

# TiFN

FOOD & NUTRITION

Rob Beudeker (TiFN)

**A radical approach  
to measuring and  
communicating  
health effects**

Wouter-Jan Schouten (TiFN)

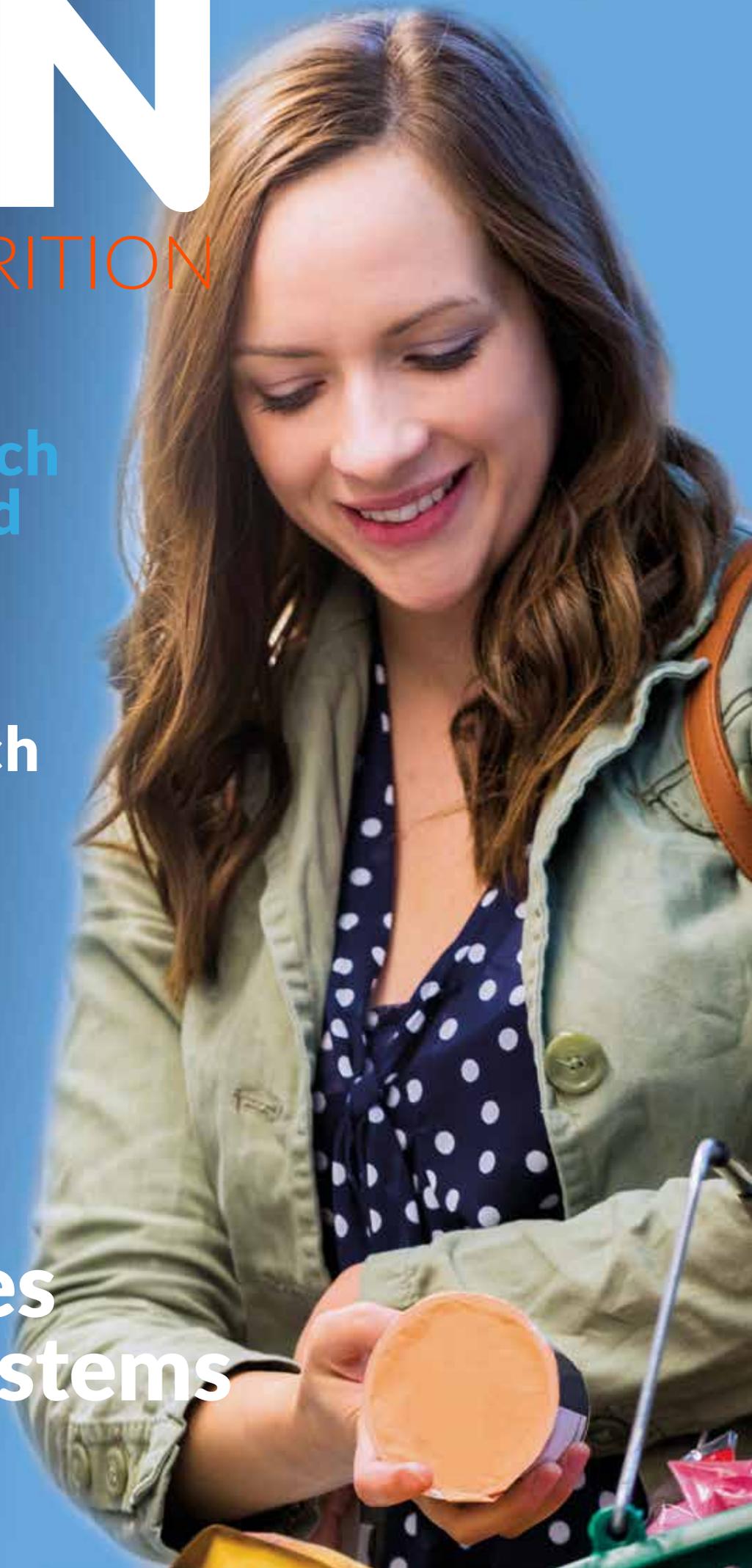
**Holistic approach  
vital for  
sustainable  
future**

