-related forum is dedicated to increasing innovative and entrepreneurial activities in Europe by creating a collaborative ecosystem and pipelines that mobilize the resources, inter-state research programs and educational opportunities necessary to develop, attract and retain talents in the region of Bonn.



## 2.

# Organization of the FoodNetCenter

The central organ of the FoodNetCenter is the center council.

The Management Board consists of three persons elected by the center council for three years in the year 2012.

## 2.1

### 2.1 Management Board

The tasks of the Management Board are:

- Development and coordination of the scientific program
- Work out of budget proposals and financial plannings
- Creation of statements on accounts and final reports
- Representation of the FoodNetCenter towards the university management as well as external investors

- Engagement in public relations work
- Preparation and execution of scientific events
- Enhancement of the communication between the members of the FoodNetCenter
- Creating genuine added value for the region and high international visibility of FNC by supporting the establishment of a leading edge cluster



#### Management Board Members:

- Prof. Dr. Brigitte Petersen  
Chair of the Management Board.  
She chairs the division of Preventive Health Management in the Institute of Animal Science. Representing the Agricultural Faculty and FNC in project team of the University preparing HRK audit of the internationalisation strategy



- Prof. Dr. Monika Hartmann,  
Vice Chair of the Management Board.  
She chairs the division 'Market Research of Agriculture and the Food Economy' within the Department of Food and Resource Economics since 2002.



- Prof. Dr. Gabriele Bierbaum,  
Member of the Management Board  
Since 2004 she has an apl. Professorship in Microbiology.

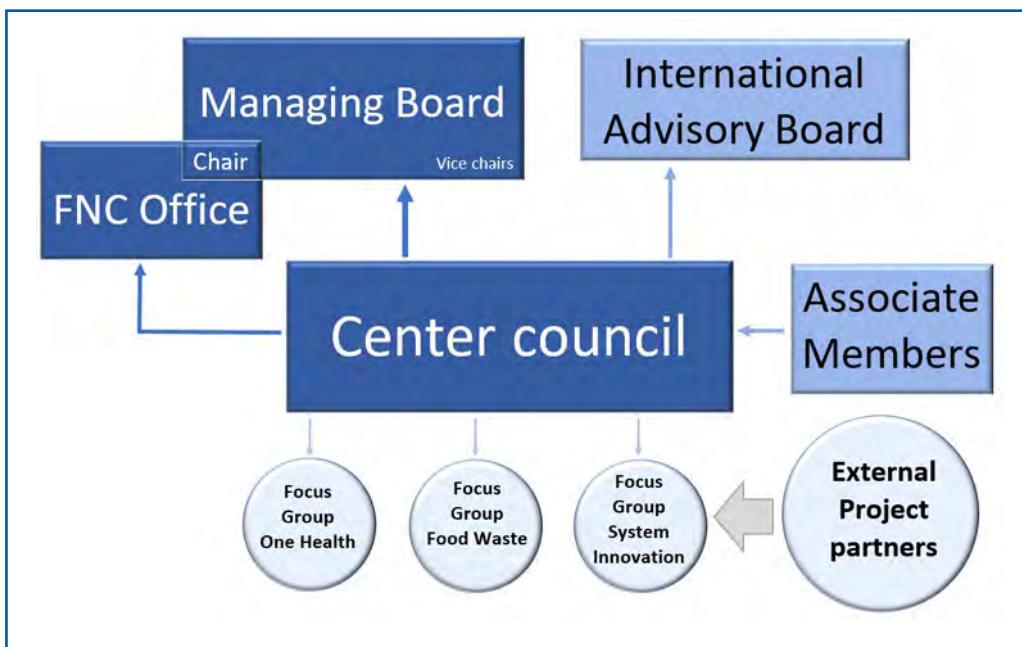


Fig. 2: Structure and Organization of the International FoodNetCenter

#### FNC Office

The secretariat of the chair supports and finances the work of the Management Board.



#### Petra Heinrich

- Coordination and allocation of tasks
- Appointment and event management
- Administrative management of community projects
- Website
- Communication between the Management Boards of FNC, Bonn.re•al•is, GIQS and bio innovation park Rheinland



#### Ramona Bleeser

- Coordination for common projects between FNC and the associated partner EQAsce
- Support of Junior Research Groups
- Communication with project coordinators and project partners
- Communication between FNC and the joint initiative CCOH



#### Dr. Susanne Lehnert until 01/2019

- Coordination of the university network in the area of Higher Education
- Establishment of an Open Education Platform
- Support of the 'DGQ Quality Systems Manager Junior' education
- Communication between FNC and other networks like EQAsce and Bonn.re•al•is
- Coordinating the technology platform SMART Pork

## 2.

# Organization of the FoodNetCenter

## 2.2

## 2.2 International Advisory Board

The International Advisory Board advises the FNC in general scientific, organizational and technical issues. The board also defines the general strategy and standards of the FNC. In addition, it facilitates contacts and cooperation between the FNC and other research networks in Germany and abroad.

The Advisory Board members are:



**Dr. Hanns-Christoph Eiden**  
President of the Federal office for Agriculture and Food



**Prof. Dr. Alexander Friedrich**  
Professor of Medical Microbiology at the University of Groningen and the UMCG, head the Medical Microbiology department.



**Dr. Dr. h.c. Christian Patermann**  
Former Director for Environment Research at the Directorate-General of the European Commission Brussels



**Prof. Dr. Ellen Goddard**  
Cooperative Chair in Agricultural Marketing and Business at the Department of Resource Economics and Environmental Sociology, University of Alberta (Canada).

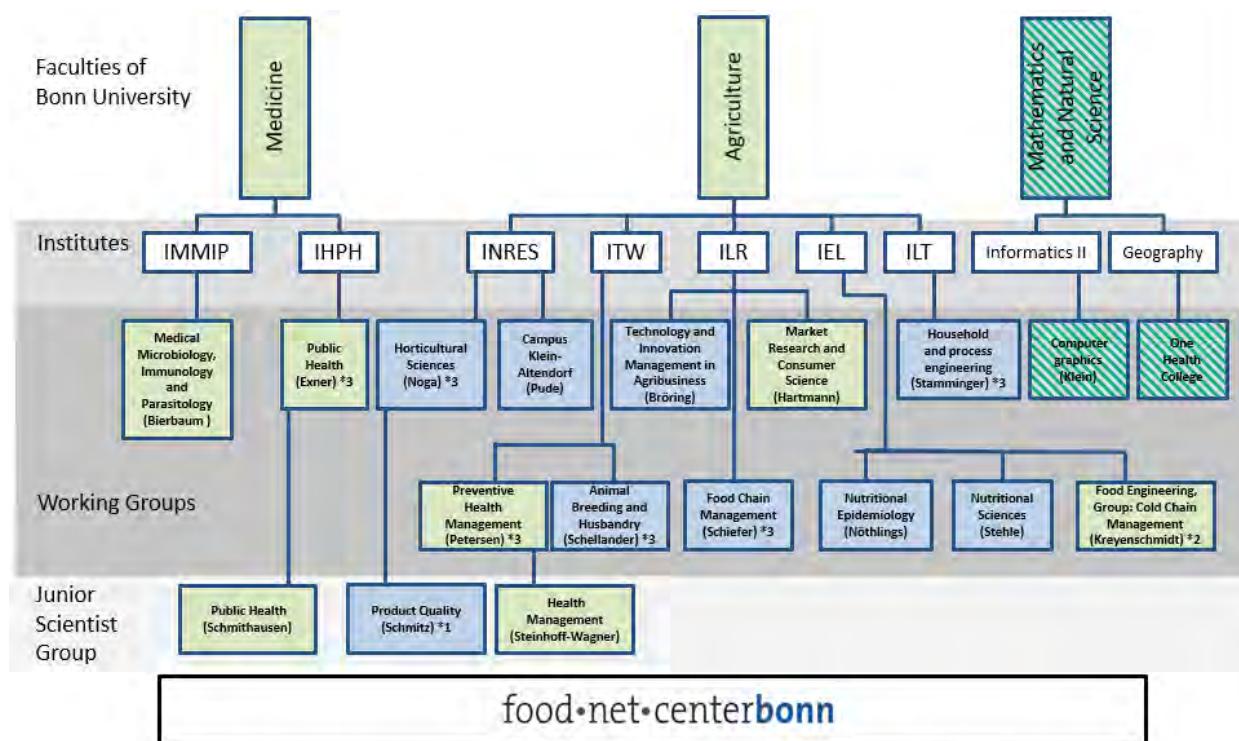


**Prof. (em) Dr. Armin B. Cremers**  
Former Dean of the Faculty of Mathematics and Natural Sciences from 2004-2008 and Vice-Rector for Planning and Finance at the University of Bonn

## 2.3 Members of the FoodNetCenter

Since FNC's very beginning, a couple of new faces have joined the network and contributed to the diversity that makes the FNC community so enriching and unique (see figure). Between 2011 and 2017 the number of FNC members increased up to 18 groups of nine institutes of three faculties. Nine of these groups are led by women. With the participation in the FNC-Council the members are committed to initiate efforts and activities enhancing international and inter-disciplinary research and innovation.

The structure of FNC will continuously change over the next years. In the past young colleagues have already left the center to change to another university or research institute. Some colleagues retired between May 2017 and December 2019 or are close to it. Others have built up their own networks and are therefore no longer involved within the three focus groups of the Center.



IMMIP: Institute for Medical Microbiology, Immunology and Parasitology  
 ILT: Institute of Agricultural Engineering  
 IHPH: Institute for Hygiene and Public Health  
 ILR: Institute for Food and Resource Economics  
 INRES: Institute of Crop Science and Resource Conservation  
 ITW: Institute of Animal Science  
 IEL: Institute of Nutrition and Food Science

\*1 Bonn Rhein-Sieg University of Applied Science  
 \*2 Substitution of the Professorship Food Process Engineer, since May 2015  
 \*3 Professorships where professors retire or are about to retire

Links between FNC Focus Groups and Graduate Schools

Fig. 3: Members of the International FoodNetCenter

## 2.

# Organization of the FoodNetCenter

## 2.4

### 2.4 Associate Members

The FNC cooperates with various groups and scientists from outside the University of Bonn. Of specific relevance are the associated members, GIQS e.V. CentMaResearch and EQA sce:



GIQS e.V. (Trans Border Integrated Quality Assurance) is one of the first public private partnership organizations for innovation and cooperation in sector oriented quality management in north-west Europe. It was established as a research and development platform in 2001 during one of the most crucial crisis situations in the European agricultural and food sector. Founding members were the universities of Bonn and Wageningen together with industry groups, the chambers of agriculture, various associations and provinces of the border region between Germany and the Netherlands, one of the European 'Euregio' regions. Enterprises are supported in the integration into international research and development projects as well as in the identification of suitable research partners in case of need. Dr. Oliver Breuer is head of the management board and Prof. Dr. Brigitte Petersen is founding member of GIQS and member of the supervisory board.

GIQS as tax-exempt organization with stakeholders from research, industry, and administration sees its primary responsibility in the support of cooperative research and development, project management and knowledge transfer. GIQS was awarded in 2002 the state of NRW's cooperation award 'Science to Business'. Since 2008, GIQS is member of the initiative 'Competence Networks Germany', an initiative of the Federal Ministry for Economy and Technology to encourage the most innovative and strongest national competence networks with technological orientation. GIQS has expressed its interest in striving for cluster excellence and is awarded with the European Cluster Management Excellence label in BRONZE. Uninterrupted quality management from farm to fork

is a precondition for safe and healthy food. However, it requires a product based knowledge and information exchange between enterprises throughout the chain. GIQS supports enterprises in production and services along the whole production chain in the planning and facilitation of enterprise cooperation systems for improving transparency for all stakeholders as well as for consumers.

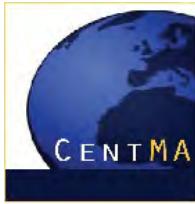
Cooperation between private and public organizations from science, industry, and administration eliminate barriers between enterprises, stages of the production chains or countries in pursuing research and development projects.

Partner support is channeled through three service packages offered by GIQS:

- Acquisition of support funds from e.g. Interreg programs of the EU, research programs of the EU, research programs of Federal Ministries.
- Initiation of research cooperation between science, industry, and administration.
- Knowledge transfer through publications, workshops, and websites.

With these services GIQS complements excellently the research activities within the FNC. Especially the acquisition of large EU funding would not have been possible without the close collaboration. Since its foundation, close collaboration with the private sector via GIQS serves as an essential tool for technology transfer and the practice oriented implementation of the theoretical findings, thus contributing to increasing the societal and economic value of academic research.

Since 2016, the coordinator of the focus group Food Waste Dr. PD Kreyenschmidt is also on the management board of GIQS. GIQS is one of the founders of EQAsce. This educational co-operative ensures the expansion of the service sector Education and long-life-learning offers for QM-responsibles in agri-food chains.



CentMa is a tax-exempt research organization with a focus on strategic management and communication developments for broad-based management support and serves the scientific and management community since 25 years.

CentMa's management workshop initiatives date back to first courses that were established in 1982 by Prof. Carl Gotsch of the Food Research Institute at Stanford University in the US. The groups included high level international project managers and international executive government officials who were interested in utilizing the most modern concepts in management and the use of the emerging computer technology in project management improvements. Shortly after, Prof. Gotsch (Stanford) and Prof. Schiefer (Kiel) decided to move the concept to Europe and establish the 'International Kiel-Stanford Workshops' for international management support that were jointly held by Prof. Gotsch and Prof. Schiefer in Kiel, Germany, and with support of the University of Kiel. The workshops proved to be highly successful attracting not only leading project managers from all over the world but also high level officials up to members of governments. The background of participants involved enterprise management as well as regional, national and inter-

national project management activities. Subsequently the workshops developed advanced management programs integrating new technologies with advanced discussions of the emerging concepts in quality and strategy management in enterprises and value chains aimed at experienced management personnel. In later years, the activities incorporated the organization of international conferences and journals with a focus on an interchange between science and management groups working in the field. In cooperation with the associate member CentMa as publisher, the Center established the international scientific journal 'International Journal on Food System Dynamics (IJFSD) ([www.centmapress.org](http://www.centmapress.org)).

A further field of activity involves European training initiatives and European interdisciplinary research projects.

To better serve the emerging international activities, the initiatives were incorporated into a non-profit, tax exempt research and training enterprise (ICID) which, in 1990, moved its activities to the city of Bonn and was later renamed into CentMa Research.

CentMa is engaged in applied research with involvement of industry and especially SMEs, by supporting exchange through scientific conferences, stakeholder workshops, and the development of international networks, by transferring research results through training workshops, expert advice and system development support, by publication of international journals and training materials and by international research project activity.

## 2.

# Organization of the FoodNetCenter

## 2.4



The Education and Qualification Alliance was founded as start-up of the International FoodNetcenter in 2015 by standard setters, certification organizations, public and private educational institutions and service providers specialized on agricultural and nutrition science.

In all European public and private institutions the need for coordinated training programmes in the field of "Food Chain", "Food Safety" and "Risk and Crisis Management" is constantly increasing. The EQA education and training is clearly tailored to the specific needs of the agrifood-personnel.

The aim of the modular course series is the long-term competence development of all participants according to a lifelong learning concept.

EQAsce is an independent body to spur innovation, lifelong learning approaches and entrepreneurship across international value chains for food and feed. EQAsce integrates multiple disciplines, diversity and complementarity along the three sides of the knowledge triangle (business, education and research).

With the initiative SMART Pork, started in January 2016, EQAsce aims to support research and development activities, which facilitate innovative ICT-based services and support European technology providers with global market development. Along with user groups initially from meat industry and European research facilities prototypical industry solutions will be developed.

Other initiatives with EQAsce in the position of a lead partner are the currently running transdisciplinary project QVIREA and the Public Private Partnership Animal Welfare. Different aspects about lifelong learning, the use of modern technologies and the im-

provement of animal welfare are combined. In first instance QVIREA develops Digital Career cards which can be seen as a digital portfolio that contains all degrees, certificates, proofs of expertise, etc. that a single person has successfully reached and gained in his/her life. Through the use of blockchain technology all data is safe, tamper proof and verifiable on the spot. The course and training element can be programmed for virtual, mixed and augmented reality.

The latest project EQAsce is involved in carries the name „GeTie“. This stands for „joint effort for animal welfare“ and means a characteristic of pork products that many people at the different stages of the food production chain contribute to. To make this effort transparent to consumers and those at the price formation for a fair product-price, the projects want to define parameters and send them to a single web platform.

EQAsce stays a strong member of regional and international networks as partner in many different initiatives and projects settled in Bonn.

Since 2019 EQAsce is involved in the Fraunhofer Institute's (FIT) project Blockchain for Education - Lifelong learning passport. The partners study how counterfeit protection as well as secure access and secure management of digital certificates could be implemented according to the needs of students in international university networks, companies and certification authorities like DGQ, EOQ, EQAsce and ASI-IN. A joint web platform will enable students or learners to present their digital certificates and supports the managing and archiving of digital certificates. The blockchain technology enables the temper-proof archiving of certificates and permanent allocation to the learners and students.



Bonn.realis (Bonn Research Alliance of innovative Information Systems in International Quality Food Chain and Crisis Communication) e. V. was founded in 2012 as a regional Cluster of public and private Organisations, knowledge providers and companies upon the expectation that during the next 20 years the global trade of feed and food will increase dramatically. This will challenge the agri-food industry, food retail and public authorities as never before. Quality- and crisis-management structures need to be adapted to these altered realities and thereby designed economically, reliable and internationally compatible. The structures require innovative concepts which apply daily and in times of crisis. To achieve this goal, one requirement is the development of innovative technologies. Therefore, the Cluster Bonn.realis lays the foundation for the medium-to-long term, that transforms the region Bonn – Rhein-Sieg – Ahrweiler into a world leading location for quality and crisis communication in the areas of food and human safety.

