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The European contribution to solving global challenges in a changing food landscape: a strategic triple helix research and innovation agenda





How can we feed the 9 billion people who will inhabit the earth in 2050? This is the most pressing challenge facing humanity today and it requires a carefully orchestrated approach to three major issues: People, Climate and big data.

In the coming decades, these issues will affect public policies, management, human resource development, technology, international trade, environmental sustainability, resource availability and even domestic and international conflicts. They are intimately interconnected and critical to the ability of the food and agribusiness industry to solve food security challenges. As part of IFAMA International, IFAMA Europe has joined forces with the Danish Food Cluster to seek answers during the 2016 IFAMA World Forum and Symposium in Aarhus, Denmark.

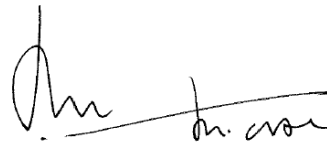
IFAMA Europe is an inspiring innovation hub in a triple helix context, unlocking interesting and cross-category open innovation possibilities for the agrifood sector on a European and even global scale through its close links with IFAMA International.



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IFAMA Europe recognises the fundamental links between Academia, Industry and Government and seeks to create opportunities at their intersections. We welcome large and small innovative parties (e.g. SMEs, start ups, incubators, etc.). IFAMA Europe's structure is designed to facilitate cooperation, information sharing and networking between members to convert good ideas into real value.

IFAMA Europe is contributing to the 2016 IFAMA World Forum and Symposium by launching the Strategic Triple Helix Research and Innovation Agenda. This agenda has been developed by the different working groups of IFAMA Europe in close cooperation with Berenschot Consultancy, where both the main authors, Edwin Lambregts and Stephanie Wagenaar, are employed. During the 2016 IFAMA World Forum and Symposium, Theo Camps, Chairman of IFAMA Europe, will present the Strategic Triple Helix Research and Innovation Agenda to the EU Commissioner for Agriculture and Rural Development, Phil Hogan.



Prof. dr. Th.W.A. (Theo) Camps
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Agrifood is an important contributor to European wellbeing as well as to its social and cultural heritage. Food is vital to human health and wellbeing in a way that the products of other industries are not. As such, this remains the quintessential reason why we attach such profound significance to it.

The sector represents a breeding ground for regional stakeholders and business investments. It attracts large sums from private financial actors, commercial banks and private foundations that search continuously for new investment opportunities. New actors are also

increasingly involved in the emerging agrifood value chains: new farmers' organisations, new cooperatives, start-up companies as well as multinational enterprises and state-owned companies.

However, the food landscape is changing fast. Global trends and technological developments greatly influence the agrifood sector. Collaboration and innovation in the agrifood value chains are essential in facing global challenges, maintaining a strong global market position and contributing to a healthy and sustainable world population.

Preamble

IFAMA is a multistakeholder organisation that brings together academia, government and enterprises in a dedicated triple helix approach to enable the European agrifood sector to provide the world with adequate and nutritious food and related technologies by stimulating research and creating cross-over connections with other industries. Our aim is to formulate a strategic Triple Helix Research and Innovation agenda to help solve the global challenges facing the agrifood industry.

In this document, we highlight six global and European challenges to which a triple helix approach could make a valuable contribution to finding solutions:

- Feeding the world.
- Food as an essential prerequisite for vitality and healthy living.
- Sustainable food systems and closing the loop in a circular economy.
- The power of big data to fuel efficient agrifood value chains.
- The rise of demand-driven agrifood systems.
- Human capital, indispensable in a changing world.





Feeding the world

More than 50% of the world's population currently lives in urban areas and this is expected to rise to 70% by 2050, particularly in developing countries. The total world population will amount to 9 billion around that time. At the same time prosperity is increasing, influencing consumers' dietary demands. How can we feed the world? And how can we do that in a sustainable way? The natural capacity for food production is reaching its limits. Due to increasing demand (while supply is struggling to meet) and the impact of climate change, world prices for food are likely to rise and become more volatile than ever before. Innovation is therefore indispensable.

"Providing healthy diets for the world's growing urban population requires forging stronger links between rural producers and urban markets and building food systems that are more socially inclusive, environmentally sound and less wasteful"

(Source: FAO, 15/01/2015).

Europe's contribution to worldwide food security can take different forms: by means of knowledge transfer, knowledge export and financial investments. It can also have different approaches: from closing the yield

gap in Eastern and Central Europe (which is often still at pre 1990 levels), to putting into practice knowledge about saline cultivation, or improving cold chains in China, India and on the African continent.