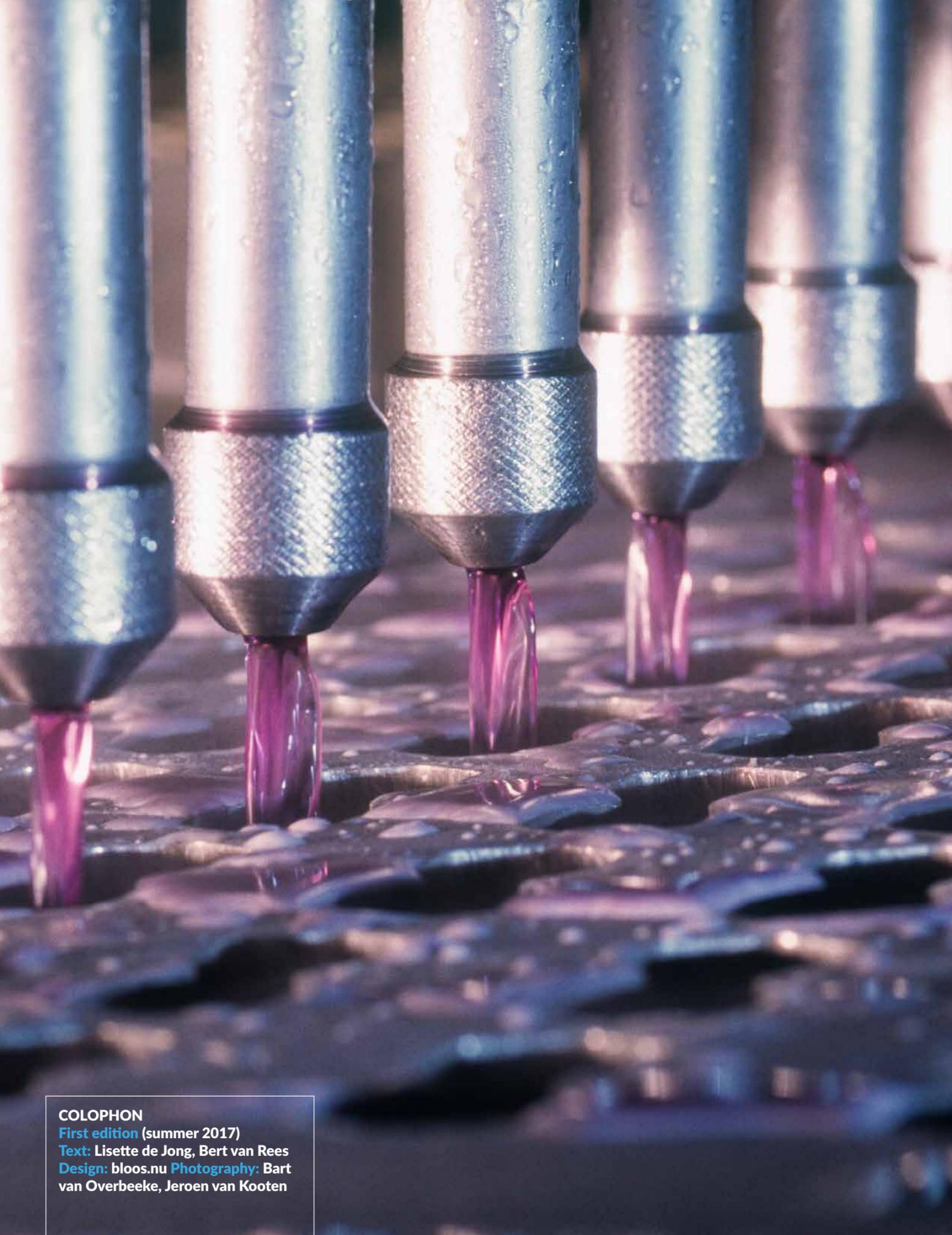
Interviews

**Koert van Ittersum (RUG), Anita Scholte  
op Reimer (Albert Heijn), Gerda Feunekes  
(Voedingscentrum), Katrien van Laere  
(Danone), Ellen Blaak (Maastricht  
University), Hans Huijbers (LTO Nederland),  
Floor Uitterhoeve & Jaap Petraeus (FNLI)**

Eight innovation challenges

**Global issues  
require a systems  
approach**





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## Eight innovation challenges

# “Global issues require a systems approach”

THREE BIG ISSUES

From malnutrition to overweight; from sustainable sourcing to consumer trust, the food industry is facing some of the most difficult issues of our time. TiFN has translated them into three research themes and eight innovation challenges.

Around the world, obesity continues to increase, with poor diets carrying much of the blame: too much fat, sugar and salt; too little fibre, vitamins and minerals. Although the safety and quality of food products is higher than ever, consumers display less and less confidence in what producers offer and communicate. Welfare levels in developing countries are increasing; nevertheless, with an expected world population of nine to ten billion by 2050, food security is now on the political agenda of every country. Already, food production systems are under pressure, with areas of land suitable for food production decreasing, as well as soil fertility and biodiversity.

### Different research agendas, same issues

Among industries, governments and societal organizations, awareness is growing that a shift is

needed towards healthier, more-sustainable diets. Within the Netherlands and abroad, different agendas for research and policy have been developed. Three important themes are prevalent in all these agendas: healthy nutrition, consumer engagement and sustainable food systems.

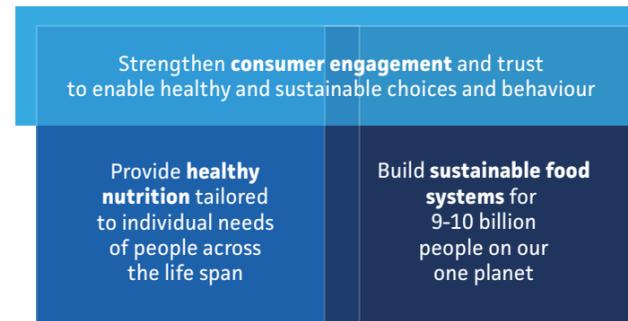
Consider, for example, the United Nations' Sustainability Goals, which include responsible production and consumption, and industrial innovation. Or the Innovation Agenda of TKI Agri&Food, which highlights the importance of cohesion, integration and collaboration in sustaining food production. Or the Nationale Wetenschaps Agenda (Dutch National Science Agenda), which refers to sustainable production of healthy and safe nutrition. There is also the strategic research agenda of the European Technology Platform (ETP) Food for Life, which focusses on a more-personalised, customised, food supply and flexible, dynamic, sustainable food systems.

These same themes - healthy nutrition, consumer engagement and sustainable food systems - also offer tremendous business opportunities. Those who are early in marrying personalised products and services built on a deep understanding of consumer behaviour, for example, or in developing smart tools to support farmers in eco-friendly production, have much to gain. The

Many agendas and sector analyses to build upon.



Building on existing agendas and analysis we identify three overarching themes for the future of the food sector



key challenge ahead, is not only developing new products or technologies, but also implementing and integrating them into existing (and future) systems.

### Holistic approach

At TiFN we believe only a holistic, systems approach can truly tackle the issues challenging our largest system, our planet. Such an approach would focus on providing healthy nutrition tailored to peoples' individual needs, based on 'smart' food production, within the boundaries of our one planet, yet producing sufficient nutrition to feed the global population. And, crucially, it would restore consumer engagement and trust: as a food manufacturer you can develop any product or technology you wish but, in the end, it is the consumer who decides to buy it or not.

A true system approach is multidisciplinary: scientists with different backgrounds closely collaborate, with many links between fundamental, applied and valorisation research projects; the needs of multinationals, SMEs and

start-ups are addressed and the natural, economic, social and consumer sciences work closely together in integrated projects.

This systems approach can, and will be, combined with our TiFN heritage of programming led by demands from business and society and result-oriented project planning and management.

### Non-competitive tools and insights

Based on this systems-approach philosophy, TiFN has organised its activities into three closely-linked Themes. The first one is Consumer Engagement, because change always begins with the consumer, and no consumer means no market. The Consumer Engagement theme develops strategies that will help gear the private and public sector alike to provide opportunities to consumers to make better choices in the areas of health and sustainability. How do you help the consumer to make better choices? And how do you involve the consumer in solving the issues mentioned in the opening paragraph?

## Leading change

“Over the last twenty years TiFN has evolved into the leading non-competitive food and nutrition research platform in the Netherlands. Numerous scientific breakthroughs have led to further innovations, empowering TiFN's industrial partners to develop new products and processes, strengthen market positions and respond positively to changing social demands and conditions.

When we published our research results over the last five years to RVO.nl, at the end of 2016, it felt like a logical moment for

us to revisit our vision and strategy. What would the industry need in the near future? What would society expect? How might we contribute to solving pressing social issues?

Together with industrial partners, research organisations, stakeholders and government representatives, we chose three overarching



themes for the food sector to spearhead our research over the next few years. Nutrition and Health remain fundamental. We expect that exciting current developments will ensure that healthy nutrition, tailored to the needs of the individual across the life span, becomes commonplace. In

addition, as our global population will move past the 9 billion mark, a transition is needed towards Sustainable Food Systems. Linking these two spearheads is our third theme: the critical success factor of Consumer Engagement.

Through the stories in this magazine you can learn which choices we are making and the innovation challenges associated with them. On most of these challenges we have a good portfolio of running projects. Some require new programmes. Just as with the creation of the new vision and strategy, we would like to flesh-out these challenges interactively with existing and new partners.