The unique selling proposition of the Cluster region on one hand is that the region is a nationwide hub of established industries in the fields of information and communication technology (IKT) and also for life science, sensor and security technology as well as logistics. On the other hand, public institutions promote investment in these technologies for the future.

The innovation engine in the field of relevant future technologies is the Public-Private-Partnership (PPP) organisation GIQS e.V., which was established ten years ago; with national and international networks, it is also based in the region. GIQS also includes Bonn-based service providers in sector specific quality management. Cross-linkages between universities, research centres, multinational corporate establishments, service companies and institutions of the federal and state government already exist to a greater extent in the stated region than in any other part of Germany. Such varied and active linkages enable the

complementary use of resources for a cluster of the type proposed.

In the field of advanced security technologies for the protection of consumer and public health, the potential of the Cluster has been cultivated in the science and research region of Bonn. The Cluster comprises small and medium-sized companies (SME), public institutions and authorities, three universities and research institutions as well as 130 additional companies which are integrated through existing networks of the International FoodNetCenter. The region of the Cluster comprises the Federal City of Bonn, the District Rhein-Sieg as well as the District Ahrweiler. The economic, science and research region Bonn in turn is embedded in the already strongly linked ABC/J research region, an alliance of the universities of Aachen, Bonn and Cologne as well as the research centre Forschungszentrum Jülich. At the same time world leading companies in the agri-business and in food retail have their European base in the Cluster region as this region is an important economic zone.

The aspired technological innovative capability of the region could be measured and internationally benchmarked by means of the improvement of the innovation indicator percentage of highly qualified employees in the knowledge-intensive economic sectors of the Cluster region. Leading issues of research and education goals are: Cloud-Computing for network coordinators in the chain-oriented quality and crisis management / Embedded sensor-systems – innovative testing tools in the mobile task-force application / Innovative intrusion-exchange-systems in the crisis and disaster management strategy / Simulation-based inter-company cold chain management and Machine-to-Machine (M2M) in the crisis management strategy / International standardisation of the quality communication in the food chain.

In 2015, bonn.realis-members EITCO, ChainPoint, AgriZert and GIQS e.V. jointly with professors from Bonn University and lecturers of other academies from Germany and abroad took part in the foundation of the European cooperative EQAsce (Education and Qualification Alliance). This was formed as a start-up of the International FoodNetCenter

Three Bonn.realis-members - the Center for Development Research of the University of Bonn, College of Education of Bonn Rhein-Sieg and the Center for En-

## 2.

# Organization of the FoodNetCenter

## 2.4

vironment and Human Safety of the United Nations University - have found „bonnalliance“ in 2017. Its goal is to foster knowledge and competences for a sustainable development.

EQAsce and bonnalliance both are supporting network-structures put up by bonn.realis through broadening the field of topics and transdisciplinary fields of innovation for research and education.



Cold Chain Management network was initiated by Prof. Dr. Judith Kreyenschmidt and deals with efficiently control and organization of production and logistic regarding temperature. It comprises of planning and implementation of single processes and process steps as well as implementation of instruments and methods of process monitoring and control. The focus of Cold Chain Management is on groceries, pharmaceutical products and chemicals, which mostly have to be cooled, as well as on other special goods like some High-Tech-Products, which needs a Cold Chain Management.

The principal aims of Cold Chain Management are optimization of product quality and product safety and minimization of wastage. In practice Cold Chain Management means often temperature monitoring at each step within the production, storage and transportation chain on inner- and inter-operation levels. In the inter-operation temperature monitoring the use of Time-Temperature-Indications and RFID systems with integrated temperature sensors are discussed. Apart from temperature monitoring product characteristics, technical equipment and facilities regarding cooling, laws, regulations and supply chain management are important.

The interdisciplinary working group Cold Chain Management of the Rheinische Friedrich-Wilhelms-University of Bonn was established to facilitate networking and interactions between and among academic scholars, industry experts and aspiring amateurs in the cold chain management.

The primary research-focus of the group is the development and implementation of innovative methods and models for the improvement of food safety and quality as well as the reduction of food waste in perishable food supply chains.

This focus is composed of the following specific research-topics:

- The characterization of spoilage processes of various foods as function of product-, process- and environmental parameters
- The development of predictive models to describe the quality loss and safety aspects as function of different parameter, development of heat transfer models
- The development and investigation of innovative technologies and sensors to control product and process-specific factors over the entire food chain and evaluation of the sustainability of these technologies.
- This includes:
  - Active and intelligent packaging solutions
  - Antimicrobial materials
  - Temperature monitoring devices

The working group Cold Chain Management has varied laboratory equipment at its disposal. This includes a microbiological laboratory for research of spoilage and pathogenic bacteria, a chemical and technical laboratory with a range of different equipment (Packaging machines, SAW Technology, Spectrophotometer, aw- and pH-measurements, gas analyser, chambers to test temperature monitoring devices).

# Focus Groups

FNC Focus Groups are the basic units of the organizational structure of the network. They are fully integrated in the University of Bonn and provide the social environment where young scientists, senior advisors, students and collaborators meet or share the development of their topic, organize activities and give mutual support. Ideally, these teams are also diverse in terms of disciplines and gender. Within the last three years, the FNC established three Focus Groups in the thematically fields One Health, Food Waste and Responsible System Innovation. Since March 2019 the focus groups have been redesigned. You can read more about the future design in Chapter 6.1 of this report.

The mission of the International FoodNetCenter is to promote chain and network research and to become an internationally acknowledged center of excellence, by establishing a world-wide infrastructure for exchanging, developing and disseminating knowledge and by supporting a public private project development in the field of food chains and networks as well as food and human safety.

To achieve this mission, the FNC has defined six main activities:

- Promotion of multi-disciplinary chain and network research
- Enhancement of international position of the center by formulation of strategic research agendas for Food Safety and Human Health
- Facilitation and support of public-private-partnerships in Food Chains and network research projects
- Engagement in jointly-organized inter-disciplinary and international research in the area of ‘Food Chain and Network Research’
- Qualification of young scientists in the research domains Food Safety and Health and Crisis Management
- Support of a global dialogue with similarly focused research networks through international conferences and workshops

## 3.1 Focus Group: One Health



### Interdisciplinary team:

- Prof. Dr. Brigitte Petersen, Preventive Health Management (coordinator)
- PD Dr. Julia Steinhoff-Wagner, Health Management
- Dr. Yvonne Ilg, Preventive Health Management (till 08/2017)
- Dr. Ricarda Schmithausen, Clinical Microbiology
- Prof. Dr. Gabriele Bierbaum, Microbiology
- Prof. Dr. Dr. h.c. Martin Exner, Public Health
- Dr. Martin Hamer, Environmental Health, HBRS
- Dr. Susanne Lehnert, Public Private Partnership Management (till 01/2019)

Antimicrobial resistance (AMR) is a global public health concern. An increasing global food trade, cross border trade of livestock animals and travel of tourists favors the spread of resistant bacteria between countries and continents. Coordinated efforts across

borders are needed to develop a “One Health” concept. The One Health concept is a worldwide strategy for expanding inter-disciplinary collaborations and communications in all aspects of health care for humans, animals and the environment.

### 3.

## Focus Groups

The aim of the Focus Group is to study the role of the total food chain as a reservoir and disseminator of drug resistant bacteria, focussing on food, animals, plants, humans and their environment.

To develop a One Health strategy, three joined research fields are defined:

1. Assessment of microbial population and drug resistance in bacteria
2. Support of food chain oriented crisis management
3. Evaluation of the One Health approach

Members of the FNC-Focus Group One Health are involved in the Fortschrittskolleg "One Health and Urban Transformation". In the next years a transdisciplinary Graduate School will be established by the regional partners: University of Bonn, the University of Applied Science Bonn-Rhein-Sieg and the United Nations University - Institute for Environment and Human Security (UNU-EHS) hosted by the center for Development Research (ZEF).

The Fortschrittskolleg was launched in July 2016 and will investigate the various dimensions and transfor-

mations of the urban systems and their impact on human, animal and environmental health. The historical development and current challenges of North Rhine-Westphalia with a particular focus on the Ruhr Valley, will be contrasted with the three urban metropolitan areas: São Paulo (Brazil), Accra (Ghana) and Ahmedabad (India).

Both "One Health" concepts of FNC and Fortschrittskolleg adopt an integrative perspective of health, recognizing the intrinsic interconnections between human, animal and environmental health. Consequently the environmental, social and economic systems interact with and shape One Health, investigating these interactions that maximize synergistic effects and minimize trade-offs and mitigate health risks.

The position of the region Bonn as "One Health" Hub will be enlarged as location for the GISKOHN (German Initiative Sharing Knowledge of "One Health" Networks) secretary in future.

### 3.2

## 3.2 Focus Group: Food Waste



### Interdisciplinary team:

- **PD Dr. Judith Kreyenschmidt, (Cold Chain Management Group, coordinator)**
- Dr. Ulrike Herbert, Postdoc Cold Chain Management Group
- Dr. Sophia Dohlen, Institute of Nutrition and Food Sciences (till 06/2018)
- Prof. Dr. Rainer Stamminger, Institute of Agriculture Engineering (ILT)
- Dr. Jasmin Geppert, Postdoc, Household and Appliance Technology Section
- Prof. Dr. Michaela Schmitz, INRES-HorticulturalScience/Hochschule Bonn-Rhein-Sieg

Food waste is one of the most publically discussed topics in the recent years. Around the world, every third food product destined for human consumption is discarded, corresponding to more than 1.3 billion tons of food per year. Wasting food means that not only the products themselves are lost, but also large

amounts of resources such as raw materials, energy, land use and packaging materials. To move towards a near-zero waste society innovative, sustainable and value added cross-sector approaches are needed to prevent food waste and limit environmental impacts. The interdisciplinary working Group "Food

# Focus Groups

Waste" is exactly addressing these topics.

1. Development and investigation of innovative technologies and approaches to improve food quality, safety and shelf life resulting in a food waste reduction

2. Development of technologies for resource efficient food production and storage
3. Investigation of consumer behavior in the field of food waste considering socio-economic and cultural aspects
4. Producing safe and healthy food products using renewable resources on an industrial scale

## 3.3 Focus Group: Responsible System Innovation



### **Interdisciplinary team:**

- **Prof. Dr. Monika Hartmann, Agricultural and Food Market Research (coordinator)**
- Prof. Dr. Stefanie Bröring, Technology and Innovation Management in Agribusiness
- Prof. Dr. Georg Noga, Institute of Crop Science and Resource Conservation
- Prof. Dr. Gerhard Schiefer, Food Chain Management
- Dr. Johannes Simons, Agricultural and Food Market Research

Responsible system innovation is a transparent, interactive process that takes into consideration the acceptability and desirability of the innovation process as well as its outcome by all relevant stakeholders. It leads to systemic changes at the technical, organizational and the socio-cultural level and is a perquisite for a dynamic and competitive agricultural and food sector. Responsible system innovation in the food production chain needs to consider the close interdependencies between actors and their dependencies on their cooperation.

The group consists of members from animal and plant science, food chain management, technology and innovation management and consumer and market economics.

Climate change with rising temperatures, rising sea level and increased greenhouse gases will be reflected by water, feed and housing conditions and affect

animal health and welfare. Because of complex interactions between animal welfare, economic aspects and sustainability as well as mainly long term effects on the production chain as a whole, responsible system innovations often fail to get priority at the company internal level.

Therefore scientific community needs to make especially overall effects for the food production chain and its members visible. This requires data collection with smart solutions and the analysis of big data.

Research activities cover the development, optimization and provision of new technologies and processes with the aim to support the performance and competitive capability of the agricultural and food sector. The role of transparency and trust in regard to sustainable agri-food chains is another big area of research in this group.

### 3.

# Bridging & Networking Functions

## 3.4

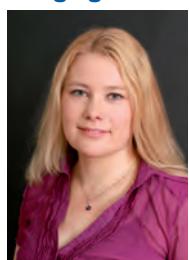
In the field of innovation and regional development, the role of FNC as a higher education institution is to act as a strategic organization bringing together all its developed know-how to create wider economic and social impact. Thus, a holistic view of the FNC's joint activities enables more possibilities, rather than an isolated view. Integrating the fields of research, teaching and external engagement, the knowledge created within FNC may have a much greater impact. The FNC Management Board as well as the FNC academic personnel act pro-active and move far beyond mono-disciplinary and mono-functional approaches.

Funding structures have changed in the past towards more competition. Therefore more engagement in proposal writing is necessary while at the same time targeted funding is more limited. Nowadays the multi-faced roles of a local network like FNC is recognized in regional capacity building in the areas of research, education and business innovation. Due to the international networking activities of FNC chairwoman, Brigitte Petersen and her board membership within

GIQS and Bonn.realis, FNC acts as bridgehead in the advancement of regional and cross-border cooperation. At the same time the head of the FNC is involved in the boards of GIQS and Bonn.realis. The FNC Management Board also initiated the recently the foundation of the European Qualification Alliance (EQA) which aims at providing internationally recognized education and training in the area of quality, risk and crisis management. The three networks FNC, GIQS and Bonn.realis together provide an adequate and effective cluster infrastructure in the area of Food and Human Safety. It leads to concentrated financial and organisational resources to achieve a powerful and serious position in this sector and to an accelerated transfer of knowledge and know-how from research to business.

A joint approach of the FNC members to foster innovation, cooperation and internationalization is to perform bridging functions on four levels: Education networks, system innovation, joint research activities and bridging between FNC Focus Groups

### Bridging to Education Activities



PD Dr. Julia Steinhoff-Wagner fulfills a multifaceted role. She has a bridging function between the Focus Groups Food Waste and One Health. Furthermore she is engaged in the Global Health Master of the University of Bonn together with UNU and ZEF and serves as a contact person between FNC and the CIDRE (Center of Integrated Dairy Research).



Dr. Susanne Lehnert is coordinating the FNC's university network in the area of Higher Education. She is in charge of the organization and coordination of the master program "DGQ Systems Manager Junior". She is bridgehead to ALFONS alliance where four universities match their teaching programs with new professional fields in the agri-food area. She is the FNC's link to the Polish Agri Innovation Cluster coordinated by Warsaw University of Life Science. From June 2015 - February 2019 she was member of the EQA-Board.



Dr. Ulrike Herbert is the contact person for matching the modules of the FNC's quality system Manager Junior program and other joint Master programs in the University of Bonn. She was involved in the working group 4 (Dialogue with public and private stakeholders) for the NEOH consortium.

### Bridging to Focus Groups



PD Dr. Judith Kreyenschmidt bridges the interdisciplinary collaboration between the FNC focus groups by providing theoretical and methodological approaches for system modeling. These scientific instruments can be used by all FNC focus groups. The modeling of biological and biologic-technological systems allows to derive prediction- and risk assessment tool. Mrs. Kreyenschmidt has also a bridging function between several external networks (e.g. the German network "essenswert", the cold chain management network).

# Bridging & Networking Functions

## Bridging to System Innovation



Prof. Dr. Stefanie Bröring has a bridging function to the BioEconomy Science Center BioSC. She is engaged in the FNC-GIQS-NRW-Business Innovation Program.



As elected chairman of the Bio Innovation park Rheinland Prof. Dr. Gerhard Schiefer fulfills a bridging function between research and business innovation.

3.4



Dr. Martin Hamer has a bridging function between like German Food Clusters and the GIQS Offices in Kleve, Wageningen and Warsaw. He is engaged in the FNC-GIQS-NRW-Business Innovation Program.



As one of the initiators of the bio innovation park Rheinland Prof. Dr. Ralf Pude has a leading function concerning the FNC's business innovation activities.

## Bridging to Joint Research activities



Prof. Dr. med. Dr. h.c. Martin Exner is initiator of the BMBF project 'HyReKA', the largest networking project ever funded by the BMBF. In this regard he has the bridging function for the FNC. He is involved in the Global Health Master of the University of Bonn together with UNU and ZEF.



Dr. med. Dr. agr. Ricarda Schmitzhausen has a bridging function between external networks and projects especially at the interface between Agriculture and Medicine. She is co-coordinator of the BMBF-Project 'HyReK' and active member of the management board of NEOH. Furthermore she is involved in the Global Health Master of the University of Bonn together with UNU and ZEF.



Prof. Dr. Juliane Fluck has taken over the professorship for intelligent information retrieval and pattern recognition at the institute for geodesy and geoinformation.



Dr. Hannah Jaenicke is the coordinator of the Horticulture Competence Centre (KoGa). In this function she provides a bridge to and between horticultural and nutrition-related research, experimentation, education and extension activities.



Prof. Dr. Silke Hüttel is professor for production economy at the institute for food and resource economy at the University of Bonn.



Prof. Dr. Jan Börner is professor for economics of sustainable land use and bioeconomy. Since 2019 he is the speaker for the transdisciplinary research area six of the University of Bonn.

### 3.

## Bridging & Networking Functions

### 3.4



The engagement of FNC members in national and international networks is of special importance to promote joint research in close cooperation with other universities and independent research institutions.

In addition, R&D networks in close collaboration with the private sector serve as an essential tool for technology transfer and practical-oriented implementation of theoretical findings, thus contributing to increasing the societal and economic value of academic research in the three focus groups: One Health, Food Waste and Responsible System Innovation. Most of the networks aim to identify the specific research demand of Germany and Europe. The intensive exchange between the different institutions as members of the networks leads to an optimal use of existing resources as well as synergy effects. All networks comprising general strategy platforms serve as a forum for the discussion of current scientific and agro-political challenges.

Europe's food and nutrition businesses operate in a challenging and dynamic environment. Translating these challenges effectively into new business op-

portunities is required for sustaining its position in global competition. The International FoodNetCenter became involved with leading research and higher education institutions and regionally rooted project partners from industry with a global reach. Actually there are four national and two new international networks intensively linked to the FNC activities.