To achieve this, research and innovation should focus on:

- Intensifying food production systems by developing and using 'precision' farming technologies that are sustainable and animal friendly.
- Drastically reducing food losses and waste, including improving cold chains (post-harvest losses), distributing foods and using waste as compost or as a source for energy or for basic materials.
- Bridging production, distribution and consumption gaps in metropolitan food systems, integrating food into urban planning, bringing together government, private sector and civil society, in ways that reflect the social, economic and ecological complexities of agrifood systems.
- Explore different ways to produce food, whether it is vertical horticulture, urban farming, artificial foods, and alternative sources of proteins, such as seaweeds, and insects.



**Food as the
essential
prerequisite
for vitality and
healthy living**

Malnutrition on the one hand and prosperity diseases on the other hand are having an increasing impact on society. Poor diets influence the development of children, the ability to recover from illnesses and achieve wellbeing, as well as nations' social security systems and costs for healthcare. The ageing population in Europe contributes to this effect. Over the next decade, genetics and neuroscience will help give us deeper insight in the relationship between food and health, both for entire populations and individual persons. Thanks to information technology and the use of big data, our understanding of consumer behaviour will improve. In the near future, we will be able to determine exactly which ingredients a person needs at any given time using data on their DNA, activity level, health and food preferences.

The agrifood sector has the potential to improve social wellbeing and lifestyles by developing new and better food products for target audiences, new food services and experiences using the pleasure that enjoying good and healthy food gives us in everyday life.

To achieve this, research and innovation should focus on:

- Developing knowledge on the relationship between food, diets and health, focusing on target groups and individuals, responding to nutritional requirements and dietary habits, combining food industry research with medical and lifestyle data.
- Enhancing the nutritional potential of new, not properly exploited raw materials and ingredients.
- Preserving and enhancing nutritional value and sensory properties in processing, storing and distributing by optimising existing and developing new processes and technologies.
- Reformulating existing products and developing new concepts to create healthier alternatives without compromising food safety or quality.
- Stimulating the application of big data to develop an understanding of the relationships between food and health and the development of innovative systems, services and applications to support healthier lifestyles.
- Nudging consumer (buying) behaviour through better understanding of consumer preferences and perception of nutrition and health issues.
- Developing smart services to evaluate nutrition and health claims on food products.



**Sustainable food
systems and closing
the loop in a circular
economy**

Climate change and the growth of the global population are both having a massive impact on food, fresh water and energy resources. The growing world food demand increasingly puts pressure on agricultural areas. Many soils and seas are already overexploited and resources are becoming scarce. Resource efficiency, efficient water and energy use, responsible procurement and sustainable packaging and distribution should be key elements in the strategies of all companies in the agrifood value chains.

In a circular economy, the value of products and materials remain part of the cycle for as long as possible. Waste production and resource use are minimised and resources are kept within the economic cycle to be reused to create further value.

To facilitate the move to a more circular economy, the European Commission is putting forward a Circular Economy Package. This package includes revised legislative proposals on waste, as well as a related action plan. These plans will have a profound impact on the food & beverage industry in areas like waste management, packaging, recycling, tracking & tracing and the bio-based economy.

To achieve this, research and innovation should focus on:

- Defining and mapping the implications of climate change on the food and agribusiness industry.
- Protein transition, stimulating different angles in innovation opportunities (for example: insects, seaweeds, other plant-based proteins and lab-grown meat).
- Enabling efficient use of materials and energy with minimum environmental impact.
- Insight into the actual residues and waste in the agrifood value chains and their compositions and applications of organic residues.
- Collaboration to enhance volumes and possibilities for circular solutions.
- Designing products and packaging to minimise waste and developing bio-based packaging without compromising food safety or quality.



**Using the power
of big data to fuel
efficient agrifood
value chains**

In a July 2015 report, Roland Berger estimated the worldwide market for precision farming to be worth € 2.3 billion in 2014, with an estimated annual growth rate of 20% through 2020. The consultancy agency estimates the European market at € 0.4 billion and the annual growth rate at 15%.

Smart Farming practises could add \$10 billion a year to the value of field crop farming on a global scale, according to calculations made by Rabobank. The real value is likely to be higher because the estimate is based on the top seven crops in the world and does not include smaller crops, fruit or vegetables. The livestock industry is also expected to see similar benefits. This is a change driver that is relevant not only for farmers, but across agrifood value chains from 'farm to fork' and 'stable to table'.

However, the successful implementation of data-led farming will also require fundamental changes to existing farming practices, as well as the relationships between farmers, suppliers and customers. Medium and small-sized companies need to develop means to access the required technology and will face considerable competitive pressures to do so. This will necessitate scaling up by either increasing their own operations or by becoming part of a bigger franchise (such as a cooperative), sharing data, technologies and expertise. Europe has a disadvantage here because most companies lack the necessary scale and access to private equity investments, most common in the US, South America and Australia.