*We sincerely invite you to think and work together with us!*

**Dr Margrethe Jonkman**  
**Dr Krijn Rietveld**  
Interim co-chairs TiFN Board



The second theme is Nutrition and Health. TiFN's role, history and success in revealing new knowledge is clear. In the new setting, the focus shifts from specific food impacts towards holistic impacts (nutrient balance) and personalized nutrition. Only by simultaneously addressing all the relevant factors can you find solutions to complex problems like obesity.

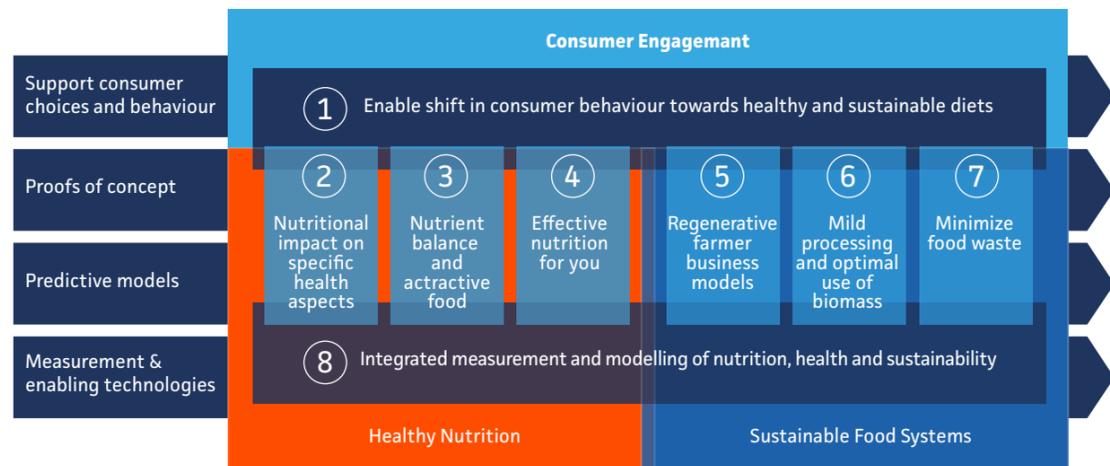
TiFN's third theme is the development of Sustainable Food Systems. Again, we have already made an important contribution to the development of knowledge and solutions. Until

our role is to connect scientists from different disciplines and institutes in order to create a scientific community that remains involved beyond ongoing projects. We are committed to maintain (objectively-assessed as outstanding) levels of performance, building on earlier TiFN acquired skills, and collaborating with talented scientists and committed industrial partners.

**From innovation challenge to research programme**

Ideally, each of the eight innovation challenges will develop into a research programme. Currently, in six of these areas, different research projects have begun, in collaboration with a large number of partners (see page 38 for an overview). Together they have committed over €22 million up to 2020. Existing and potential partners have also shown interest in the two remaining innovation challenges: Enable shift in consumer

**Combined we identify eight innovation challenges and programmes**



now, the focus has been mainly downstream (food waste and packaging topics); we will expand the scope of our work in this area and include primary production and food processing.

**Eight innovation challenges**

Based on the three overarching themes we, defined eight innovation challenges (See text box on page 7 for an overview). As a collaboration platform we will contribute to addressing these challenges with a focus on providing non-competitive tools and insights at four specific levels: measurement and enabling technologies; proofs of concepts; predictive models, and supporting consumer choices and behaviour.

The programme will put renewed focus on creating business opportunities and tackling societal issues, and will enable increased flexibility in attracting new partners - including SMEs - for individual projects. At the same time, around every innovation challenge,

behaviour towards healthy and sustainable diets and Regenerative farmer business models.

The aim is to invest an overall sum of €10 million per year in research that falls into TiFN's new portfolio; a relative small investment compared to the impact it could have on the transition towards sustainable food systems for today's growing world population, and towards a consumer who is capable, able and willing to make responsible choices.

**Facilitating transformation**

We invite every company in the agrifood sector or adjacent areas - from SME to multinational - to join the TiFN programmes. The more we understand the eight innovation challenges, the better we will be able to contribute to the necessary transformation of the global food system towards a system that provides healthy and sustainable diets for all.

# The eight innovation challenges 8

1. Enable shift in consumer behaviour towards healthy and sustainable diets

2. Nutritional impact on specific health aspects

3. Nutrient balance and attractive food

4. Effective nutrition for you

5. Regenerative farmer business models

6. Mild processing and optimum use of biomass

7. Minimize food waste

8. Integrated measurement and modelling of nutrition, health and sustainability

## TiFN mission

- Leading collaboration platform for non-competitive research on Food & Nutrition in the Netherlands
- Open to all Dutch research organisations
- Open to all companies active or interested in the food sector prepared to commit to funding of, and active participation in, TiFN
  - Dutch companies, as well as international companies with relevant R&D presence in the Netherlands
  - Expand existing partner base of large companies and include (groups of) SMEs with interest in non-competitive research
- Programming led by demands from business and society in co-creation with research organisations
- Leading-edge research, executed in Public-Private Partnership projects
  - 30-50% of funding from business, of which at least 25% in cash; in-kind contributions need to be well defined
  - Each project executed by at least two companies and two research organisations

# Collaboration in TiFN; how it works

Private sector partners commit to their programmes of choice

- Commit to purpose of the programme
- Base funding and 30-50% funding of selected projects that fit within the programme purpose

TiFN, together with committed private-sector partners, also invite small group of selected scientists to commit to this programme

- Commit to purpose of the programme
- Time investment to develop research and innovation proposals for projects

TiFN, together with private sector and science partners, pitch for projects that fit the programme purpose

- NWO, STW, TKI Agri&Food, Horizon 2020, ...

Ambition is to conduct research and innovation for > €1 million per annum in each programme and at least € 10 million per year in total

- Can start smaller for new programmes; threshold to be reached within 2-3 years

# What do we continue and what do we change?

We are and will remain the leading platform for non-competitive collaborative research, in food and nutrition, in the Netherlands

- We can build on our strong heritage, network and know-how in Nutrition & Health, Food Sensory & Structure, Microbes and Function and Food- Chain Sustainability
- And we can build on significant commitments and partner base involved in running projects.

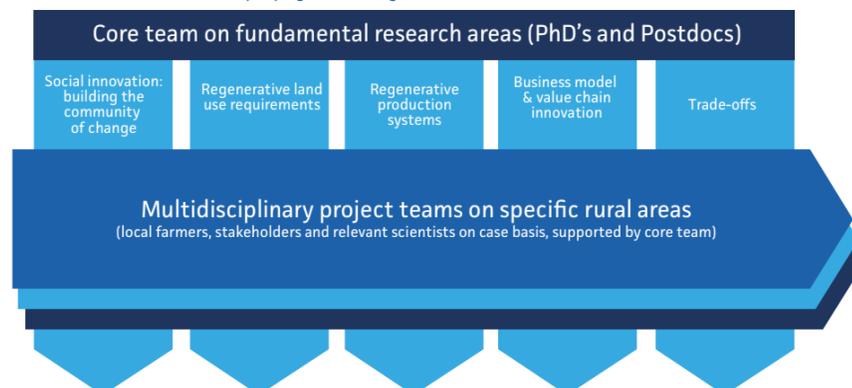
We will shift from programming in four 'technology themes' to programming in eight innovation challenges posed by society and industry

- This will require holistic, integrated and multidisciplinary programmes covering fundamental-strategic and applied research
- Programmes executed by mixed teams of PhD students, postdocs and research professionals
- And will require broadening of our research scope
- On Nutrition and Health: from specific food impacts to holistic impacts (Nutrient balance) and Personalised nutrition
- On Sustainable Food Systems: include primary production and food processing
- Add the Consumer Engagement theme to our research scope.