#### Networks coordinated in the Bonn Region:



# Interdisciplinary Research

The integration of animal, plant and human health as well as environmental protection in a globalized world was considered by the International Advisory Board as a „pearl“ and „capital“ of the FNC. The board noted the high relevance of three research topics and

a stronger integration of social science research in the Focus Groups. The members of the Focus groups tried to follow the recommendation in the last year.

## 4.1 Antibiotic Resistance

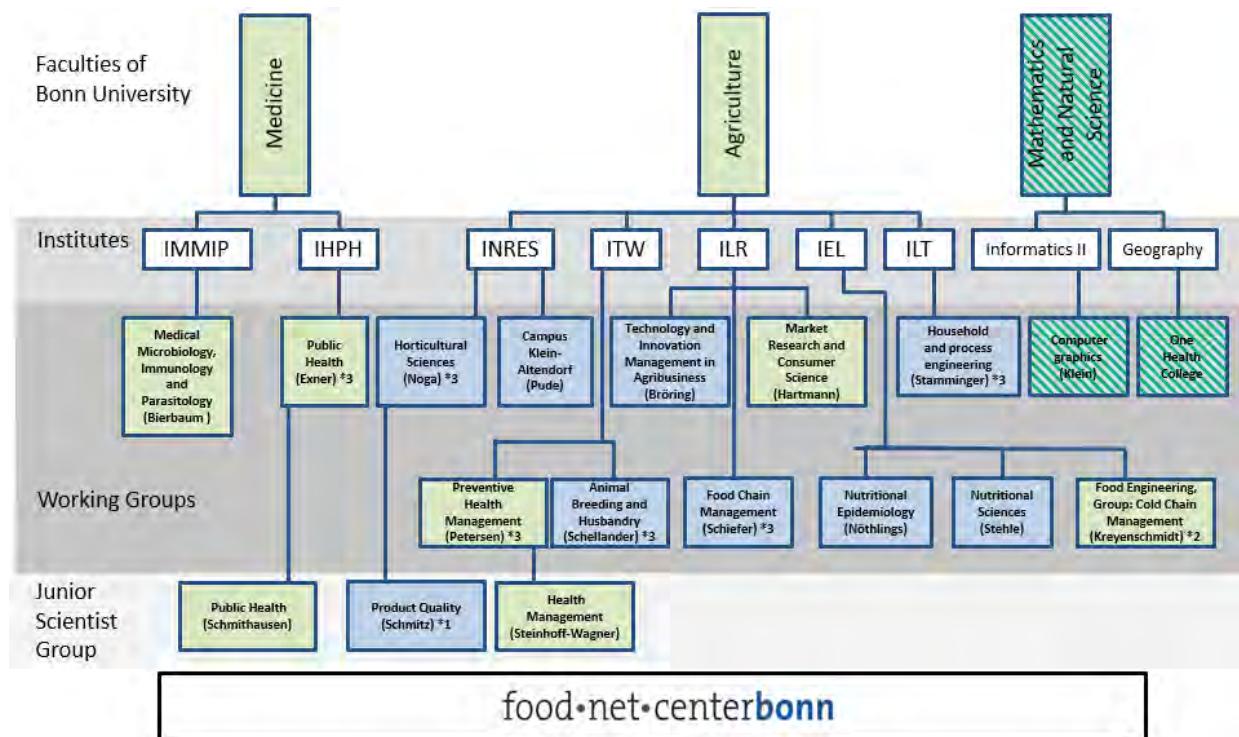


Fig. 4: FNC organisation chart: Antibiotic Resistance

The core project of the group „Antibiotic Resistance“ is the HyReKA project. The project has started on 1st February 2016 and is now well under way. The groups of the FNC meet once a week and the first months were spent with preparatory work including several meetings, generation of a website and press-release, the definition of protocols, of parameters for the data base, sample points and the generation of sampling plans.

Further work was spent on the optimisation of sample processing, especially to adapt the agars and methods that are used for cultivation in medical microbiology to samples of waste water which contain environmental bacteria. First results show the presence of resistant bacteria in waste water from hospitals as well as from waste water from a rural area and very diverse antibiotic concentrations were measured in the waste water from the hospital.

# 4.

## Interdisciplinary Research

### 4.1

#### HyReKA

**Funding:** Federal ministry of education and Research  
**Period:** 01.02.2016 – 31.03.2020  
**Partners:** International FoodNetCenter Bonn (Bierbaum, Exner, Petersen, Kreyenschmidt, Schmithausen, Steinhoff-Wagner and employees), RWTH Aachen, TU Dresden, Institute for technology Karlsruhe, Erftverband Bergheim, Oldenburgisch-Ostfriesischer Wasser-Verband, Xylem Water Solutions, Klärwerk Steinhäule, Federal office of environment  
**Aims:** Tracking of antibiotic resistant pathogens from hospitals, agricultural facilities, slaughterhouses and airports via wastewater and sewage water treatment plants into surface waters and prevention of their dissemination.  
**Methods:** Sampling of a large variety of waste and raw water, isolation of resistant bacteria, determination of antibiotic concentrations and resistance genes and characterization of bacteria, modeling of various systems.

#### MiRA: Microbe induced Resistance to Agricultural pests

**Funding:** European Union's Horizon 2020 research and innovation programme  
**Period:** 12/2017 – 05/2021  
**Partners:** 11 Academic institutions including International FoodNetCenter Bonn (Hartmann), and 6 companies  
**Aims:** The MiRA project will train 15 PhDs in basic and applied research on context-dependency of Microbe-induced Resistance (MiR), mechanisms, and impacts on plant performance and other biocontrol organisms. We will use this understanding to improve our ability to predict the effectiveness of MiR under different conditions, to select plant and microbial strains with improved context-stability, and to develop better methods for the formulation of microbial inoculants and their application in agriculture. Finally, we will analyze economic prospects and constraints for MiR development and use. The focus of International FoodNet-Center Bonn in the project is to analyse the market potential and endusers' willingness to uptake MiR.  
**Methods:** Methods applied in the framework of the project at International FoodNetCenter Bonn: Expert Interviews, Focus Group Discussions, Surveys

#### UBA-Project: Communication strategies for reduction of veterinary drug entries

**Funding:** Federal office of environment  
**Period:** 01.07.2016 – current  
**Partners:** Egologic Institute non-profit GmbH, International FoodNetCenter Bonn (Petersen, Steinhoff-Wagner, Ilg), EQAsce, Landwirtschaftskammer NRW, Hydor Consult GmbH,  
**Aims:** • Collection of scientific and recommendative informations for veterinarians and farmers about the environmental impact of usage of veterinary medicine  
• Measurement of the environmentally friendly usage of veterinary medicine  
• Production of information brochures, education and learning materials and an internet platform for various target groups  
**Methods:** Literature research, concept development and expert discussion

# Interdisciplinary Research

## NEOH Cost Action

4.1

**Funding:** EU Cost Action  
**Period:** 11/2014 – 11/2018  
**Partners:** International FoodNetCenter (Petersen, Schmithausen, Hamer)  
**Aims:** The overall aim of NEOH is to enable appropriate evaluations of One Health activities and hence comparison of initiatives as well as informed decision-making and resource allocation. To this end, NEOH will deliver:  
 - A science-based, standardised framework for the evaluation of One Health  
 - A suite of example evaluations of One Health initiatives  
 - A networked community of experts collaborating to assess the value of One Health  
 - A pool of early-stage researchers trained in performing evaluations of One Health activities.  
**Methods:** Workshops, exchange platform for junior scientists in case studies

## MiRA: Microbe induced Resistance to Agricultural pests (Proposed)

**Funding:** Københavns Universitet Denmark  
**Status:** Submitted  
**Partners:** Applied for International FoodNetCenter Bonn (Hartmann), 11 Academic institutions and 6 companies  
**Aims:** MiRA project will train 15 PhDs in basic and applied research on context-dependency of Microbe-induced Resistance (MiR), mechanisms, and impacts on plant performance and other biocontrol organisms. We will use this understanding to improve our ability to predict the effectiveness of MiR under different conditions, to select plant and microbial strains with improved context-stability, and to develop better methods for the formulation of microbial inoculants and their application in agriculture. Finally, we will analyze economic prospects and constraints for MiR development and use.

## SocialLab: Society's perception of animal husbandry (Proposed)

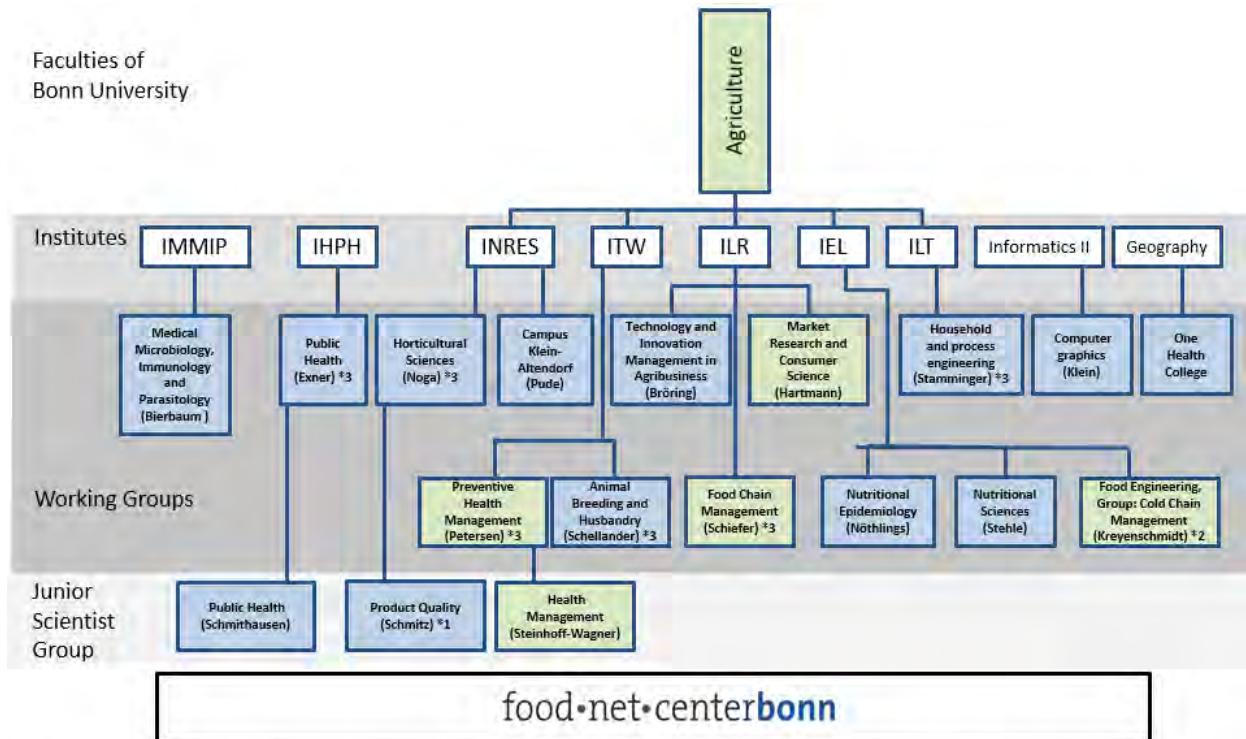
**Funding:** Federal Ministry of Food and Agriculture (BMEL) based on a decision of the Parliament of the Federal Republic of Germany via the Federal Office of Agriculture and Food (BLE) under the innovation support program  
**Period:** 05/2015 – 04/2018  
**Partners:** Thünen-Institut für Marktanalyse, Fachhochschule Südwestfalen, Georg-August-Universität Göttingen, Technische Universität München, International FoodNetCenter Bonn (Hartmann), Heinrich-Heine-Universität, Instet-Privates Forschungs- und Beratungsinstitut für angewandte Ethik und Tierschutz, Zeppelin Universität  
**Aims:** Differentiated analysis of criticism of farm animal husbandry from various societal groups; Identifying realistic ways how farm animal husbandry can be improved from the perspective of different societal groups; Removal of barriers between e.g. consumer, citizen, farmers, retailer in dealing with each other  
**Methods:** Combination of qualitative (e.g. expert interviews, focus groups), quantitative (e.g. online surveys) and/or imagine methods (e.g. functional magnetic resonance imaging)

# 4.

# Interdisciplinary Research

## 4.2

### 4.2 Sustainable Food Value Chains and Animal Welfare



IMMIP: Institute for Medical Microbiology, Immunology and Parasitology

ILT: Institute of Agricultural Engineering

IHPH: Institute for Hygiene and Public Health

ILR: Institute for Food and Resource Economics

INRES: Institute of Crop Science and Resource Conservation

ITW: Institute of Animal Science

IEL: Institute of Nutrition and Food Science

\*1 Bonn Rhein-Sieg University of Applied Science

\*2 Substitution of the Professorship Food Process Engineerin, since May 2015

\*3 Professorships where professors retire or are about to retire

Fig. 5: FNC organisation chart: Sustainable Food Value Chains and Animal Welfare

It will be challenging to meet future global demands for food while avoiding, or at least mitigating, negative impacts on ecosystems – and at the same time reducing poverty, supporting livelihoods and ensuring food safety and animal welfare. At the same time, the research groups are confronted with changing consumer demands, the challenges of climate change and advancing globalization as well as shortages of resources. Other assessments indicate that nowadays nearly half of our food is already lost before it reaches private households. The reasons for this lie, amongst others, in rotting and destruction by parasites already in the field, inefficient management of supply chains, weak points in the management of cold chains and inadequate local infrastructures.

The global challenge to produce more food and to ensure, at the same time, that this food is of high quality, in consideration of the principle of sustainability,

requires research approaches and management strategies guaranteeing an overall view and interconnection of all links and players of the feed and food chains in an international context. Therefore the interdisciplinary research group deals mainly with the Netchain as research objective. The interdisciplinary approach can contribute in this regard enormously to responsible and sustainable food production, processing and consumption.

The interdisciplinary teams are devoted to developing science based concepts for the creation and management of complex value added networks in the national and global agri-food industry. They also focus on optimizing the integration of the networks into the respective socio-cultural and socio-political environments.

Current projects

Submitted projects

# Interdisciplinary Research

## Competing objects of protection in animal husbandry – Analysis from a consumers' perspective

4.2

**Funding:** Ministry for Environment, Agriculture, Conservation and Consumer Protection of the State of North Rhine-Westphalia (MULNV)

**Period:** 07/2018 – 06/2020

**Partners:** International FoodNetCenter Bonn (Hartmann, Simons)

**Aims:** The project aims at (1) identifying relevant goals of protection in the context of animal husbandry from the perspective of consumers or citizens respectively, (2) characterizing approaches to deal with conflicting goals and (3) providing information for decision makers in ministries, farms and companies with respect to developing animal husbandry.

**Methods:** Conflicting goals in animal husbandry are identified based on a literature review and expert interviews. The way consumers / citizens deal with conflicting goals and the way they prioritise respective goals is analysed based first, on focus group discussions and second, by making use of a quantitative survey with an integrated experiment.

## Using Club Theory to Better Design Whole-of-Chain Solutions to Food Loss and Food Waste in the Fresh Produce Sector

**Funding:** German Academic Exchange Service (DAAD)

**Period:** 01/2019 – 12/2020

**Partners:** University of New England (Centre for Agribusiness), International FoodNetCenter Bonn (Hartmann, Simons)

**Aims:** The project attempts to tackle the important food value chain challenge of food waste using novel concepts derived from the theory of clubs. These concepts are chain failure (failure to maximise value chain surplus), chain externalities (spill-ins or spill-overs outside the value chain), and chain goods (collective ways of overcoming chain failure).

**Methods:** Literature review, workshops, expert interviews.

## Strength2Food – Strengthening European Food Chain Sustainability by Quality and Procurement Policy

**Funding:** European Union's Horizon 2020 research and innovation programme

**Period:** 03/2016 – 02/2021

**Partners:** 30-partner consortium (13 European academic partners including International FoodNetCenter Bonn (Hartmann), 2 third country academic partners (Thailand and Vietnam), 3 communication and training partners, 12 international and national stakeholders)

**Aims:** This project aims to improve the effectiveness of EU food quality schemes (FQS), public sector food procurement (PSFP) and to stimulate Short Food Supply Chains (SFSC) through research, innovation and demonstration activities. International FoodNetCenter Bonn is leader of Work Package 8. The main objectives of this Work Package is to understand the perspectives of consumers in terms of their knowledge, perception, confidence and valuation of EU/national/regional quality labels as well as their food practices and purchasing behavior with respect to products promoted by those schemes across different consumer groups, food cultures and settings.

**Methods:** Methods applied in the framework of the project at International FoodNetCenter Bonn: Online Surveys, Ethnographic fieldwork, Experiments with a Virtual Supermarketanalysed based first, on focus group discussions and second, by making use of a quantitative survey with an integrated experiment.

# 4.

## Interdisciplinary Research

### 4.2

#### TMB Food - Tailored microalgae-based foods and feed for sustainable and healthy nutrition

**Funding:** Federal Ministry of Education and Research - Nationale Forschungsstrategie BioÖkonomie 2030  
**Status:** submitted  
**Partners:** 5 partners at the University of Hohenheim; International FoodNetCenter Bonn (Hartmann), 1 company  
**Aims:** Aim of the project is the development of new and innovative products based on the whole microalgae instead of particular ingredients and usable as a new/novel food securing sustainable and healthy human nutrition according to current diet advices and as a new feed for innovative farm animal nutrition fostering the production of healthy animal products for humans.  
**Methods:** Methods applied in the framework of the project at International FoodNetCenter Bonn: Intensive one to one interviews and focus group discussions, online surveys, non-hypothetical laboratory experiment.