It is not just the agribusiness that is influenced by big data. It affects all parts of the food chains. For example, transport arrangements can be made more efficient as well as the retail sector. E-commerce has dramatically changed the behaviour of consumers who now have the opportunity to obtain real time information on everything from prices to the freshness of food. The use of smart devices and big data will also contribute to consumer health by providing dietary information for individual needs.

To achieve this, research and innovation should focus on:

- System integration, with crossovers between information technology, knowledge databases (like weather forecasting, real time sales data from retailers) and the agrifood sector.
- Access to private equity capital for investments in larger scale solutions. Join the global race in the 'winner takes all' platform development for smart farming.
- Collaboration between companies across the agrifood value chains to collect, store, distribute and share insights based on big data and linking main ports with green ports, red ports and blue ports.
- Facilitating crossovers between the big data, Life sciences & Health and agrifood sectors.
- Stimulating the development of 21st century skills within the agrifood workforce. Stimulating creativity and technological knowledge which are indispensable for innovation and thus the leading position of Europe in agrifood.







**The rise of
demand-driven
food systems**

Traditionally, consumers make purchase decisions based on price, taste and convenience. Using information technology, consumers have begun to weigh a new set of factors in their purchase behaviour, shifting the power structure in the agrifood system in a way that presents both opportunities and challenges for farmers, growers, the food and beverage industry and retailers. These new value drivers are: transparency, health & lifestyle, food safety, social impact, experience and sustainability. Consumers in Europe's mature markets seem to be developing a preference for food that is produced 'close to home' and retailers and food companies are responding. For example, retailers in the UK are reporting the 'food miles' associated with products in their stores and we expect mainland Europe to follow their lead.

In addition, consumers have an unprecedented ability to access information about products and share this information via social media. This makes it more challenging than ever before for agrifood companies to manage messaging, especially in the case of an incident. Although food safety standards are high and incidents are scarce, the impact can be large.

At the same time, the rapid growth of online purchasing and home delivery of groceries means an increased need for round-the-clock deliveries to the doorstep. The same applies to omni channel approaches to food retailing. As a result, retailers are under considerable pressure to both manage their stock and provide efficient delivery in terms of speed, price, service and quality. Also, growing traffic congestion in cities will make the need for innovative solutions for 'the last mile' to the consumer a key topic.

To achieve this, research and innovation should focus on:

- The advantages and disadvantages of new entrants in the retailing business, such as Hello Fresh and Amazon Fresh.
- Crossovers between health & life sciences and the agrifood sector, because stimulating a healthier lifestyle and diet will be an important focus point for European governments wanting to control health care costs.
- Innovations and new strategies regarding 'last mile' delivery, especially for retailers and logistics service providers, also because of the increasing travel congestion in urban areas.



**Human Capital,
indispensable in
a changing world**

Agriculture and the food business are mayor employers worldwide and are important pillars of social communities. They influence our wellbeing by producing, trading, preparing and sharing food.

The tension between the fast growth of the world population and the current limits of sustainable food production to guarantee food security around the world is a real challenge. Rapid technological developments and research offer multiple solutions. Europe can play a significant role in the development of solutions for these global challenges. This also offers an opportunity to retain a stable share in the global food market. It is therefore very important to focus on human capital.

The 'jobs of the future' in agrifood value chains are related to themes like robotics, big data, 3D printing and new logistic solutions in the circular economy. Innovation and technology are key, so highly educated technological employees are required.

In the meantime, the focus on efficiency and upcoming robotics affects the lower and non-educated workforce. Presumably companies in agrifood value chains will demand '21st century skills and knowledge'

(e.g. digital thinking, and inter and intrapersonal skills). Two vulnerable groups are discernible: senior employees and employees who lack the '21st century skills and knowledge' fit for future demands, for whom alternative perspectives on work have to be found.

To achieve this, research and innovation should focus on:

- Development, transfer and accessibility of new and advanced knowledge and solutions for the provision of skilled staff with updated, relevant competences.
- Enhancing the attractiveness of working in agrifood business for (young) professionals.
- Enhancing the attractiveness of technology-based education and stimulating schools through to universities to develop education programmes fitting the '21st century skills and knowledge' for agrifood businesses.
- Identifying and overcoming the barriers that influence the appeal of the food and agribusiness industry to young people in various regions, from primary school through to university.
- Identifying the educational changes required to enhance the flow of high quality talent into the agrifood industry.

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