We will ensure longer-term continuity of our programming and experience base.

- Partners will commit to one or more of the eight innovation challenges rather than to one-off projects
- We will build/strengthen a scientific community, for each of the eight challenges, that stays committed to our programmes beyond 'their' current projects
- We will partner with other research platforms (e.g. ISPT, CCC) when appropriate, and avoid fragmentation of the communities around the eight challenges
- We will expand the existing partner base of large companies and include (groups of) SMEs who show interest in non-competitive research.

Envisioned multidisciplinary way of working within programmes  
Example: programme on regenerative farmer business models



Koert van Ittersum  
Consumer Engagement

“Consumers crucial to the success of healthy and sustainable innovations”

## EXPERT'S VIEW

Strengthening consumer trust and engagement is crucial in establishing healthier and more sustainable eating patterns, is the belief of Koert van Ittersum, Research orchestrator at TKI Agri&Food and TiFN portfolio adviser. “Innovations throughout the supply chain only make sense when the consumer appreciates them.”



**Koert van Ittersum is Professor of Marketing and Consumer Well-being at the University of Groningen, and Research orchestrator of the Roadmap Consumer & Supply Chains at TKI Agri&Food. The research agenda he recently developed, for this roadmap, interfaces positively with TiFN's Consumer innovation challenge.**

For over ten years now, food manufacturers and retailers have been called upon to make their product portfolios healthier and more sustainable, and to provide more transparency in order to help consumers make healthy and sustainable choices. Levels of salt, sugar and saturated fats are gradually being reduced and significant efforts are made to improve the sustainability of the food chain from farm to fork.

However, despite all efforts, a major shift in consumer choices towards healthy, sustainable diets has yet to happen. Few people consume the daily-recommended amount of vegetables, and many prefer sugary, fatty and salty products to healthy alternatives. Moreover, consumers are generally unwilling to pay a higher price to cover the additional costs of environmentally- or animal-friendly production methods.

This is an undesirable situation, not only from a societal perspective but also for manufacturers and retailers. "Innovations need to meet consumer needs, desires and expectations in order to enhance the market share, profitability and competitive position of the companies bringing them to market", stresses Van Ittersum. "And successful innovations are crucial to maintaining public support for the agrifood sector."

#### Getting involved

According to Van Ittersum, the consumer should be involved from the very beginning of product development, as they are increasingly becoming individual data gatherers and data reservoirs. "Rapid developments in IT are enabling consumers to be well-informed, for example via smartphone apps that detail the nutritional value or carbon footprint of food products", he says.

Moreover, manufacturers and retailers need a better understanding of consumer behaviour. "What we don't know yet, for example, is how such apps affect buying and consuming behaviour", illustrates Van Ittersum. There is also uncertainty about the efficacy of labels (front or back of products), 'nudging' and other shop-floor interventions. If, for example, someone was 'nudged' to purchase a healthy or sustainably-produced product, would he or she compensate this later with an unhealthy, unsustainable indulgence?

These and other questions are central to TiFN's Consumer Engagement research programme, which closely aligns with the research agenda of the Roadmap Consumer & Supply Chains, recently published by TKI Agri&Food. TiFN is currently working with the retail sector to initiate a first project in a new Consumer Engagement programme. The aim is to develop a learning platform that identifies which interventions (on the shop floor and/or online) best support different target groups to make healthy and sustainable choices. Also we are working with our knowledge partners to programme consumer research in the soon to be established World Food Centre in Ede.

#### Empowerment

According to Van Ittersum there is a wealth of opportunities to engage with and empower consumers to make healthy and sustainable choices. "There are still so many things about consumer behaviour that we do not understand. The aim of the TiFN research programme is to develop and validate effective interventions towards better choices and behaviour, that are based on and build up our understanding of consumer behaviour."

#### Build on strong TiFN heritage: the leader in non-competitive Food & Nutrition research in the Netherlands

- Established in 1997; from year one superb track record in scientific excellence and industrial relevance
- In most-recent FES period: €108 million in research investment; 50 projects; every €1 investment creates €5 additional turnover; > 90 PhD students; 475 peer-reviewed publications
- Results and highlights of last FES period are summarised in our report to RVO.nl: "Adding value to industry, science and society" [<https://tinyurl.com/FES-report>]

#### Clear need for continued TiFN leadership of a (limited) number of large research programmes, within a fragmented landscape

- Example, Nutrition: > 390 projects in last 5 years; many small initiatives throughout NL; impact and quality difficult to assess
- Within this fragmented landscape TiFN remains the leader in non-competitive research projects > €1 million
- Trusted platform; academia and industry collaborate on key challenges
- Grand design 2013: TiFN as main platform for TKI Agri&Food



Innovation challenge

# Enable shift in consumer behaviour towards healthy and sustainable diets

Manufacturers working towards a healthier and more-sustainable product portfolio are faced with two consumer-based challenges. Consumers claim that health and sustainability are important influencers of their choices. In practice, factors such as convenience, price and taste will always be the prime main criteria for the consumer purchase decision. In addition, the industry must face the fact that a large group of consumers are quite sceptical about the industry.

The challenge thus is to make it convenient and affordable for consumers to make healthy and sustainable choices for products that taste great. Effective interventions are needed that can

inspire millions of consumers with different preferences to choose for a healthy and sustainable diet.

**Research scope**

- Design and show efficacy of interventions that facilitate the healthy choice
- The power of transparency at the moment of buying
- Business model for a healthy store display: gradual reformulation
- Design and show efficacy of interventions for consumer appreciation and sense of control
- New forms of information gathering: serious gaming
- Effective dialogues (World Food Centre)
- Self-assessment and nudges

**Projects**

Among others, the PPS-projects Nudgis and DONRO and the experience with 'Etiketwijzer' and 'Vinkje' are valuable input for the development of this innovation challenge. Industry parties are cordially invited to contribute to project definitions. More info can be obtained via Wouter-Jan Schouten, Theme Director Sustainable Food Systems at TIFN (schouten@tifn.nl).