#### SocialLab II - Acceptance of livestock husbandry through innovation

**Funding:** Federal Ministry of Food and Agriculture (BMEL)  
**Status:** Submitted, Project outline within the framework of the Innovation Promotion Programme of the BMEL  
**Partners:** the BMEL  
University of Applied Sciences South Westphalia (FHSWF); Heinrich-Heine-University of Düsseldorf; Research and Consulting Institute for Applied Ethics and Animal Welfare (INSTET), International FoodNetCenter Bonn (Hartmann); Thünen Institute for Market Analysis; Technical University of Munich; Georg-August-University of Göttingen, Zeppelin University  
**Aims:** Follow-up project based on SocialLab I.  
The aim is to answer questions on the social, market economy or political implementation  
**Methods:** of the further development of livestock farming from various stakeholders' point of view.  
(1) Modules for carrying out longitudinal studies on the acceptance of livestock farming are developed, tested and made available to the BMEL for regular implementation. In addition, a media impact analysis is planned. (2) By using discussion platforms, options in livestock farming with a high level of acceptance among citizens and at the same time offering perspectives for agricultural enterprises will be developed. (3) Experiments will be conducted using a virtual supermarket and a real laboratory.

#### Analysis of marketing channels and market conditions for lamb meat and wool in Germany with regard to developing recommendations for improving profitability of sheep farming in Germany.

**Funding:** Federal Office for Agriculture and Food (BLE)  
**Period:** Submitted: Planned 01.2019 – 12.2021  
**Partners:** University of Bonn, ILR, Production Economics; International FoodNetCenter Bonn (Hartmann, Simons); Vereinigung deutscher Landesschafzuchtverbände  
**Aims:** The overall aim of the project is to gain insights into the lamb meat and wool markets as a basis for the improvement of the profitability of sheep farming in Germany. Against this background information on the marketing chain and market conditions for lamb meat and wool are collected. Based on the results of the analysis and in close co-operation with the other project partners and actors of the value chain recommendations are developed. To the extent possible recommendations are implemented during the project term and evaluated regarding their effectiveness.  
**Methods:** The market study is based on a review of literature and statistics. Detailed information on strengths and weaknesses of the value chain will be collected by expert interviews. Market conditions on the level of consumers will be analysed with two different, complementary approaches: (1) a qualitative study based on in depth interviews and group discussions and (2) a quantitative online survey.

# Interdisciplinary Research

## RiskInK – Development of measures to minimize health risks in piglets during recovery phase after castration surgery under injection anesthesia

4.2

**Funding:** Ministry for Climate Protection, Environment, Agriculture, Conservation and Consumer Protection of the State of North Rhine-Westphalia

**Period:** 07/2018 – 10/2019

**Partners:** University of Bonn (ITW: Steinhoff-Wagner, Schmid; ILT: Büscher)

**Aims:** The castration of male piglets will be restricted to surgeries with anesthesia and sufficient pain medication. Preliminary work narrowed procedures down to general anesthesia by injection. However, the disadvantage of this technique is the long recovery period, whereby piglets fail to maintain body temperature and injuries as well as crushing may occur. Therefore, the aim of the project is to develop measures to minimize health risks for piglets during the recovery period.

**Methods:** For that purpose, a practicable concept procedure should be developed, tested and evaluated, by using a simple technical solution (e. g. usage of sensor technology for smart phones). Risk-minimizing includes measures to maintain body temperature, prevent crushing by temporary limitation of movements and avoid injuries after anesthetization until full recovery. This was investigated by analyzing behavior using video techniques and body temperature measured by various techniques. Additionally, valid measurable and under practical conditions feasible parameters should be stated, which can be used to evaluate and review piglet well-being from anesthetization to first suckling after surgery by the farmer.

## Chain Failure and Chain Goods in Sustainable Food Value Chains

**Funding:** DAAD (German Academic Exchange Service)

**Period:** 01/2016 – 12/2017

**Partners:** International FoodNetCenter Bonn (Hartmann)

**Aims:** Developing an theoretical framework to analyse food chains in order to find essential connecting points for a sustainable restructuring of the chain and deriving from that a reference model as a basis for a Dialog between science and economy to process the sector.

**Methods:** Analysing the value chain with the help of the evidence-based reasoning method by integrating the Club theory.

## Animal Welfare in agricultural livestock farming in Germany - Changes and trends in consideration of actual political and social frameworks

**Funding:** Landwirtschaftliche Rentenbank

**Period:** 01.05.2016 – 31.12.2018

**Partners:** International FoodNetCenter Bonn (Petersen, Steinhoff-Wagner, Ilg)  
Dr. Christiane Gothe - Communication specialist and journalist in agribusiness, Lilienthal

**Aims:**

- Identifying the willingness of pig and cattle farmers to change their investments in new production and animal husbandry systems.
- Evaluating the opinion barometer of the farmers
- Improving the dialogue between agriculture, society, trade and politics

**Methods:** Literature research, survey at the animal fair Eurotier in Hannover, expert interviews

**Output:** Book: „Qualitätsmerkmal Tierwohl“ (International FoodNetCenter)

## 4.

# Interdisciplinary Research

## 4.2

### MarkiT - Development of a brand meat program for the integration of animal welfare in consideration of economic and social aspects

**Funding:** Federal Ministry of Food and Agriculture (BMEL), Landwirtschaftliche Rentenbank  
**Period:** 11/2014 – 05/2018  
**Partners:** International FoodNetCenter Bonn (Petersen, Steinhoff-Wagner), Fleischwerk EDEKA Nord-GmbH, Vermarktungsgemeinschaft für Zucht- und Nutzvieh ZNVG eG, Georg-August-Universität Göttingen, Lehrstuhl Marketing für Lebensmittel und Agrarprodukte, Grenzüberschreitende Integrierte Qualitätssicherung e.V.  
**Aims:** The objective of the interdisciplinary collaborative project is to further develop a branded meat program in a customer-oriented manner taking economic, social, animal welfare and animal health aspects into account.  
**Methods:**

1. Definition of measures and criteria for the integration of animal welfare aspects into the production guidelines
2. Analysis of information requirements, total costs of implementation, and willingness to invest in the value chain
3. Development and testing of chain-oriented consulting and communication concepts
4. Testing and economic-labour-efficient evaluation of measures for the conversion of the production of agricultural pilot farms and contract design
5. Animal health assessment and design for the extension of existing audit activities
6. Coordination & project management, transfer of knowledge

### SMART PORK - Production-accompanying Organisation of Animal Welfare and Health Cooperations along the entire meat value chain

**Funding:** Meat-Sector-Technology Platform  
**Period:** 01/2016 – 12/2018  
**Partners:** International FoodNetCenter Bonn (Petersen), EQAsce, PigCHAMP Pro Europa, EITCO GmbH, CSB-System AG, ChainPoint GmbH, AgriSyst GmbH, EPG Assistant GmbH, Fleischprüfring Bayern e.V., Agrizert GmbH, Topigs Norsvin GmbH  
**Aims:**

- Creation a roadmap to implement system innovations
- Creation of synergy effects between simultaneous development projects within different pilot value chains.
- Neutral assessment of cost and benefit of technical solutions to improve the animal welfare performances of all responsible persons in the entire value chain.
- Improvement and acceleration of the common knowledge building.
- Improvement of the cooperation between universities and companies.

**Methods:** The merger of companies and research institutes according to the four industry challenges. Regular workshops of the platform.

# Interdisciplinary Research

## Implementation of animal welfare aspects in German poultry industry

4.2

**Funding:** Landwirtschaftliche Rentenbank

**Period:** 04/2017 - 12/2018

**Partners:** International FoodNetCenter Bonn (Petersen)

Dr. Christiane Gothe (Communication specialist and journalist in agribusiness, Lilienthal)

**Aims:** Documentation of progresses and future perspectives in regard to implementation of animal welfare aspects in German poultry industry

**Methods:** Literature research, surveys with practitioners, expert interviews

## DFG Project „Living Handbook of perishable food supply chains“

**Funding:** Deutsche Forschungsgemeinschaft supports the project with funds of 128,668 €

**Period:** 03/2016 - 03/2019

**Partners:** Leibniz Information Centre of Life Sciences; University of Bonn, FNC Food Waste Group (Judith Kreyenschmidt)

**Aims:** The Living Handbook of perishable food supply chains covers two main topics

1. Country specific information about Cold Chains (Trade Statistics, Structure of market, Country specific regulations, current technologies, challenges)
2. Research activities in the field of Cold Chain Management and technologies (Product and process specific research, transportation systems and logistics, environmental and sustainability aspects)

**Methods:** Literature review, collection of peer-reviewed articles, international meetings

**Output:** Open-source, online Handbook

## Safeguarding of hygiene standards in dairy calf systems - identification of critical control points and method validation

**Funding:** Landwirtschaftliche Rentenbank

**Period:** 01.06.2018 - 31.12.2019

**Partners:** University of Bonn (ITW: Steinhoff-Wagner, Heinemann)

**Aims:** The project aims to improve hygienic conditions in dairy calf rearing systems by monitoring the success of cleaning and disinfection at different farms and to identify critical control points. Based on the results from the first sampling a training concept for farmers will be designed to interrupt reinfection and reduce the incidence of calf diarrhea.

**Methods:** Different locations in pens are sampled with swabs or sock samples. Samples will be analyzed for protein- and adenosine-triphosphate content, total aerobic count, Salmonella spp., E. coli and number of total coliforms, ESBL-producing bacteria and MRSA. Additionally, occurrence of oocysts from cryptosporidiosis spp. will be investigated. A risk assessment will be derived from the experimental data to design training concept for farmers. After implementing the concept, farms will be visited and sampled again to evaluate success of the training.

## 4.

# Interdisciplinary Research

## 4.2

### Development of intelligent packaging solutions to increase the resource efficiency in supply chains of perishable food products (Intelli-Pack)

**Funding:** The Federal Ministry of Food and Agriculture (BMEL) and Federal Office for agriculture and food (BLE) support the project with funds of around 1,8 million €. University of Bonn, FNC (Food Waste Group): 446,794 €

**Period:** 01.10.2018 - 30.09.2021

**Partners:** University of Bonn (FNC Lead: Judith Kreyenschmidt), University of Bayreuth, EUFH, FH Münster, Bizerba Labels & Consumables, European EPC Competence Center, Genusshandwerker, Landpack, Wolf Wurstspezialitäten, Metro Logistics

**Aims:** The aim of the research project is the development of a sustainable and novel intelligent packaging system for different supply chains (B2B, B2C), to improve the quality, safety and resource efficiency of perishable products. The main approach focus on the measurability of the shelf life in real time at each point of the supply chain provided by the information

**Methods:** of the intelligent packaging.  
Literature research, creation of requirement profiles for intelligent packaging (IP), analysis of supply chains, characterization of IP, modelling, storage tests, pilot studies, integration

**Output:** of flexible best-before days  
Advancement of intelligent packaging systems, App for the prediction of the remaining shelf life in real time, sustainable sensor-based packaging for B2B und B2C incl. online trading, IC tool to support the implementation of intelligent packaging and to assess the sustainability of the new labels

### Potential for Innovative Chains: unlocking the potential for Competitiveness and Agro-food Sustainability (Proposed)

**Funding:** EU programm

**Status:** First draft version revised by members. All institutional registration completed.  
Last Draft version from coordinator expected on Jan. 27, 2017 - to be reviewed and approved by partners:

**Partners:** Stichting Wageningen Research (Netherlands) (Coordination)  
24 (Universities, Research centers, Private firms)

**Aims:** To provide in-depth insight into horizontal and vertical collaborations amongst agri-food chain actors, to design and test new business models for co-creation, and to uncover the mechanisms that (dis)enable innovative processes.

**Methods:** Empirical investigations

### One Health and Food Safety: Conference

**Funding:** German Research Foundation

**Period:** 05/2018 - 09/2018

**Partners:** International FoodNetCenter Bonn (Hartmann)

**Aims:** Objective of the congress One Health and Food Safety is to bring together researchers from around the world of different disciplines including public health politics, human and veterinary medicine, animal, plant and environmental science, and economics.

# Interdisciplinary Research

## Intelli-Pack: Development of intelligent packaging solution to increase resource efficiency in cold supply chains

4.2

**Funding:** Federal Office for Agriculture and Food (BLE)

**Period:** 2018-2021

**Partners:** Intelli-Pack is a joint research project under the leadership of the University of Bonn and the membership of nine further research and industry partners.

**Aims:** The goal of the research project is the development of sustainable and novel intelligent packaging systems for different supply chains (B2B, B2C) to increase the quality, safety and resource efficiency of perishable products.

**Methods:** The main focus is to allow the calculation of the remaining shelf life just-in-time. These calculations will be performed on the basis of intelligent labels combined with advanced data management systems and the implementation into a user-friendly smartphone application. Furthermore, a sustainable packaging solution including modern sensor-technology systems, specifically for online businesses, will be developed. Meanwhile, relevant legal aspects for the introduction and use of intelligent packaging will be illuminated and assessed. Current traceability solutions for the support of quality sensor data will be expanded. The novel common technology will be tested under laboratory conditions and validated in pilot chains. Consumer studies will clarify whether intelligent packaging can replace the use-by-date. The development of an online platform to assist companies in the implementation of intelligent packaging will be the final part of the project.

## FreshIndex: Investigation of a real-time dynamic shelf life indicator to optimize the food supply chain

**Funding:** Federal Ministry of Education and Research (BMBF)

**Period:** 2018-2020

**Partners:** The FreshIndex project is funded by the BMBF and 7 partners from industry and research are involved.

**Aims:** Investigation of a real-time dynamic shelf life indicator to optimize the food supply chain.

**Methods:** Development and validation of a predictive shelf life model depending on the spoilage kinetics of specific products / Definition of a graded FreshIndex on the basis of the predictive model / Building a big data cloud for cross-industry exchange of quality data / Development of an app to predict the remaining shelf life in real-time / Implementation of rapid methods to analyze the initial hygiene of each product in real-time

# 4.

# Interdisciplinary Research

## 4.3

### 4.3 Waste Management

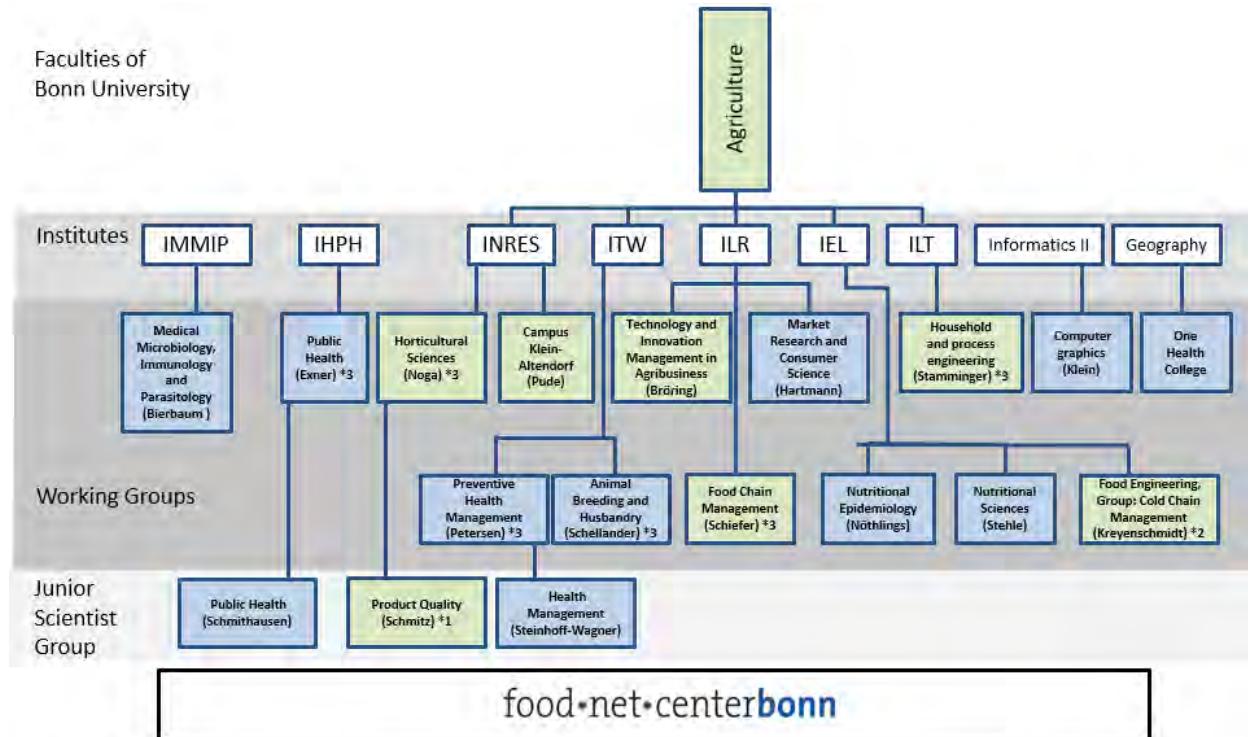


Fig. 6: FNC organization chart: Waste Management

Food production significantly contributes to total global environmental impact. Food and beverages represent 20–30% of the environmental impact of all consumed products in Europe, which include clothing, communication, transportation and so on. Large quantities of these produced food products are wasted along the entire supply chain. Within the group of food products, the amount of food waste varies greatly. From different available studies, it is evident that most products are thrown away in fruit & vegetable chains, followed by leftovers of homemade dishes and/or ready meals. Although meat only ranks at number 5 on the list of food disposables, meat production is associated with a high usage of energy and water, plus a high emission of green-house gases. Thus wasting products is a problem for environmental, food security and economic reasons.

There are different reasons why food is wasted, e.g. insufficient consumer awareness, habits and expectations, products not conforming to quality or safety requirements, premature spoilage before the “best before” or “use by” date is reached or the non-consumption of food before product expiry. Thus, to address all these different issues and to reach a more sustainable food production a strong cooperation between interdisciplinary research teams is important which are working together on the development of innovative sustainable products and on the optimisation of the waste management along the entire supply chain.