**Financial ambition**

**Build a programme funded to about €1 million per year by 2020.**



**STAKEHOLDER'S VIEW**

Albert Heijn - interview Anita Scholte op Reimer

## The where, how and why of consumer behaviour

“As the Netherlands’ major retailer, Albert Heijn understands and accepts its responsibility to help consumers make healthy and sustainable choices. We do so by anticipating, and creating, consumer trends, and by influencing consumer behaviour.

There are many ways to do so: using in-store nudges – subliminal incentives – that modify shopping patterns and choices; inspiring customers to eat healthier, without patronising them, for example via our magazine Allerhande; via stories about vegetables and meat replacers; by giving sustainable products more-prominent shelf placements and by the ongoing development of more-healthy products, such as ready-to-make fresh vegetable packets for convenient preparation of fresh soups and curries.

We are proud that similar innovations, specifically our Zucchini Spaghetti and Cauliflower Rice, were awarded the Jaarprijs Goede Voeding 2017 (Annual

Good Nutrition Prize). Behind the scenes, together with our manufacturers, we are working on salt, sugar and fat reduction, and sustainable sourcing and production of products like coffee, soya and dairy: the latter are long-term projects. One of our most recent experiments is personal health coaches on the shopping floor.

**More-scientific basis**

With our hands-on approach we have already made significant progress but, in order to make further advances we need a more-scientific approach that underscores our efforts. As a retailer, we know (almost) everything about consumer purchases, but what we don’t always understand is why some interventions work while others do not. We know little about food consumption; how much of purchased food is consumed by whom, and how and where. Equally, we want to understand how and where the actual purchase decision takes place – at

home or in the (online or real) supermarket. Once we know this, we can give people more-targeted, personalised advice. For example about how best to consume (the recommended) 250 grams of vegetables per day – an amount that, currently, very few achieve.



#### The latest insights

From this perspective, participation in the TiFN theme Consumer Engagement could be of great value to us. Collaboration in this public-private partnership will broaden our thinking and perspectives, giving us access to the latest insights and learning from the research approaches of the academic world. We are currently discussing possible issues and targets for the research, how to integrate it with our own consumer studies, and how to handle confidentiality issues.

I believe platforms like TiFN are essential in enabling a shift towards healthy and sustainable consumer behaviour. Only if we combine strengths and have the courage to share knowledge, ambitions and ideas can we create the major societal food transformation the planet (and the Netherlands) needs."

**Anita Scholte op Reimer, MSc**  
Senior Director Quality Assurance  
& Product Sustainability at Albert Heijn

## Voedingscentrum Gerda Feunekes

"Over the last 100 years we learned a great deal about nutrition. It is only comparatively recently, however, that scientists have begun to identify determinants of eating behaviour. We now know, for example, that health and sustainability are important for people, but that price, taste and convenience have more impact on the purchase decision. We still lack a basic understanding of how desired consumption patterns can be achieved in the long-term.

How can we motivate individuals to make healthy and sustainable choices, including people who are rather disinterested in the issue? Think of those with a low socio-economic status or the increasing number of elderly: how might we inspire them to adopt a healthier diet and help them overcome the challenges they face in maintaining such a diet? At present, our knowledge about these challenges is scarce.

From an explorative study by the Voedingscentrum (Netherlands Nutrition Centre) it appears that the elderly, even those with chronic diseases such as diabetes, often have little awareness of the quality of their diets and little desire to change; for people with a low socio-economic status other issues, like price, might predominate.



#### Enormous impact

The context in which people live, and where they purchase or consume their foods, has an enormous impact on the choices they make. Choices that are often based on irrational, unconscious

factors, affected by the situation they are in at that moment. Once we better understand

# We need to truly understand eating behaviour

## STAKEHOLDER'S VIEW



these factors, food professionals and the industry can develop more-effective diet and lifestyle interventions.

Another area of interest to our scientists is how to help people make sustainable choices? Today, little is known about how to measure overall sustainability of food products and to weigh the different criteria involved, such as environmental impact, animal welfare and social issues. Combining such a sustainability assessment with a 'health rating' of food products seems to be even more challenging. What would, for example, be the best choice from a combined health and sustainability perspective: a ready-made meat replacer with a relatively-high salt

content, or a home-cooked meatball with only a little salt added? Scientific evidence is needed to help consumers make these, often-confusing, choices.

#### Developing concrete solutions

I believe non-competitive research, via a public-private partnership like TiFN can, in addition to academic research, be a valuable way to achieve a basic understanding of eating behaviour. Such a setting allows partners to answer concrete questions and develop concrete solutions. Food professionals and consumers will benefit from such an approach."

**Dr Gerda Feunekes,**  
Director Voedingscentrum

## TiFN THEME DIRECTOR'S VIEW

Empowering the food industry to provide healthy nutrition, tailored to the individual needs of people across their life span, is the driving force behind TiFN's research within the Nutrition and Health theme. "We are developing a radical approach to measuring and communicating health effects", says Theme Director Rob Beudeker.

Around the world, obesity continues to increase, yet many people have poor diets: too much fat, sugar and salt; too little fibre, vitamins and minerals. To date, efforts by government, industry and society to reduce obesity have had minimal impact. Nutrition and lifestyle intervention campaigns attract just a few consumers, and food manufacturers find it almost impossible to get health claims approved, for example for probiotics to support gut health. "What, why, how and when people eat, depends on many different factors, such as age, lifestyle and socio-economic status. This makes food-consumption behaviour difficult to predict", explains Beudeker.

### Long-term effects

Moreover, nutrients often have various, minor, long-term health effects that result from interaction with other ingredients present in a food or diet, and these can differ between people. "For this reason, randomised, controlled trials - mandatory in health-claim applications - often show no effects", he says. "And when they do have a measurable effect it is seen in only around twenty per cent of the population."

Yet another disadvantage is that nutritional health effects can take a long time to manifest. "That we need to change consumer behaviour is clear. But who is likely to respond to a message such as reduce your sugar intake now and avoid the chance of getting diabetes in twenty years?", illustrates the Theme Director.

The good news is that, thanks to rapid developments in technologies such as sensors and wearables, it will soon be possible to measure the direct effects of nutrition - reliably, quickly and non-invasively. "This will enable consumers to adapt their nutrition to their needs", says Beudeker.

### Comprehensive and personalised

TiFN's Nutrition and Health research continuously anticipates such developments, using a comprehensive yet personalised focus. The multidisciplinary scientific structure of the programmes within this field, allows for addressing diet quality on the one hand, and the

individual, whole-life needs of people on the other. The first programme, *Nutrient balance and attractive foods*, will develop a methodology to make healthy choices easier and improve consumer appreciation (see page 19 for more information.), based on the Nutrient Balance Concept - a new metric that reflects the overall nutritional quality of foodstuffs, diets and meal plans. "Representatives of both academia and industry have long been calling for such an approach", explains Beudeker. "You can imagine it as a nutritional lingua franca, facilitating communication between manufacturers and consumers, and making the healthy choice the easy choice."

The second programme, *Nutritional impact on specific health aspects*, has been established to obtain, amongst other goals, more understanding of the link between microbiota composition and biomarkers related to immune and mucosal health, at all age points. "This will increase the chance of health claims being approved and provide leads for optimising age-specific gut-health interventions", says the Theme Director.

The third, *Effective nutrition for you* is dedicated to the development of effective, personalised coaching in nutrition and lifestyle (see page 20 for more information). "The research will increase our understanding of individual responses to changes in diet and lifestyle, and provide insight into what motivates consumers to make and sustain healthy changes", says Beudeker. "An important target is glucose metabolism, extensively studied in earlier TiFN research. The programme is also developing new research methodologies, focussed on assessing individual time series as an alternative to conventional, randomised, controlled trials."

### People, profit, planet

In order to be really successful, TiFN's industrial partners must educate people about appropriate aspects of diet and lifestyle. Then, as consumers, people can make the right choices, instore or online, from both a health and a sustainability point of view. Industry can only make continued profits if they demonstrate that they care about the people consuming their products, and the impact their products have on the planet.

Beudeker: "We will provide sound data that ensures industry gets more business opportunities, whether by communicating about healthy diets, personalised nutrition, or specific health aspects such as beneficial gut bacteria, and be in a position to take early advantage of emerging markets, trends and technologies."

Dr Rob Beudeker has been Theme Director Nutrition and Health at TiFN since January 2017. He combines this position with his role as Senior Investment Manager at DSM Venturing, responsible for investing in start-up companies specialising in nutrition. From 2010-2016 he was Vice-President Innovation in Human Nutrition and Health at DSM.

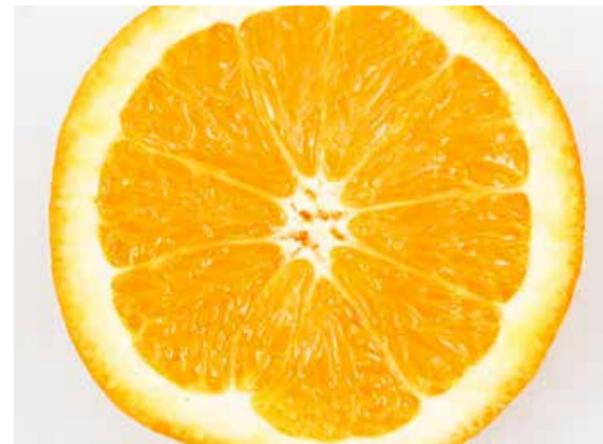
A portrait of Dr Rob Beudeker, a middle-aged man with short grey hair and glasses, wearing a blue and white striped shirt and a dark jacket. He is smiling slightly and looking towards the camera. The background is a blurred indoor setting with warm lighting.

A radical approach  
to measuring and  
communicating  
health effects

Rob Beudeker

# Innovation challenge

## Nutritional impact on specific health aspects



## Nutrient balance and attractive food

**The composition of the diet undoubtedly influences health. The exact effects of certain nutrients, as well as their mode of action in the body, are often unknown. This makes it difficult for industry to develop products with a scientifically-proven mode of action.**

This innovation challenge has been established to gain (among others) more understanding of the link between the composition and metabolic activity of the microbiota and of biomarkers related to immune and mucosal health, at all age points. The ultimate goal is to deliver sound scientific

proof, which the industry finds relevant.

### Research scope

- Association studies between specified metabolome, diet and microbiome, on gut health and the gastrointestinal epithelial and immune barrier, resulting in the selection of a biomarker profile
- Investigate which nutritional components/ingredients have an impact on the selected biomarker profile
- Change the dietary intake to affect biomarkers and measure the impact of this on immune fitness, epithelial integrity and function in different age groups (young, adult and elderly). Eczema, in combination with mucosal integrity, would be an easy to measure and relevant health phenotype in infants, and

might have a partial overlap with low-grade inflammation in the elderly.

- For infants we have to focus on naturally-occurring immune-related problems. In the adult/elderly population we can consider challenge models.

### Projects

The earlier TiFN-programme Gastrointestinal Health has already demonstrated the importance of dietary components (such as fibres) in supporting response against inflammation and pathogens. These insights, as well as developed methodologies, are seen as valuable for this innovation challenge.

### Financial ambition

It is the ambition to build a programme funded to about € 1.5 million per year by 2019.

**In general consumers often know the characteristics of healthy food. However, creating a healthy daily diet is a challenge, as many consumers do not have the specific knowledge needed to make well-informed choices.**

The challenge is to develop a methodology that makes healthy choices easier, and improves consumer appreciation, based on the Nutrient Balance Concept - a new quality metric that reflects the overall nutritional quality of foodstuffs, diets and meal plans. This methodology facilitates communication between manufacturers and consumers and helps make the healthy choice the easy choice.

### Research scope

- Improve the scientific robustness of the Nutrient Balance Concept tool
- Develop tool and demonstrate effectiveness in guiding consumers towards healthy choices
- Link the NBC to sustainability (SHARP)
- Stimulate industry consensus for use

### Projects

The TiFN-programme SHARP is generating valuable insights for this innovation challenge. Also, the proceedings of the ILSI working group on Nutrient Balance are relevant here.



### Financial ambition

It is the ambition to build a programme funded to about €1 million per year by 2019.

# Innovation challenge

## Effective nutrition for you



**Each individual has their own optimal diet for good health and well-being, determined by differences in, for example, gender, age, exercise frequency, genetic make-up and immediate environment. Therefore, a one-size-fits-all-approach cannot realise the full potential of effective nutrition.**

The challenge is to develop effective, personalised coaching in nutrition and lifestyle. By increasing the understanding of individual responses to changes in diet and lifestyle,

and by providing feedback to consumers, making healthy choices will become easier.

### Research scope

- How do changes in diet and lifestyle mediate individual responses?
- Which research methodologies are needed? Should one shift from randomised control trials to individual time series?
- What are the motivators of, and effective coaching routes towards, personalised lifestyle interventions?

### Projects

The current project *Unravelling the biology behind perceivable consumer benefits* fits this innovation challenge. Industrial

parties are cordially invited to contribute to defining additional projects. More info can be obtained from Rob Beudeker, Theme Director Nutrition and Health (beudeker@tifn.nl)

### Financial ambition

It is the ambition to build a programme funded to about € 1.5 million per year by 2019.



**Katrien van Laere**  
Danone

**PARTNER'S VIEW**

**The challenge is real, tangible innovation**



“Danone’s mission is to ‘Bring health through food to as many people as possible.’ This implies we are always looking forward, beyond current practice towards new approaches. Fundamental insight into the health benefits of nutrition is essential for us, as are sustainable sourcing and mild processing. Not only because consumers demand all three, but also in order to ensure long-term food security and to protect and restore the health of our planet.