  Current projects     Submitted projects

# Interdisciplinary Research

## Assessment of meat failures and shelf life of poultry meat in relation to different nutritional strategies

4.3

- Funding:** Evonik Nutrition & Care GmbH
- Period:** 01.07.2018 - 28.02.2019
- Partners:** University of Bonn (FNC Lead: Judith Kreyenschmidt), Evonik Nutrition & Care GmbH, feed-test
- Aims:** The project aimed at the detailed investigation of the quality and shelf life of fresh poultry meat with special regard to meat failures.
- Methods:** A total of 720 broilers were fattened with six different diets and slaughtered at two different slaughter ages. The breast filets were stored and meat quality, meat failures and shelf life was investigated. The analyses comprised typical physicochemical parameters (pH, colour, TBARS) and a sensory evaluation of the samples. A detailed investigation of the meat failures white striping and woody breast was conducted by a sensory grading of the filets as well as shear force and texture profile analyses.
- Output:** Publication of results

## Bio-based packaging materials, part of the research project “competence focus bio-based products”

- Funding:** The ministry for economy, innovation, digitization and energy of North-Rhine Westphalia supports the project in the program promotion of investments in growth and employment from the European fund for regional development with funds of 955,447.50 €. University of
- Period:** Bonn, FNC (Food Waste Group): 199,405 €
- Partners:** 01.10.2017 - 30.09.2020  
University of Bonn (FNC Lead: Judith Kreyenschmidt), University of Bonn (INRES, ILR), University of Applied Sciences Bonn-Rhein-Sieg and Alanus University of Applied Sciences,
- Aims:** there are also more than 10 companies involved in the project.  
The aim of the research project is the development of sustainable packaging solutions out of regional biomass for the direct marketing of agricultural products. Quick growing grasses, so-called “low-input plants” are the resources of the sustainable packaging materials, cultivated at the University of Bonn. After material utilization, new sustainable paper
- Methods:** and bio-based polymer packaging will be produced. Bioactive additives will be integrated to prolong the shelf life and the waste in the chain.
- Output:** Literature research; analysis of the antimicrobial activity of selected additives; pilot studies with sustainable paper and bio-based polymer packaging; value chain analysis and life cycle assessment  
New sustainable paper and bio-based polymer packaging solutions out of regional biomass for the direct marketing of agricultural products; online platform for the technical and commercial development of sustainable packaging, scientific publications

## Customer satisfaction survey on apples

- Funding:** Private cooperation project: University of Warsaw and University of Bonn
- Period:** 10/2016 – 09/2018
- Partners:** EQAsce, International FoodNetCenter Bonn (Petersen), University of Warsaw
- Aims:** Customer-satisfaction analysis and ranking. Test two new developed Polish apple types and comparison to same German type; suggestions for improvements and evaluation of the prospects on the German market
- Methods:** Sensory evaluation

## 4.

# Interdisciplinary Research

## 4.3

### Investigation of a dynamic shelf life criteria for the optimization of the food supply chain (Fresh-Index)

**Funding:** The Federal Ministry of Education and Research (BMBF) supports the project in the framework of the funding measure "KMU-NetC" with funds of around 1 million €. FoodNetCenter (Judith Kreyenschmidt), University of Bonn: 137.700 €

**Period:** 01.01.2018 - 31.12.2019

**Partners:** University of Bonn (FNC, food waste Group), arconsis IT Solutions GmbH, Bonn-Rhein-Sieg University of Applied Sciences, METRO AG, tsenso GmbH, GS1 Germany, bwcon e.V.

**Aims:** The aim is to establish a Fresh Index for the meat supply chain. The Fresh Index is a dynamic real-time shelf life, which can be flexible adapted in each step of the chain. The real-time determination of shelf life is based on predictive food models and on a reliable gapless system, which monitors temperature and product hygiene throughout the entire supply chain. The implementation of the Fresh Index will enhance the product quality, safety and traceability and lead to a long-term reduction of food waste.

**Methods:** Characterization of the food spoilage process by different microbial, chemical and sensory parameters, development of model to predict the shelf life of different products

**Output:** Shelf life models to predict the remaining shelf life in each stage of the chain, scientific publications of the results, on-site user workshops

### Bio-based products (Coordinator: University of Bonn (INRES)) (Proposed)

**Funding:** Ministry for innovation, science and research of North-Rhine Westphalia (MIWF)

**Period:** ???

**Partners:** University of Bonn (IEL), Cold Chain Management Group, University of Bonn (INRES (Coordinator), IEL, ILR), Hochschule Bonn-Rhein-Sieg, there are also more than 10 industry companies involved in the project

**Aims:** Development of sustainable packaging solutions out of regional biomass for use in agricultural products.

**Methods:** Quick growing grasses, so-called 'low-input plants' are the resources of this product, cultivated at the University of Bonn. After material utilization new sustainable paper and bio-based polymer packaging will be produced. Bio-active additives will be integrated to slow down the loss of freshness and therefore reduce rejects in the supply chain.

# Interdisciplinary Research

## Network bioPack and transportation

4.3

**Funding:** Central Innovationprogram for medium-sized businesses (ZIM) / Federal Ministry for Economy and Energy

**Period:** since 2019

**Partners:** The research network comprises 14 collaborating companies and 5 research institutes from Germany, Austria and Luxembourg.

**Aims:** The focus of the network is the development of sustainable packaging solutions with special emphasis on the sustainability of the used materials.

**Methods:** Following the 'cradle to cradle' principle, the development of products and materials with a focus on reuse is forced. As biological base, the resources should allow for subsequent organic growth or be reused as secondary resources. The specific aim of the network is the development of a solution portfolio for the innovative use of natural resources in ecological and sustainable packaging materials.

## Competence focus on bio-based products, sub-project: Development of sustainable packaging solutions from regional biomass for the marketing of agricultural products (EFRE, NRW 2017-2020)

**Funding:** European Regional Development Fund / Ministry of Economic Affairs, Innovation, Digitalisation and Energy of the State of Northrhine-Westphalia

**Period:** 2017-2020

**Partners:** University of Bonn (IEL), Cold Chain Management Group,

**Aims:** The aim of the project is to develop sustainable packaging concepts for the marketing of regional products.

**Methods:** Fast-growing grasses (low-input-plants) serve as raw material for new sustainable paper and bio-based poylmer packaging. Basically, the packaging is of crucial importance as it contributes to the freshness, safety, durability and it protects the product from external influences. Bio-based materials often do not correspond to the technical properties compared to previous fossil-based packaging materials. This results in a faster loss of freshness and increased food waste in the entire value chain. To ensure the necessary mechanical-dynamic and chemical material properties of the packaging materials these parameters are considered for the development as well as product-specific quality and safety parameters. In order to slow down the loss of freshness, extend the shelf life of the products and thus reduce food waste in the chains bioactive additives with an antimicrobial and antioxidant effect, such as plant extracts e.g. essential oils, enzymes, organic acids or biopolymers are incorporated in both types of developed packaging. The developed materials are examined in suitability tests specifically adapted to the products. Pilot studies are carried out with first prototypes in selected food chains. A value chain analysis including life cycle assessment is also carried out for the packaging materials to be developed, in order to assess the sustainability of the new packaging solutions compared to previous fossil-based materials.

## 4.

# Interdisciplinary Research

### 4.3

#### Living Handbook of Perishable Food Supply Chains

**Funding:** German Research Association (DFG)

**Period:** 2016-2020

**Partners:** As a collaboration partner of the University of Bonn, ZB MED publishes scientific handbooks through the PUBLISSO Living Handbooks publishing platform.

**Aims:** Creating the Living Handbook of Perishable Food Supply Chains

**Methods:** Authors can add contributions themselves and update them at any time. The quality of the handbooks is ensured by an editorial board and a mandatory peer review process. As well as text-based articles, contributors can include research data and multimedia content. All content is open access, which means it is freely available online.

The aim of the Living Handbook of Perishable Food Supply Chains is to present this combined interdisciplinary knowledge and challenges in the field of cold chain management in food supply chains in one comprehensive book. The book is divided in two main parts, covering two main topics: The first part focuses on country specific information and challenges in the field of Cold Chains (Part I). The second part addresses current developments and research activities in the field of Cold Chain Management (Part II).

#### ReMESH: Research NEtwork on Emergency REsources Supply CHain

**Funding:** Horizon 2020 program of the European Union MSCA-RISE

**Period:** 2019-2023

**Partners:** The research network comprises several universities throughout Europe and collaborating universities in Asia.

**Aims:** The ReMESH project aims to provide a systematic study of the ERSC management systems to bridge the existing knowledge gap on the topic.

**Methods:** The proposed research will use novel approaches to design ERSC systems for better management of response to different types of disaster.

The Remesh project will make several investigations on the ERSC to:

- determine the resources required to accomplish the emergency response functions.
- identify the functions that must be performed to respond to the demands that emergencies place upon response organizations,
- develop a novel holistic and interactive framework to identify critical failure modes; with the resource supply chain broken down to its component levels;
- incorporation of decision-making into the ERSC life cycle.
- use modern system engineering technologies to identify the most vulnerable components in the ERSC
- and provide a set of deterministic/stochastic models to analyse the risks caused by the vulnerability.

After the investigations, this project will propose and implement a decision support framework to capture and minimize inherent vulnerabilities and improve resilience in the ERSC for large-scale natural disasters.

# Interdisciplinary Research

## WALF-Pack: Application of new packaging solutions to reduce food losses in West Africa by extending shelf-life of local perishable foods

**Funding:** Federal Office for Agriculture and Food (BLE)

**Period:** 2017-2020

**Partners:** The project is conducted in collaboration with the University of Abomey-Calavi in Benin, West Africa.

**Aims:** Application of new packaging solutions to reduce food losses in West Africa by extending shelf-life of local perishable foods

**Methods:** The project aims at extending the shelf-life of perishable foods from West Africa through appropriate and simple-to-use packaging and with focus on the Beninese local food supply chains.

The objectives are:

- The investigation of the entire supply chains of the selected products with focus on the identification of the hotspots and the steps where the losses mostly occur
- Design of simple and cost-effective packaging solutions for reducing the losses of these products along the supply chains, and evaluating the acceptance of different packaging solutions
- The evaluation of the effects of the packaging solutions on physico-chemical microbiological and nutritional properties of the selected foods during storage
- Performing cost benefit and resource efficiency analyses for the packaging solutions
- The implementation of a good coordination framework among stakeholders at micro, meso and macro levels for a good dissemination of the project outputs

## 4.

# Interdisciplinary Research

### 4.3

#### Application of new packaging solutions to reduce food losses in West Africa by extending shelf-life of local perishable foods (WALF-Pack)

**Funding:** The Federal office for agriculture and food (BLE) supports the project with funds of 351,297.97 €  
University of Bonn, FNC (Food Waste Group): 173,771 €

**Period:** 01.10.2017 - 30.09.2020

**Partners:** University of Bonn (FNC Lead: Judith Kreyenschmidt), Germany; University of Abomey-Calavi, Benin

**Aims:** The aim of the project is the development and implementation of innovative and sustainable packaging solutions to prolong shelf life and increase food safety. By that, the food losses in the chains and due to that malnutrition as well shall be reduced. The packaging solutions will partly be produced out of local biomass. In addition, antimicrobial agents like plant extracts shall be added to the packaging to delay the loss of freshness and the food safety shall be increased. The packaging solutions will be developed for three local Beninese products; „Waragashi“, a traditional cheese from cow milk, locally produced chicken and the African garden eggplant (*Solanum macrocarpon*), a leafy vegetable.

**Methods:** Antimicrobial Screening, Interviews, Additive selection, Development of biobased packaging solutions, Storage tests, Workshops, Literature research

**Output:** Biobased packaging solutions for West Africa for three local products to reduce food losses, Workshops, Online Toolkit, scientific publications

#### Coolfresh – Development of internationally applicable test standards to evaluate the essential food preservation characteristics of household refrigerating appliances (Proposed)

**Funding:** Federal Ministry for Economic Affairs and Energy

**Status:** Submitted 08.2016

**Partners:** University of Applied Sciences Albstadt-Sigmaringen, University of Bonn, BSH Home Appliances GmbH and Liebherr Home Appliances GmbH) led by Stamminger (University of Bonn)

**Aims:** The objective of the project is to develop and establish internationally applicable test standards to evaluate the essential food preservation characteristics of household refrigerating appliances. In a first step, the influence of different storage conditions and hygienic features on the quality and freshness of food should be analysed. Subsequently, standardised and reproducible test methods for the evaluation of the essential food preservation characteristics should be developed.

**Methods:** To assess the replicability and reproducibility of the test methods, various Round Robin tests are planned in the third phase involving a few external test institutes. In a final step, content-related and editorial changes should be made before submitting the results to the German (DKE; and indirectly to the European (CENELEC) and International (IEC)) standardisation committee.

# Events

## 5.1 Conference Series

### 11th/12th/13th International Forum on System Dynamics and Innovation in Food Networks (Igls-Forum)

The conference series organized annually by Prof. Schiefer and his team took place in Igls/Innsbruck, Austria. The conference is a meeting of primarily senior scientists engaged in management, economics, policy and consumer research with a focus on the European and global food sector. It is supported by major European and international scientific associations such as the European Association of Agricultural Economists (EAAE) which lists the conference as one of its European seminars, the International Food and Agribusiness Management Association (IFAMA) and the International Commission of Agricultural and Food Engineers (CIGR).

In 2015, the main focus of the conference was on water as a scarce resource-involving policy, trade and management issues. The last conference of 2016 focused on the selected theme „Future of Food“, interacting with actors and experts in the field (‘science meets reality’).

The presentations of the conference are published in a series of freely available e-proceedings while the best papers are published in the electronic open source journal „International Journal on Food System Dynamics“. Proceedings and journal are accessible through <http://www.foodsystemdynamics.org/>.

The annual event has the character of a „Think Tank“, in which future lectures are examined and discussed by experienced scientists and industry experts. You can find the focus themes of the previous conferences from 2008 until 2018 in the list below:

### 2019: System Dynamics and Innovation in Food Networks

#### 2018: Science meets reality

Mr. Martin Frick Dr. Johannes Kotschi  
Dr. Hendrik Haman

#### 2017: System Dynamics and Innovation in Food Networks

Mr. Jean-Jaques Vandenheede Dr. Danielle Rossi  
Dr. Dr. Christian Patermann

**The 14th International Forum on System Dynamics and Innovation in Food Networks will take place February 10th-14th 2020, Garmisch-Partenkirchen, Germany.**

#### 2016: Future of Food

Dr. Kurt Schmidinger	Mr. Maximilian Lössel
Mr. Gus van der Feltz	Ms. Selma Seddik
Mr. Erez Galonska	

#### 2015: Water as a crucial resource

Prof. Dr. Lundquist	Mr. Jippe Hoogeveen
Mr. Cesare Ronchi	Prof. Hong Yang
Dr. Grobicki	

#### 2014: Sustainability, Water, and Emerging Management Opportunities

Dr. Josef Haber	Mr. David Rhotert
Prof. Rod Franklin	Mr. Wilfried Schock
Dr. Ashok Chapagain	

#### 2013: Urban Agriculture, Food Logistics and PPP

Mr. A. Modig	Dr. K. Jäger
Prof. Dr. M. Köhler	Dr. J. Maat

#### 2012: Corporate Social Responsibility

Mr. M. Coomans	Dr. Koen Boone
Ms. M. Rute	Dr. M. Blowfield
Mr. B. Geier	Mr. S. Kreutzberger
Mr. G. Calzolari	

#### 2011: Scenario Dynamics - Challenges Ahead

Dr. Angela Wilkinson	Mr. Mark Schauer
Dr. Juan Gonzalez-Valero	Prof. Erik Mathijs

#### 2010: The Challenge of Transparent Food

Mr. F. Ahlers	Mr. M. Abreu
Mr. H. Hagspiel	Dr. M. Rosier
Mr. J. Elfman	Dr. T. Busse

#### 2009: Science meets the world of regulations

Mr. Coomans	Dr. Godefroy
Prof. Dr. DeHaen	Ms. Majewski
Dr. Fischler	Mr. Schmidt

#### 2008: Science meets industry

Dr. Haber	Dr. Greubel
Dr. Joehr	Dr. Maat

# 5.

## Events

### 5.2



AWARD: Innovations in digitalization of teaching to Dr. Julia Steinhoff-Wagner for the Development of “Digital Enriched Items (DiElite)”

Digital media, such as videos and photos, have great potential of creating more applicability of educational contents and exam items. Until now, however, digital media have not been sufficiently included in electronic exams. With the project “Digital Enriched Items” ideas will be generated via a matrix model consisting of several exam item types and different media, to address existing and new educational goals with new innovative exam items.



Fulbright Exchange Grant to Sydney Steward from Oklahoma State University, Stillwater, OK, USA for a one-year stay in the junior research group from Dr. Julia Steinhoff-Wagner. Her aim is to evaluate European strategies to reduce antibiotic drug use in pig production chain from One health perspective.

#### EQA-AWARD

Science meets business

Simone Schmid and Matthias Schöne (APTIS)  
The award was given to Mrs. Schmid during the celebrations of the triple-anniversary at the University of Bonn. Mrs. Schmid has also been awarded for the RiskInk-project in the USA.



Young Talent Award of the Theodor-Brinkmann-Stiftung (Master Thesis under supervision PD Dr. Steinhoff-Wagner) to Claudia Achten  
June 2017, Bonn, Germany



2nd place ASAS PhD Student Poster Competition  
Baltimore, USA  
Celine Heinemann



# Events



For writing the best Master Theses of their year, Mrs. Julia Boothe and Mrs. Marina Labalestra have been given an award certificate. Mrs. Boothe wrote about a training concept for combi-certifications following the IFS and QS standards. Mrs. Labalestra has created an education program for cleaning and desinfection work within smallest enterprises for superfresh foods.