#### **Personalised approach**

The innovation challenges, defined in TiFN’s new research portfolio, dovetail perfectly with our vision and strategy. We expect the programme, *Effective nutrition for you*, to give us a far better understanding of how to develop nutritional interventions for specific target groups. The effects of nutrition, because they are subtle, long-term and multiple, and because individuals respond differently to the same foods, require specific design. We believe that human trials with a more-personalised approach, using state-of-the-art devices that allow people to measure their own health, wellbeing, and lifestyle effects, is the way forward.

The *Nutritional impact on specific health aspects* programme, involving scientists from leading research groups in Groningen and Maastricht, looks both exciting and appropriate. Gut health, including the microbiome, has always been a key topic for our company, as we believe it plays a prime role in growth and development. We have conducted a significant amount of research in this area, in close collaboration with Wageningen University & Research, and supported the appointment of a Professor of Intestinal Microbiology in Early Life.

Finally, there is the *Sustainable food ingredients* project, in which Nutricia Research has been involved since its inception in early 2017. We are delighted to be working together with TiFN in three such important research areas.

#### **Tangible solutions**

For many years now, TiFN has been an important strategic partner for us. Participating in this public-private initiative has enabled us to collaborate with many leading research organisations and obtain valuable insights in areas key to our strategy. However, the challenge for the coming years is to ensure this non-competitive research translates into solutions with tangible benefits for the consumer; not only as the aim of this key partnership program, but also to highlight the Netherlands’ global leadership position in food and nutrition innovation.

Making the scope and targets more specific would make the results easier to apply in practice. Such an approach requires, of course, a great degree of openness and a shared ambition among research and industry partners. If we all can share the vision that healthy, sustainably-produced nutrition is a fundamental need, then I believe that together we can overcome this challenge.”

**Dr Katrien van Laere,**  
VP Research and Innovation at Nutricia Research

[Nutricia Research is the global R&D organisation behind the Early Life Nutrition and Advanced Medical Nutrition divisions of Danone.](#)

# It is time for a more-personalised approach

“Nutrition sciences have always taken a rather generic approach, investigating health effects in large groups of people. However, in order to make new steps forward we should shift towards a more-personalised approach.

Illustrative is a recent TiFN project, *Microbiota, energy balance and metabolism (2011-2015)*, from which we concluded that the gastrointestinal microbiota does not influence human metabolism in all circumstances or all persons. The administration of antibiotics to human volunteers for one week ‘switched off’ the microbiota, but did not result in any observable short or long-term metabolic effects. On the other hand, we demonstrated that direct administration of short-chain-fatty acids (SCFA) to the large intestine has a pronounced effect on fat oxidation and hormones. SCFA are formed by bacteria when they ferment indigestible food compounds.

After completion of the project, there were still two questions: first, whether the impact of microbiota on human metabolism might vary in healthy volunteers and subjects with an increased risk for chronic metabolic diseases; and, second: how do these bacteria interact with dietary components? For example, after consumption of large amounts of complex carbohydrates, fermentation of dietary fibres by the microbiota - that takes place in the distal, rather than the proximal part of the large intestine - might exert different health effects.

#### Intriguing questions

In order to answer such intriguing questions we need to compare subgroups, and combine state-of-the-art technology for measuring individual gut and metabolic health. TiFN is well-equipped for such a personalised approach, with scientists from multiple disciplines - nutrition sciences, microbiology, gastrointestinal physiology, systems biology and modelling - working in multi-disciplinary research.

In the beginning of 2017 we began, as part of the latest TiFN research portfolio, a project focussed on the personalised approach: *Unravelling the biology behind perceivable consumer benefits*, also called *Glucose mapping*. The research, involving four different research partners, aims to reveal determinants of blood-glucose control, and the effects of changing blood levels on cardiometabolic risk and mental performance and wellbeing. Disturbed blood glucose control seems to be more and more common in western societies - probably due to diet and lifestyle factors - and is a risk factor for diabetes and cardiovascular diseases.

In the project we have data available from earlier, large European dietary-intervention studies on macronutrients and metabolic health. These data will be used to design a personalised dietary intervention, targeted at people with a specific metabolic profile, to achieve the most-effective metabolic outcome. We will investigate the added value of this ‘tailor-made’ intervention in normalising glucose control, and subsequently test whether we can develop more-personalised nutrition advice for people in real-life situations.

#### Proof-of-concept

I hope, and expect, the project will provide a proof-of-concept for a more-personalised approach in nutrition. This will open up opportunities for product developments and targeted intervention strategies in the prevention of obesity, diabetes and cardiovascular diseases. Generating non-competitive knowledge, with industrial relevance is what makes TiFN research so satisfying for me.”

Prof. Ellen Blaak,  
Professor of the Physiology of Fat Metabolism at Maastricht University, and project leader at TiFN



EXPERT'S VIEW

Ellen Blaak

# Wouter-Jan Schouten



## Sustainable food systems

# “Holistic approach vital for sustainable future”

Feeding an estimated 9-10 billion people was, and remains, the global challenge TiFN partners took on when they created the research programme within the Sustainable Food Systems theme. “We are bringing together experts in ecology, economy, sociology and agritechology to develop scientifically-proven, appropriate and far-sighted solutions”, says Theme Director Wouter-Jan Schouten, MSc.

The way in which the ‘world’ currently produces food is absolutely untenable in the long run, says Schouten, getting straight to the point. “Half of the world population suffers from malnourishment; more than 75% of farmers globally are caught in a poverty trap. Food production is a major contributor to exceeding planetary boundaries like climate, freshwater, nutrient cycles and biodiversity - and 30-40% of the food produced goes to waste”, he explains. “Despite efforts by governments, societal organisations and industry, this situation is hardly improving, because approaches are fragmented and reductionist.”

The Theme Director believes a long-term, holistic approach that includes finding business opportunities in truly sustainable food production would be far more effective. “Working on systems solutions can be very rewarding”, he

stresses. “Applying the principle of true pricing, for example, can provide economic growth, and companies taking this lead are growing faster.” According to Schouten, coalitions of visionary organisations must be established, to focus on transforming agrifood-production landscapes, value chains and consumer markets - elements that are all interrelated. “Sustainable agrifood-production will only become mainstream when it offers solid revenue models to farmers and companies in the value chain, and when consumers choose sustainably-produced foods.”

### Collaborative learning

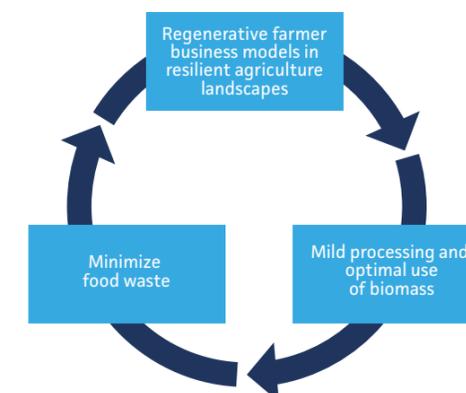
It is crucial that coalitions appreciate the importance of collaborative, multidisciplinary learning as a first step to identifying and exploiting the opportunities for growth and value creation. This philosophy provides the basis for TiFN's Sustainable Food Systems research Theme, which focusses on three programmes: Regenerative farmer business

models, Minimal processing and optimal use of biomass, and Minimize food waste.