During the celebration of the 125 years of the Institute at the Katzenburgweg, Prof. Dr. Maldonado, Prof. Dr. Kreyenschmidt, PD Dr. Steinhoff-Wagner, Prof. Dr. Hamer and Dr. Kubarenko have gotten the certificate for the recognition as EQAsce-lecturerer.

Mrs. Heinrich and Mrs. Brüssel have been awarded for the work they did for many years. Mrs. Heinrich has trained young people to become office professionals. Mrs. Brüssel has put a lot of energy into training people for working at laboratories.



A LV-scholarship has been given to Mrs. Bleeser, Mrs. Frawick and Mrs. Meyer in September 2019.

Source: KTBL/Steinmetz

# 5.

## Events

### 5.3

#### 5.3 Calendar of Events 2017/2018/2019

1.Joint Summer School  
„Data Management and One Health“  
Bonn, October 4th-11th 2017

ONE HEALTH Strategy Workshop I  
Bonn, November 3rd 2017

Harmonization of competence schemes, Workshop I  
Berlin, November 21st 2017

ONE HEALTH Strategy Workshop II  
Bonn, January 11th 2018

Harmonization of competence schemes, Workshop II  
Berlin, February 1st 2018

ONE HEALTH Strategy Workshop III  
Bonn, February 2nd 2018

IGLS-Forum  
System Dynamics and Urban Gardening  
Igls, February 5th-8th 2018

Harmonization of competence schemes, Workshop III  
Ostbevern, June 26th 2018

GISKOHN ONE HEALTH Network Meeting, Workshop  
Bonn, September 17th

2.Joint Summer School  
„One Health and Sustainability“  
Bonn, September 17th-20th 2018

Triple Anniversary  
& ceremonial inauguration of Raiffeisen lecture hall  
at the Institute of Animal Science  
Bonn, September 20th

Challenge Animal Welfare  
Expert discussion and solution proposals  
Hannover, November 15th 2018

Responsibility on a European Level  
Discussion on the International Green Week  
Berlin, January 19th 2019



*Signing the „Memorandum of understanding“ to establish a thematic University-network, Cologne, October 2017*



*Vice-president Prof. Dr. Holm-Müller of the University of Bonn and chairwoman of FoodNetCenter, Prof. Dr. Petersen at the opening ceremony of the 1.Joint Summer School.*



*Discussion at the triple-anniversary ceremony including Prof. Dr. Börner, Mrs. Weller-Molongua, Dr. Ehlers and Dr. Möller.*



*A delegation from the government of Taiwan visited experts from the agri and food sector of the University of Bonn in fall 2019*

# Events

## 5.3 Calendar of Events 2019

BMBF-Verbundvorhaben HyReKa:  
Anitbiotikaresistenz im Wasserkreislauf  
Abschlussveranstaltung  
Berlin, April 03rd-04th 2019

IntelliPack project:  
The approval of financial promotion is given to Prof. Dr. Kreyenschmidt  
by German Federal Minister for Agriculture, Julia Klöckner.  
Spring 2019

Kick-Off-Meeting for the Projekt Q-VIREA  
Bonn, August 23rd 2019

Challenges of harmonizing international branch standards  
and the role of cooperatives  
Bonn, September 2019

Cold Chain Management Workshop  
Bonn, September 2019

3rd Joint Summer School One Health & Food Safety  
Bonn, September 28th 2019

125th anniversary  
of the Institute for Animal Sciences at Katzenburgweg 7-9, Poppelsdorf  
Bonn, October 11th 2019

A delegation from Taiwan visits experts from the Int. FoodNetCenter  
Bonn, October 2019

ASIIN Global Conference 2019  
The race is On - Pioneering Strategies for Tomorrow's Higher Education  
December 09th-10th 2019, Dresden



*Expert-discussion at the EuroTier 2018, Hannover*



*Meeting with Minister iat Bonn*



*International discussion experts at the International Green Week 2019, Berlin*



*Starting Q-VIREA at Bonn in summer 2019.*



*The principal of the University of Bonn, Prof. Dr. Dr. Hoch at the 125th anniversary celebration*



*The minister for agriculture of NRW at the celebration of 125 years institute at the Katzenburgweg*

# 5.

## Events

### 5.4

#### 5.4 One Health Congress



##### One Health and Food Safety Conference

At the occasion of the 200th anniversary of the Rheinische Friedrich-Wilhelms-Universität Bonn the International Center for Food Chain and Network Research (FoodNetCenter) organized on September 18th and 19th, 2018 in Bonn an International Conference under the topic One Health and Food Safety.

It was the objective of the congress to bring together researchers from around the world of different disciplines including public health politics, human and veterinary medicine, animal, plant and environmental science, and economics.

130 researchers from 26 countries attended the conference to discuss this important topic in a truly interdisciplinary setting. The meeting provided a forum to exchange ideas with respect to One Health and Food Safety allowing for deeper disciplinary insights but also for an understanding on the issues and problems regarding the theme between disciplines. 5 papers were presented in plenary session, 33 papers in contributed and organized session, and a total of 25 posters were discussed in the poster session. In addition, there was a workshop integrated in the conference and a plenary panel moderated by Dr. Eckart von Hirschhausen on 'One Health and Food Safety: Necessity and challenges of interdisciplinary research'.

The research presented and discussed covered a number of diverse disciplines ranging from human and veterinary medicine, animal, plant and environmental science, economics up to philosophy. All of them of relevance for finding solutions for pressing problems in the One Health and Food Safety area. The contacts made and insights gained during the conference will facilitate a stronger integration of the research of this important topic between disciplines and continents.

	<b>DFG</b> Deutsche Forschungsgemeinschaft
	food-net-centerbonn
	<b>bonn realis</b>
	UNITED NATIONS UNIVERSITY UNU-EHS Society for Environment and Human Security



Poster-presentation



Key Note: Health Literacy with Dr. Eckard von Hirschhausen and Prof. Dr. Hartmann



Professor Dr. Exner presents HyReKa

# Started Networking Initiatives

The following network proposals have been submitted by one or more FNC-Partners:

Acronym	Project Title	Submitted	Funding program	Evaluation result
STEPS 	Sustainable and digital transformation to manage potential and risks in urban and rural regions and global agrifood chains	03/2017 Preparation: 6 months	Internationalization of clusters (BMBF)	Rejected 07/2017
COOH 	Establishment and international networking of a competence center ONE HEALTH	03/2018 Preparation: 6 months	EFRE.NRW	Rejected 09/2018
GISKOHN 	Global initiative sharing knowledge of ONE HEALTH networks	12/2016 Preparation: 2 months	Landwirtschaftliche Rentenbank	Funded until 12/2018

Tab. 1: Network proposals submitted by one or more FNC partners

GISKOHN was the only funded project. On the occasion of the 200th Anniversary of the University of Bonn on September 17th FNC and EQAsce invited all those who join initiatives on promoting the topic One Health in global networks to an international networking event: The „One Health Network Meeting“ including the opening of the 2nd Joint Summer School „One Health & Sustainability“ organized by the Thematic University Network TUNEQA. The meeting aimed to help cross borders and barriers between different disciplines, healthcare professionals from different countries and public and private sector organisations worldwide.

In the scope of the 2nd Joint Summer School, which was opened on this day, lecturers from all over the world representing different disciplines explained to the students that collaborative meetings are essential for the One Health movement.

In addition, the GISKOHN initiative was presented to the public for the first time. In order to maintain val-

able personal cross-border contacts and to facilitate the transfer of knowledge and the search for suitable project partners, the idea of setting up GISKOHN as a platform was born to consolidate international One Health network structures. The organizers were convinced that the International One Health & Food Safety Congress 2018 in Bonn is just the right time to transform GOSKOHN into a hub for important topics such as reduction of antibiotic use, new early-warning-systems and joint strategies for the prevention of zoonoses and food-borne diseases.

Since FNC and EQAsce believe in partnership and open-mindedness as positive forces for change, they gave actors from different fields the opportunity to share their knowledge and to inspire each other in September 2018.

## 6.

# Started Networking Initiatives

The FNC Annual General Meeting took place in January 2017. The old board was re-elected for another two years. The FNC General Meeting 2018 will take place after the second Advisory Board meeting on December 3rd, 2018.

The most important task the Management Board has undertaken is to develop a future concept for the Center with the help of the Scientific Advisory Board and to define important goals. In the reporting period the following activities have been undertaken:

1. Cooperation with the Centers CIDRE, ZEF and COGA via a cooperation and a long-term project with Evonic in the following fields:
  - a) Good Bacteria and Bioactives in (GOBI) reducing antibiotic growth promoters worldwide
  - b) Alliance nutrition and health (Developing quick tests for health assessment and early warning of poultry producers)
  - c) Big Data and Precision livestock farming
  - d) Evonic & EQA -Careerprogram (10 Deutschland-Stipendien for University of Bonn)
2. Coordinated cooperation between the Rectorate in the area of internationalization strategy
3. Pooling of resources from both FNC-driven networks Bonn.realis and bio Innovation Park
4. Increased Participation in Summer Schools and PhD Training via the Theodor Brinkmann Graduate School and the NRW Progress Board
5. Expansion of continuing education courses within the framework of the Global Health Study Program and EQAsce's Life-Long Learning Concept:  
The joint Master programme in „Global Health Risk Management and Hygiene Policies“ is hosted through a collaboration between the University of

Bonn and the Institute of Environment and Human Security (EHS) at the United Nations University, also in Bonn. This modular course is offered to post graduate students from around the world and will be taught in English.

Alongside internships and the Master thesis the programme contains 10 intensive study modules (120 ECTS).

Fields of study:

- Basics of global health, public health and hygiene infrastructure and policies.
- Control of communicable diseases, mother/child health, environmental disaster management.
- Health systems and management structures.
- From MDGs to SDGs as guiding principles global consent.
- Health risk assessment and capacity building in the public health sector

Responsible for all these areas of action have been addressed in 2017 and the first dates for the demonstration of the cooperations are fixed during 2018. In the following, three important activities for the future are presented in more detail. At the same time, an excellent cooperation climate in Bonn can be set up at the University of Bonn on the basis of appropriate funding measures by the federal, state and EU member states and the reorientation of higher education policy.

The already established cooperation with all universities on the ground, companies and governmental institutions in recent years lead to profile formation and concentration of competences and generate successful synergies. The knowledge potential generated by the FNC often finds access to the market only in the partnership with companies, and vice versa, agricultural products and transformation processes in the economy can not be successfully implemented without the scientific accompaniment.

Important preconditions for sustainable cooperation are to be created jointly in the next years in the sense of George Bernard Shaw.

# Started Networking Initiatives

## 6.1 A new setup for further research

*„If you have an apple and I have an apple and we exchange the apples, each of us will still have an apple. But if you have an idea and I have an idea and we exchange ideas, then each one of us will have two ideas“*

On February 11th 2019 the members of the International FoodNetCenter of the University of Bonn have met to rearrange its setup. In the discussion, many aspects were raised, such as the rephrasing of the focus groups that projects are described to.

Regarding current running projects and others that are extended (see chapter four) or still ongoing, the members of the FNC were discussing about new names and topics. As shown below there is a new structure to the focus groups now: Still there are three different groups with content-related titles. Additionally three fields of other aspects appear behind these

groups to show that other disciplines are included independent from the specific focus group.

In the new group names, previously different groups are put together, new aspects are opened up. All participants in the discussion during the future-workshop agreed upon excluding „sustainability“, „education“ and „digitalization“ from the three group names. These fields play a role in all focus groups but not for every single project within them. This is why these three fields are seen behind the groups.

In the future a project will be listed connected to a focus group under its new title. Additionally one to three fields will be listed as features of this project. The framework-setting of the university with its interdisciplinary approach (including three faculties of the University of Bonn) and transdisciplinary research areas stays as it has been up to now.

6.1

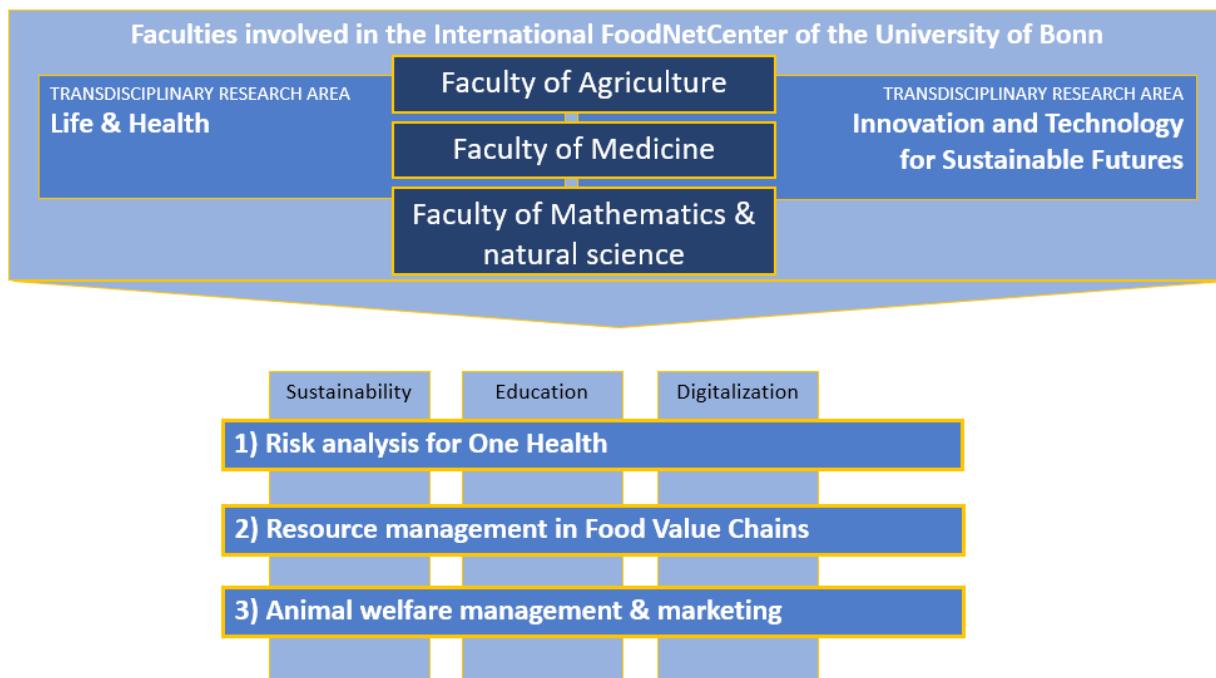


Fig. 7: New setup for FNC focus groups

# 6.

## Started Networking Initiatives

### 6.2

#### 6.2 One Health Competence Center & GISKOHN

In 2017, the ZEF (Center for Development Research), the FNC (FoodNetCenter) and the UKB (University Hospital Bonn) started an initiative to foster their transdisciplinary networks by setting the stage for establishing a Competence Centre One Health (CCOH) NRW at the University of Bonn. This meant to serve as a future-oriented infrastructure in order to pool this expertise, to strengthen interdisciplinary and international cooperation, and to enhance networking between enterprises and medical institutions located in North Rhine-Westphalia (NRW) in the fields of health and digitalisation. By means of joint research and coordination performance, the competence centre shall develop concepts to solve three societal challenges of global dimensions:

(1) the reduction of the use of antibiotics, (2) the supply of safe food for the population, and (3) security and social cohesion in a time of social change. The technical development and the development of utilisation concepts for research structures will be realised with the support of SMEs of the ICT sector and the service sector based in NRW and PPP networks such as Bonn.realis and GIQS. Several jointly planned and implemented initiatives in research, teaching and international networking which focus on One Health will serve as engine for the intended initiative. First structures of the international network, which will be

expanded, include: HyReKa (biological and/or hygienic-medical relevance and control of antimicrobial-resistant germs in clinical, agricultural and communal sewage systems and their meaning for raw water), which is a project supported by the Federal Ministry of Education and Research, the so-called Fortschrittskolleg "One Health and Urban Transformation", the Master's programme "Global Health" and the multilingual coordination centre GISKOHN (Global Initiative for Sharing Knowledge of One Health Networks). The same applies for the start up enterprise EQA sce (Education and Qualification Alliance), which is a spin-off of the FNC.

The intended initiative includes the realization of four subprojects (SPs) (see Fig. 1):

SP 1 Communication & Knowledge Transfer between the associated partners from North Rhine-Westphalia and international One Health networks in order to provide target groups from economic institutions, associations, governmental institutions, medical facilities, suppliers and the civil society with neutral and independent information regarding health risks faster than currently possible. In addition, the scope of this subproject and the role of the CCOH as a forum for international knowledge exchange will be enhanced.

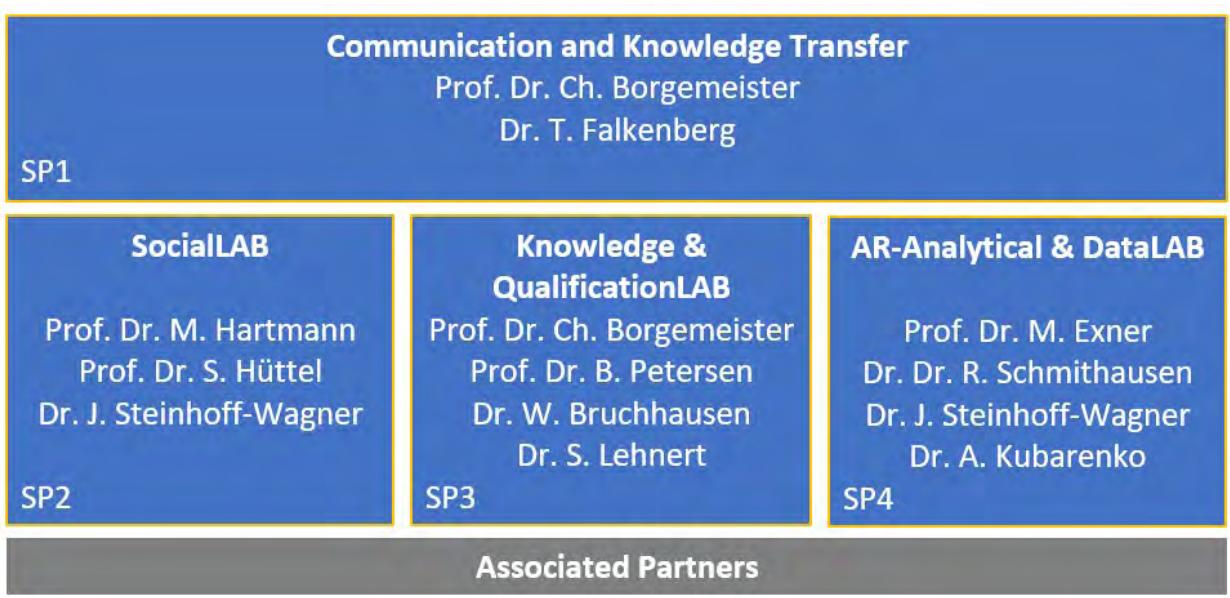


Fig. 8: Structure and responsibilities in the CCOH-initiative

# Started Networking Initiatives

6.2

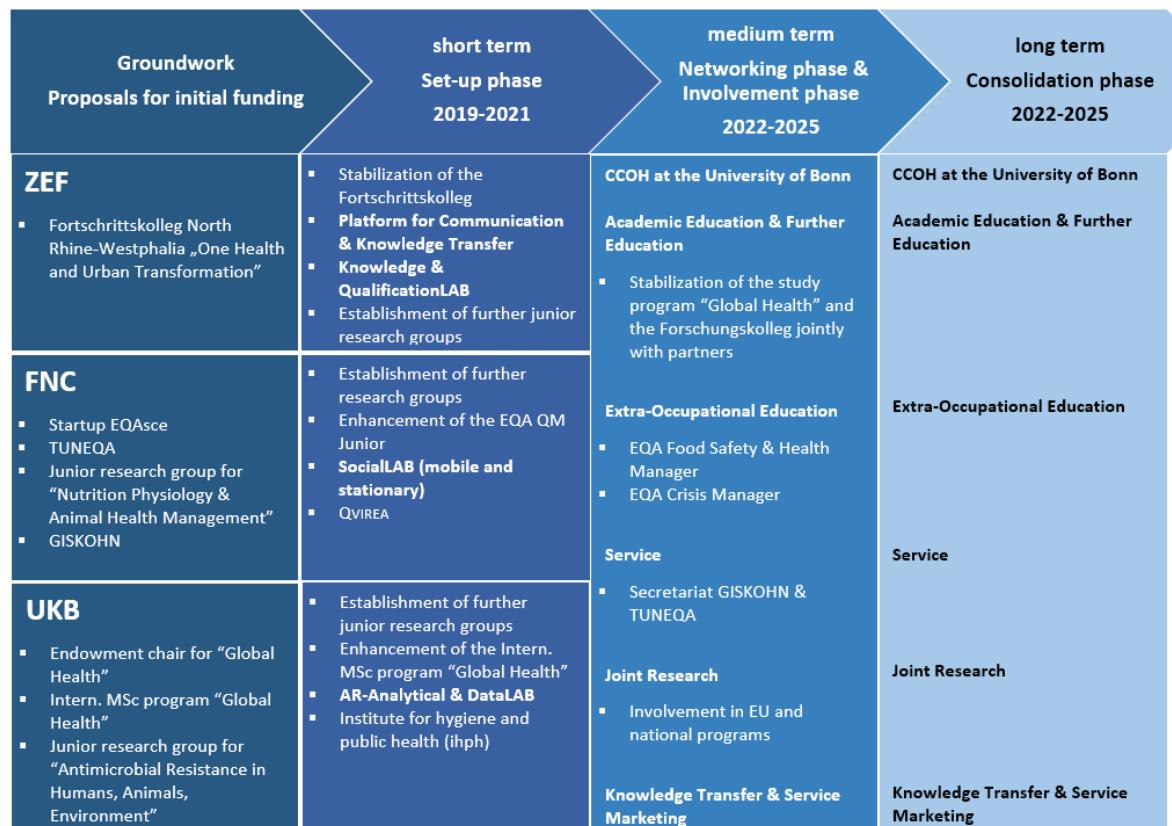


Fig. 9: Sustainability and financial perspective

The figure above 3 shows how the sustainability and the financial perspective of such a Competence Centre One Health in Bonn until 2030 are seen. Its base consists of six business fields, which can be offered from 2026 after the set-up phase and a networking and involvement phase: academic education and further education, extra-occupational education, service, joint research, knowledge transfer and service marketing.

SP 2 SocialLAB as infrastructural and conceptual requirement to gain a better understanding of decision behaviour of consumers and economic, administrative, political and media stakeholders. Research studies in the field of behavioural economics (including experiments, focus group discussions, future forums, team work in risk evaluation, and public private partnership exercises in crisis management) serve as basis to derive strategies for the reduction of health risks.

SP 3 Knowledge & QualificationLAB as technical requirement to allow both national and international students not only to obtain knowledge in innovative ways by research-based learning (supported by e-learning tools, self-assessment tools, virtual reality tools etc.) but also to apply and to reflect the knowledge obtained in order to develop independent aca-

demic professionalism in the field of One Health. SP 4 Antimicrobial Resistance (AR)-Analytical & DataLAB with a mobile laboratory for sample-taking to gather monitoring data from various biotopes in a joint database system, to process these data into information relevant for decisions in health management, and to provide junior research groups of a specific One Health profile with these data for the purpose of meta studies, risk analyses, and the development of prognosis models.

Although the fundings for the Competence Center One Health (CCOH) have not been approved, single aspects of this undertaking have been put into practice. This article shows the intention of the original plan. The Social LAB, the Knowledge & Qualification LAB and the AR Analytical & Data LAB have been realized in different ways.

# 6.

# Started Networking Initiatives

## 6.1

### 6.2 One Health Competence Center

Institutions participating in this 2017 started initiative are the Center for Development Research (ZEF), the FoodNetCenter (FNC) and the University Hospital of Bonn (UKB).

#### From the Center for Development Research (ZEF)



Prof. Dr. Christian Borgemeister is the consortium leader of the proposal. He obtained his PhD in horticulture from the Leipniz University University (LUH), where he worked as lecturer before starting his research career in Africa in 1992. He worked for the International Institute of Tropical Agriculture (IITA) in Benin, West Africa, where he was responsible for the coordination of a cross-border plant protection programme funded by the Federal Ministry for Economic Cooperation and Development until the end of 1997. In 1998 he returned as researcher to the LUH, where he was appointed extracurricular professor in 2003. Between 2000 and 2001, he represented the chair of Applied Zoology at the Justus Liebig University Giessen. From 2005 till 2013, he was the director general of the International Centre of Insect Physiology and Ecology (icipe), a Pan-African R&D Centre headquartered in Nairobi, Kenya. Since October 2013 he is ordinary professor at the University of Bonn and head of the Department for Ecology and Ressource Management at the Center for Development Research (ZEF). In January 2015, he was further appointed executive director of the ZEF. Professor Borgemeister is a fellow of the African Academy of Sciences, the Royal Entomological Society, and the Entomological Society of America. He is also a member of the Council of the International Congress of Entomology. Since 2017, he is head of the Fortschrittskolleg “One Health and Urban Transformation” in cooperation with a number of faculties of the University of Bonn, the UN-University and the Hochschule Bonn-Rhein-Sieg.



PD Dr. med. Walter Bruchhausen M. Phil. is senior fellow at the ZEF and visiting lecturer at the Institute for Hygiene and Public Health. In the scope of the subproject “Knowledge and Qualification LAB”, he will serve a bridging function between the various qualification offers in the field of One Health at the University of Bonn. Since nearly 30 years he teaches training courses and further education courses in nursing, medicine, nursing science, health economy, and health service research. After holding various managerial positions in African healthcare and a position as deputy institute director, he became active in the study commission and the deanery at the University of Bonn, was strongly involved in reforming and expanding the study of medicine and has established three innovative study courses in health at the Universities of Aachen and Bonn on his own responsibility. He is one of three study coordinators of the M.Sc. programme „Global Health Risk Management & Hygiene Policies“ at the University of Bonn. As deputy head of the Ethics Commission and the Hospital Ethic Committee, his ethical research focuses not only on environmental but also on social compatibility of innovations. With more than 70 scientific publications, mainly in the areas of medical anthropology and global health, he conducts research on health-related behaviour of users and suppliers and on integrative aspects of health systems and disease control programmes.



Dr. Timo Falkenberg works as coordinator of the so-called Fortschrittskolleg “One Health and Urban Transformation” and as visiting lecturer at the Department of Geography and at the Institute for Hygiene and Public Health. With his interdisciplinary educational background (public health, development planning, geography) he acts as an interface between health and social sciences. In his PhD thesis, he has investigated health risks related to urban agriculture and thus gained research experience in the One Health approach at the interface between agriculture, society and health.

# Started Networking Initiatives

From FoodNetCenter (FNC)



Prof. Dr. Monika Hartmann will coordinate the subproject “SocialLAB” and will be responsible for the establishment of a laboratory for research in behavioural economics at the Faculty of Agriculture. Since 2002 she holds the chair in Agricultural and Food Market Research at the Institute for Food and Resource Economics (ILR) of the University of Bonn. Her ongoing research focuses on analyses of consumers’ conceptions and their attitudes and preferences (including measurements of their willingness to pay) regarding healthy, sustainable and ethical consumption. Moreover, she is a member of the research team of the project “SocialLAB – Livestock Farming in the Mirror of Society” which is funded by the Federal Office for Agriculture and Food. She leads various studies on consumer research in the scope of the EU-funded project Strength2Food (Sustainable food chains through public policies: the cases of the EU quality policy and of public sector food procurement).



Prof. Dr. Silke Hüttel will be involved in the establishment of an interdisciplinary junior research group in the scope of the initiative. In 2017 she was appointed a professorship for Production Economics at the Faculty of Agriculture at the University of Bonn. Until now her research has focused on productivity analyses, with the meat and dairy industry serving as examples. Her research method mainly consists of choice experiments which involve various economic, scientific and administrative decision-makers and groups. Prof. Dr. Hüttel and Prof. Dr. Hartmann are currently both engaged in a project consortium to examine the aquaponics system as agricultural system of the future and they are involved in the work of the SocialLAB.



Prof. Dr. Brigitte Petersen will supervise the communication between project coordinators and associate partners. Since 1985 she is responsible for the field of Preventive Health Management at the Faculty of Agriculture of the University of Bonn. Her research and teaching focuses on quality management in international value chains of the agricultural and food economy. Apart from coordinating numerous national and international collaborative projects in the field of One Health, she holds a position as chair of the International FoodNet-Center of the University of Bonn, which was founded in 2016. Through it she offers extra-curricular training courses leading to the qualification DGQ/EQA-Quality System Manager Junior. For her dedication in supporting the career paths of young professionals in quality management she has been awarded the title „Professor of the Year 2014“. She is founding member and supervisory board member of the international research platform GIQS and since 2012 research coordinator and executive board member of the cluster Bonn.realis. Since 2015 she represents the interests of the international members of the educational cooperative EQAsce as chair of its management board. From September 2018 she will chair the platform GISKOHN, which is a continuation of the network NEOH. Current projects are the development of an Academic Career Card through the QVIREA-project.



PD Dr. Julia Steinhoff-Wagner will manage one of the five interdisciplinary junior research groups of the CCOH. She is a livestock scientist focusing on nutrition physiology and animal health management and will be involved in all subprojects. Her research focuses on postnatal health of calves and piglets. In particular, she investigates physiology as seen from the One Health perspective, thereby also taking into consideration the aspects animal welfare, management, and animal farming. In ongoing projects she observes the effects of antibiotic-containing milk on the microbiome and develops various recommendations for action to reduce the entry of antibiotics into the environment. The project “Communication Strategies for Reducing Agriculture-related Entry of Veterinary Pharmaceuticals into the Environment” funded by the German Environment Agency gave her the opportunity to combine her subject-specific competencies and teaching skills.

# 6.

## Started Networking Initiatives

### 6.2

#### 6.2 One Health Competence Center



Dr. Susanne Lehnert will be responsible for the accreditation of a qualification concept for a lifelong learning approach to education and training in the field of One Health in the scope of the subproject "Knowledge & Qualification LAB". She works as leading auditor for the sector-specific certification body AGRIZERT GmbH. Simultaneously, she is an academic staff member for research and teaching at the FoodNetCenter. In her position as deputy chair of the management board of the EQAsce, she represented EQAsce 2015-2019 in international standardisation bodies, such as the European Organization for Quality (EOQ) in Brussels. Moreover, she is involved in the Master's programme "Global Health" as lecturer.

##### From the University Hospital Bonn (UKB)



Prof. Dr. med. Dr. h.c. Martin Exner will support the subprojekt "Resistance Analysis and DataLAB" during its set-up phase. Since 1994 he serves as director of the Institute of Hygiene and Public Health. Over the past decades he has been active in the field of water and wastewater hygiene as medical specialist in hygiene and environmental medicine. As long-standing president at the Drinking Water Commission of the Federal Ministry of Health, he is active in health policy consulting and ecopolitical consulting. Moreover, he leads HyReKA, a joint project of the Federal Ministry of Education and Research. He serves as managing director at the Centre for Hygiene and Medical Microbiology since 2003. In the same year he has been appointed Dean of Studies of the Faculty of Medicine (Vice Dean for Study and Teaching Affairs). In this regard, the implementation of new regulations regarding medical licenses and the integration of the subject area "Hygiene and Public Health" into the curriculum were of particular importance. Since 1994 he serves as president of the Hospital Hygiene Commission of the University Hospital Bonn and as quality assurance officer of the University Hospital Bonn. He counts as one of the most important initiators of the post-professional Master's programme "Global Health" at the University of Bonn.



Dr. Dr. Ricarda Schmithausen coordinates a junior research group in the new established One Health LAB. She is a qualified agricultural scientist and medical practitioner. Apart from her professional duties as visiting lecturer at the University Hospital Bonn, she also performs teaching activities in the scope of the Master's programme "Global Health". Currently she is responsible for the establishment and development of analytical prerequisites for a One Health Laboratory at the Institute for Hygiene and Public Health of the University of Bonn. She has been awarded several prizes for her publications in international journals in the scope of her PhD thesis at the Faculty of Agriculture. She is involved of the work at the institute for hygiene and public health.



Dr. Andriy Kubarenko is responsible for IT-based networking of the mobile sample-taking laboratory, the One Health Laboratory, and the One Health Communication Platform GIS-KOHN. As developer of IT solutions for the University Hospital Bonn, he is involved in the project "Digital Medical Faculty" and in the interconnection with server and database systems of the University Computer Center of the University of Bonn and the centres ZEF and FNC. In 2003 he developed the successful system RDMS (Ressource And Data Management System) and implemented it in various international research institutions and universities. Currently he is involved in the project "Digital Faculty" as scientific resource and data manager at the Faculty of Medicine of the University of Bonn. The FNC also benefits from his role as IT and data manager in the excellence cluster ImmunoSensation Bonn and in the research funding programm BONFOR of the University of Bonn. He is also involved in developing the Digital Academic Career Card.

# Started Networking Initiatives

## 6.3 Thematic University Network TUN EQA

6.3

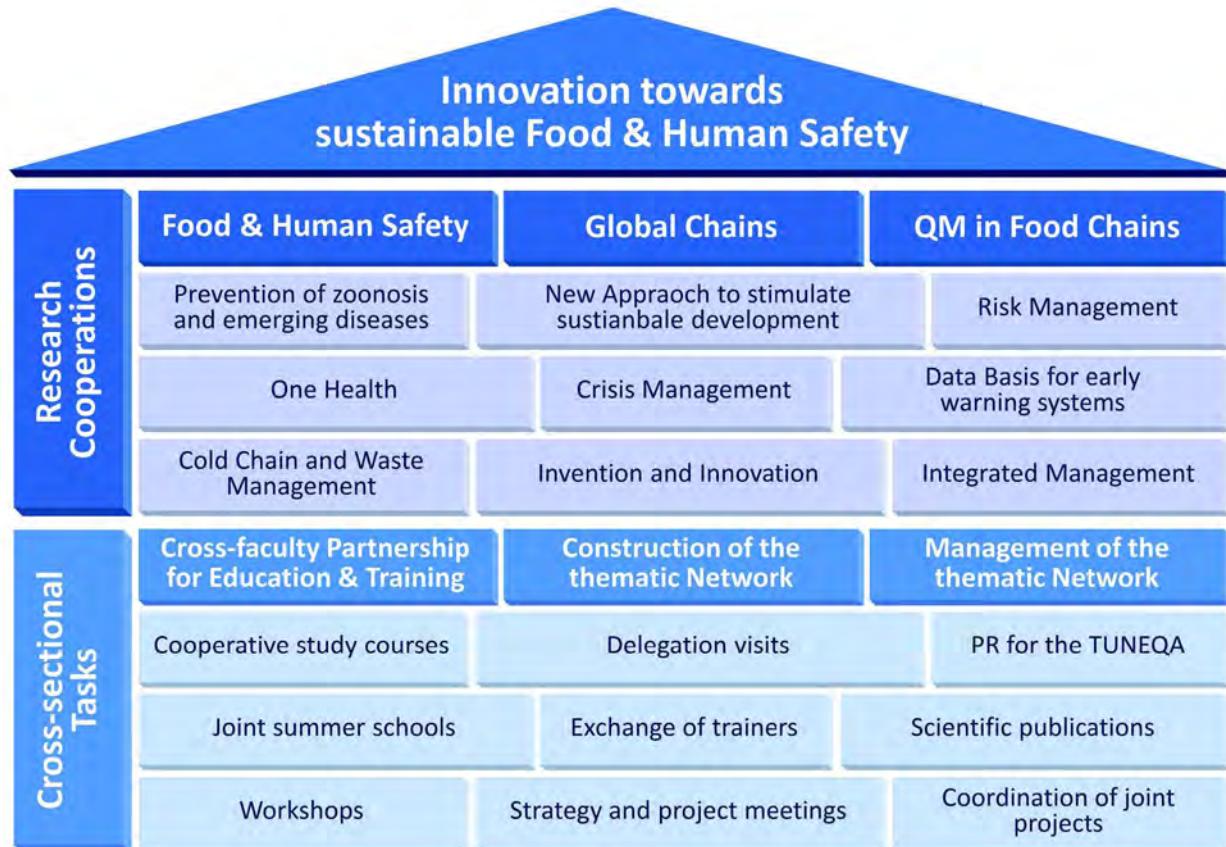


Fig. 10: Joint activities in TUN EQA

Three main topics under the overall topic “Innovation Towards Sustainable Food and Human Safety” and nine sub-fields which are contents are the research cooperation agreements of TUN EQA. In addition, further collaboration will take place in ‘horizontal activities’ to facilitate and to manage the thematic research and education network. The research tasks are linked to each other and the horizontal activities will build a sustainable fundament for long impact of the TUN EQA. Members of the Steering Committee fully consist of representatives of member universities who have signed the present MOU and contribute to the activities of the Project Teams and the Evaluation Team.

The road map regarding the Project Teams and the Evaluation Team was decided on 8th October, 2017. The Project Teams take active part in the cross-sectional tasks and the research co-operations shown in the Figure. Decisions regarding the parties involved in the Steering Committee and the two teams were made upon mutual agreement within the TUN EQA. Each party is obliged to actively promote the common educational and scientific goals of the TUN EQA.

### AGREEMENT

The overall objectives of TUN EQAsce (Thematic Uni-versity-Network of EQAsce) are:

- expanding and deepening partnerships such as workshops, strategy development meetings, joint summer schools etc.,
- creating joint degree programs and certification models in the field of Food Chain Management, Food Safety and Health Management and Crisis Management,
- establishing a joint TUN EQA Knowledge and Registration Platform, and

## 6.

# Started Networking Initiatives

### 6.3

- contributing to continuous improvement of contents, technical and organizational support of the platform.

Objective of the Thematic University Network of the EQAsce (hereinafter "TUN EQA") is the extension and deepening of cooperation between knowledge providers in Europe and other parts of the world. There is a specific need for innovative solutions to support education and qualification in the fields of quality, risk, crisis and audit management. The challenge is to solve current and foreseen problems in international agri-food chains with the support of an interdisciplinary and international TUN EQA Knowledge and Registration Platform. The overall objective of the TUN EQA is to deepen existing relationships and to create future relationships between universities and the Education and Qualification Alliance (EQAsce), which has been founded in 2015 as a startup of the International Food-NetCenter of the University of Bonn. This objective will be reached by means of the joint TUN EQA Knowledge and Registration Platform and joint qualification standards for:

- Food Chain Manager
- Food Safety and Health Manager
- Crisis Manager

The TUN EQA's aim is to achieve mutual recognition, registration and certification of qualifications in the scopes Agriculture and Food and Feed Industry, educational programs and academics and professionals. The concept and objectives of the cooperation of universities is to gain:

- added value of TUN EQA-based competence certificates,
- an outstanding reputation by worldwide accepted processes of assessment, examination, certification and re-certification used in accordance with ISO/ IEC 17024 Standard's requirements and
- closer relationships to leading international organizations in the fields of Quality Management, Food Safety and Health, Sustainability and Public-Private-Partnership-Networks.

### 6.4

## 6.4 Public Private Partnership Initiative Animal Welfare

The livestock sector can contribute directly or indirectly to each of the Sustainable Development Goals (SDGs) behind the FNC focus groups activities, especially in the field of animal welfare. Nevertheless, there are complex interactions that make the achievement of some SDGs stand in conflict with the accomplishment of others. Therefore, it is likely the policy makers will have to trade-off gains in some areas with losses in others. To better support the transformation needed in the livestock sector FNC members in all focus groups have requested the establishment of a Public-Private Partnership Initiative "Animal Welfare".

The concept to prove is that bringing together key policy makers, researchers and stakeholders to support countries identify policy issues, generate analytical evidence, and formulate policy instruments. Through the financial support of a project by the Landwirtschaftliche Rentenbank, it has been possible since April 2018 to coordinate such an initiative nationwide from the FNC and international networking with similar initiatives in the neighboring countries. Currently, the conditions for international harmonization of certificates of competence for livestock and veterinarians are being created. A current example for which this is urgently needed is the entry into force of the EU-wide regulation on the elimination of anesthetic piglet castration. In order to prevent distortions of competition in the trade of castrated piglets, industry and science have agreed on a training standard for different stakeholders in the pork supply chain.

Under this standard, EQA currently accredits knowledge providers and certifies their instructors.



# Started Networking Initiatives

## 6.4 GETIE

The goal of the GeTie project is to facilitate the collection and exchange of animal health and welfare data via modern media for those responsible in pig producing farms, thus making a contribution to sustainable, customer-oriented meat production.

The innovative character of the scientifically coordinated and accompanied joint project lies in the individual capturing and administration of data as well as the targeted control and release to various communication partners by the respective animal owner.

For the first time, a technical-organisational communication system regarding animal welfare efforts will be developed, evaluated and tested in the planned project. At the same time, the system will be evaluated by animal welfare label providers and recipients

in order to determine the extent to which animal welfare efforts can be made visible and verified with the help of a web platform and associated app. The platform for all actors with animal welfare responsibility will be set up in such a way that it complements the existing IT systems in the animal feed and meat industry in a meaningful way.

6.4



Fig. 11: Sketch of the GeTie data-management for more transparency.

## 6.

# Started Networking Initiatives

## 6.5

FNC is in the middle of developing a unique version of a lifelong learning approach at the University of Bonn. Together with EQAsce the core of this concept is a special qualification card which has similar functions as the „Sachkundenachweis“-card which is already implemented in the agricultural sector of plant farming. The idea is to have a system with several levels that can be reached through qualification. Starting on the level of certificated basic knowledge more levels can be reached (e.g. „agent“, „representative“ or „manager“).

There are various offers for further qualification in the fields of Feed and Food Safety, Crisis & Risks, Hygiene & Health but also in the subjects of Animal Health & Welfare as well as ICT & Lab Management. Because offers of further qualification are different to each subject the level-structure varies.

The unique aspect of the Bonn model is that there are two general ways of qualification offers: One is meant for people working in an academic environment. This means that students who have reached a certain level of qualification can participate in courses offered in the framework of the Bonn Model's lifelong learning concept. The other side is meant for everybody who already works in the agricultural field and deals with topics and challenges of the described fields above. This way the concept of life-long learning reaches from the last years of academic education until the last day of work.

The card will be designed in different ways from the outside to show if people participate in the academic or professional qualification. The functions of the cards are equal:

- Collecting points of participation: For all classes attended and examinations passed the participants „earn“ points

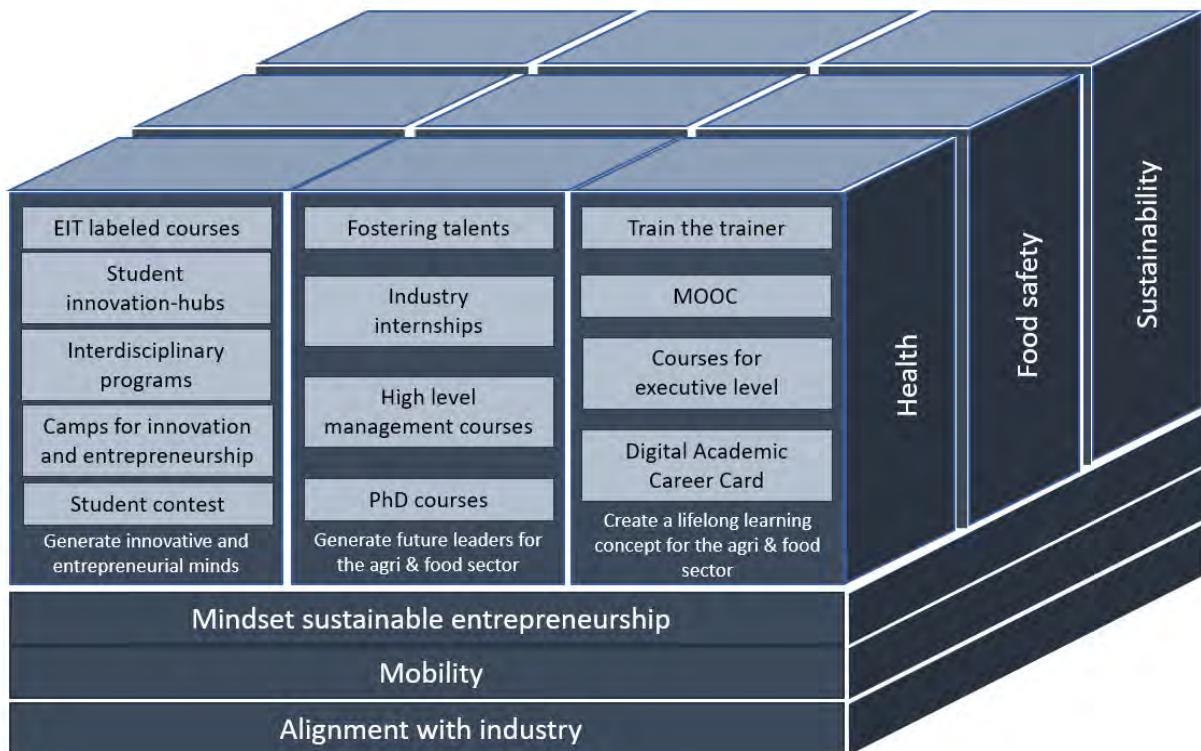


Fig. 12: EdQualification spiral

- Showing certificated qualification: On the card the reached steps of qualification can be displayed. This includes classes, subjects and levels of education/qualification
- Getting discounts: Owners of the qualification cards will be able to get access to special benefits such as discounts at agricultural stores.

In times of digitalization the card will be a high level The platform is the center for everything that is connected to the certificated qualification: Lecturers, participants, enterprises, public bodies and standard-providers. It shows courses, standards, information about lecturers, paths of further qualification and saves all data connected to a single person/participant. This way the process of life-long learning and its qualifications is saved digitally and follows the international requests of data-providing in times of digitalization. A responsible use of data will be ensured through the IT-experts and partners involved in the project. The International FoodNetCenter of the university of Bonn supports the development and offers courses of qualification. It serves as a provider of experts, classes and certification, especially for the academic qualification. development supported by IT-specialists. The connecting point for all parties involved will be an online-platform.

# Started Networking Initiatives



6.5

Fig. 13: Education cube of multi-dimensional fields of tasks for the training of junior staff and leaders

FNC and EQAsce create a Lifelong Learning concept for students, researchers and lecturers .

Lifelong Learning is the willingness to learn new things, not to be content with what has been achieved, to actively participate in social and technological changes in agrofood chains and to be an active member of society in the fields of health, Food Safety and Sustainability (Fig. 11).

In the new learning world, which is characterized by digitalization students are offered the opportunity to develop their potentials individually. Digital technologies should be used in all processes of lifelong learning, education, training and in particular within work. Digitalization is changing the way universities and companies work. It extends the possibilities of individual and cooperative work. New activities and new forms of international cross-site teamwork requi-

re a stronger inter- and transdisziplinary understanding.

From summer schools and online courses dedicated Master and PhD programs a Thematic University Network (TUN) started to develop a range of joint activities for anyone who wants to learn about One Health Strategies, Food Safety and Crisis Management and Sustainability in global feed and food chains. FNC is working with leading higher education institutions and organizations to develop and offer exciting programmes to help individuals with their career in the sector. The programmes are aimed at current and future students as well as professionals either wanting to work or already working in the sector. They are designed together with industry professionals and entrepreneurs and are tailored to fit around busy schedules.

## 6.

# Started Networking Initiatives

## 6.6

### QVIREA

QVIREA is a cooperatively shaped initiative that started its work in August 2019. Part of the project is the realization of the previously described „digital cards“ from chapter eight. The aim is to have academics and practical workers apply for the digital card that will be available in two different versions: First, the Digital Academic Career Card; second, the Digital Qualification Card.

The International FoodNetCenter has been part of the conception of the whole project and might also be involved in the testing which will take place in spring 2020. The digital cards function as a digital folder of certificates, degrees and other report cards. It follows the concept of life-long learning and stays valid for a whole lifetime as a personalized card, like a bank card for example. Having all data recorded at one platform is not an innovative or secure approach anymore: Thus, the degrees and certificates will be written into a blockchain. This new technology ensures security of the documents, makes all qualification proofs verifiable on the spot by a digital interface that interacts with the card and all data is protected in the way to stay temper-proof.

Additionally to the concept of the cards, the life-long learning concept is included in a way that covers not only degrees or qualifications but also temporary valid documents. The re-certification is part of the whole concept. Through automatic reminders holders of certificates can be warned in time to take another class and to refresh the competences. Classes and courses taken that might count for the next step of becoming quality system manager of a certain stage

are also recorded as trainings that are done in one or two days. Information about lecturers, course offers and trainings will be available via a separate platform run by TiGA. The course content also includes latest developments of technologies: Where its use makes sense, Augmented, Mixed or Virtual Reality tool will be included. For example, VR might serve as a learning tool for anesthesia-tasks for the animal. Pain and stress for animals can be reduced to a large degree by doing practice in a virtual world. This again serves for improving animal welfare, an initiative that is also supported by the International FoodNetCenter.

The benefits of this digital project are of various kinds:

- Latest technology is used to improve a checking and learning procedure in an easy, secure and verifiable way
- Digital certificates, degrees and qualification proofs are the form of attesting in modern times will stay for decades. The cards are the base for a life-long proving of certificates
- Proving, checking, applying: The card is the digital interface that grants access to all data written into the blockchain. It improves transparency.
- Quality in qualification and in working is improved through an automatic reminding of refreshing certificates - classes can be taken in time.
- The learning methods include latest technology and therefore can not only improve successful learning but also animal welfare through animation and software that stops pain and stress for animals. At the same time it might lead to cost reducing.
- Learning is no longer a matter of attending classes personally at a school. It is rather decentralized and

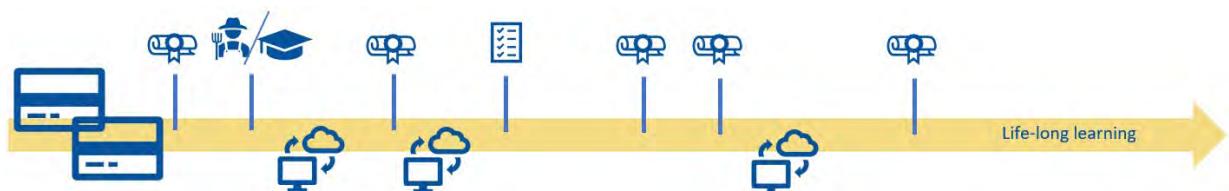


Fig. 14: Overview over the lifelong learning concept including the digital cards.

# Started Networking Initiatives

can be taken at home at any time through webinars, online-classes and online provided materials.

The International FoodNetCenter is part of the conception and has also taken a small role in the technical development to produce a prototype. The interest

for the cards is big as the participation in the pilot-project at the University of Bonn has shown. The testing will take place in the beginning of 2020 - a time of validation and corrections will follow. The cards and specific courses shall be ready for marketing by January 1st, 2021.

6.6

One technology – two fields of practice

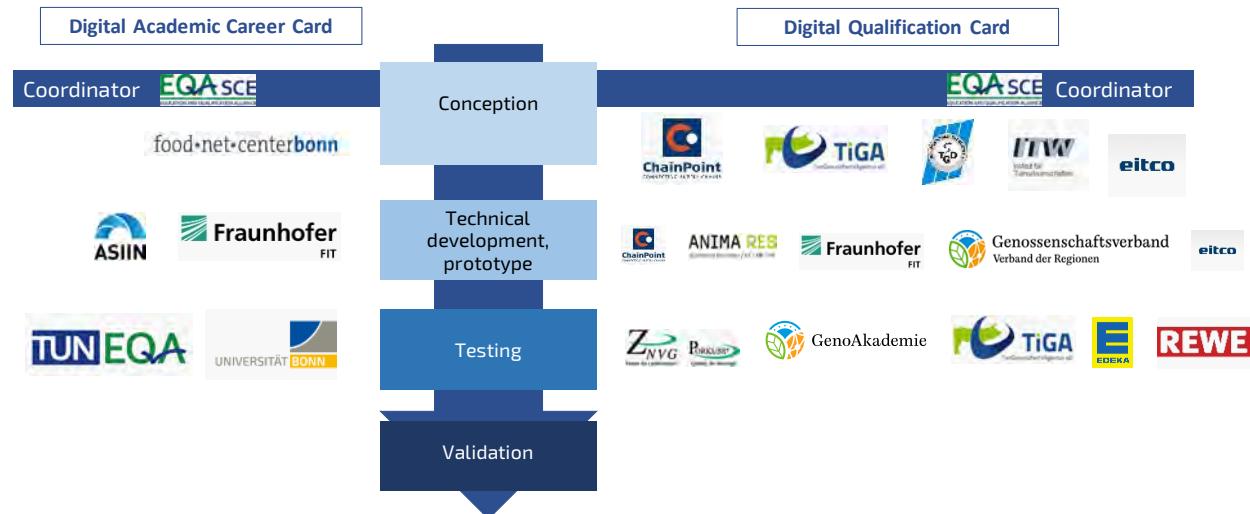


Fig. 15: The consortium working for QVIREA consists of education and training providers, software engineers, institutions of the agricultural sector in Germany, system engineers and standard providers.





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