“In all three themes we bring together experts in ecology, economy, sociology and agritechology in order to establish scientifically sound, meaningful approaches to the transition to sustainable food systems”, says the Theme Director. Fundamental and applied research will go hand in hand in the research, supported by business cases and social innovation. “It is not about reducing negative impacts, but about achieving structural

improvements. Such changes only take place when, from the very beginning, the goals of science, business and consumers are agreed and shared”, he stresses.

### Sustainable Food Systems theme: three innovation challenges



### Regenerative farming

The focus on regenerative farmer business models is new for TiFN but, according to Schouten, indispensable in the overall transition process. "Primary production is responsible for most of the negative impacts of food production on environment and rural communities; if we want to make true progress we should give suitable attention to this part of the chain", explains Schouten. "Moreover, regenerative use of land provides an important basis for the development of a circular economy."

In the programme, questions will be answered such as "What type of production can be best done at what location? How can we close nutrient cycles and restore biodiversity? How can we develop farmer business models based on differentiation, ecosystem services and low inputs rather than lowest price/commoditisation? What are the implications for taxation, subsidies and regulation? How should we engage with consumers to promote choices that drive net positive production, and restoration of the Dutch agricultural landscape?"

### Valorisation of biomass

The second programme will investigate how to valorise the biomass produced in the Netherlands. "Optimum valorisation will increase the protein available for human consumption, and liberate

biomass for the development of bio-based materials. It will also open avenues for the use of new protein sources such as insects and algae and new crops such as lupine", illustrates Schouten. The third programme will identify the long-term potential of waste-prevention technologies and develop proofs-of-concepts (POCs) for promising technologies. "Imagine, for example, specialised processing that increases shelf-life, and recycling via fermentation technologies", illustrates Schouten. The programme will also focus on feedstock flexibility in food processing and B2B acceptance of side-streams, as well as logistical optimisation solutions. Questions will be addressed such as 'How to collect and distribute side streams and overripe products?', and 'How to enable consumers to avoid waste and to accept less-standardised food products?'

### Clear vision, credible roadmaps

Schouten has high expectations of the research: "Within four years we will have a clear vision of how we can create truly-sustainable food-production systems, with credible roadmaps", he says. "The positive responses we have received from many companies and farmer organisations are encouraging, as are opportunities for large-scale application of mild-processing technologies. This will help us to build sound business cases that will convince parties throughout the world to join our programmes."



**Wouter-Jan Schouten, MSc,** has been Theme Director Sustainable Food Systems since October 2016. He combines this position with his role as Senior Advisor at NewForesight, a strategic consultancy that specialises in tackling complex sustainability challenges by creating partnerships and building sustainability platforms in the global food sector. In his long career, Schouten also had roles with the World Wide Fund for Nature and was a partner and managing director at the Boston Consulting Group.

## Innovation challenge

# Regenerative farming business models



**Many of the current farming methods in the Netherlands lead to a loss of environmental quality. Soil and water quality and biodiversity are decreasing in many agricultural areas, as long-term methods are not sustainable.**

The challenge is to devise agricultural concepts that restore environmental quality without compromising productivity and profitability. In addition, the production system must be circular with regard to nutrients and carbon. Greenhouse gas emissions should fall within the scenario of the 1.5 to 2 degrees Celsius limit. At the same time, the concept must lead to flourishing companies and communities, and provide added value throughout the production chain. The development of a regenerative business model in the Netherlands would generate international opportunities for Dutch business.

### Research scope

For (parts of) the Dutch agricultural landscape: develop proofs of concepts for how regenerative production can be achieved within one generation

- Bio-physical flows:
  - what mix of land-based and land-less (stables, greenhouse) production systems fits best within planetary boundaries?
  - what type of production can best be done at what location?
  - how much output can thus be achieved in a net positive system?
- Economic transformation model:
  - farmer business models include differentiation, revenues for ecosystem services and minimised inputs
  - implications for agri-food value-chain players (for example: local processing)
  - implications for taxes, subsidies, regulation

- Social innovation model:
  - how to enable transition of majority of farmers towards net positive production?
  - Consumer engagement with Dutch agricultural landscape:
  - how to engage with consumers to promote choices that drive net positive production and restoration of Dutch agriculture landscape?

### Projects

Among others, the PPS-projects Breed4Food and Feed4Foodure supply valuable insights for the development of this innovation challenge. Industrial parties are cordially invited to join in defining projects. More info can be obtained from Wouter-Jan Schouten, Theme Director Sustainable Food Systems (schouten@tifn.nl).

### Financial ambition

It is the ambition to build a programme funded to about € 2 million per year by 2020.

Innovation challenge

# Mild processing and optimal use of biomass

A growing world population and the transition to a biobased economy greatly increase the demand for biomass. Because sustainable production of biomass also has its limits, it is important to optimise valorisation of the biomass produced. Many food processing activities have a large carbon footprint. In order to reduce the footprint, new processing methods must be designed which use less resources and produce minimal waste without compromising product quality.

This innovation challenge is focussed on redesigning production of food ingredients and food products towards minimal waste and minimal footprint and with maintaining/improving functionality and nutritional value from all biomass.

This offers interesting business opportunities for processing at or close to the farm. This will de-commoditise agricultural products, reduce price fluctuations and strengthen rural economies. Knowledge gained will generate international opportunities for Dutch businesses.

#### Research scope

- Identify long-term potential to improve valorisation of existing biomass through mild processing (e.g. enzyme technology, fermentation):
  - Functionality from food; less waste
  - More protein available for human consumption; potentially substituting plant for animal proteins
  - More biomass available for bio materials
  - Use of alternative sources (algae, insects)
- Identify pathways and requirements to deliver the identified potential
  - Mild-processing technologies
  - Substituting conventional assets with mild-processing technologies
  - Plant breeding to enable improved biorefinery and valorisation of biomass
  - Implications for value chain beyond processing

#### Projects

The current project *Sustainable food ingredients* fits this innovation challenge. Industrial parties are cordially invited to join in the definition of projects. More info can be obtained via Erik van der Linden ([vanderlinden@tifn.nl](mailto:vanderlinden@tifn.nl)).

#### Financial ambition

It is the ambition to at least maintain the current level of investments at about € 2 million per year.

*At the time of writing, many Dutch companies, together with the Ministry of Economic Affairs, ISPT and TiFN are engaged in a scoping study for the 'Sustainable Food Initiative (SFI)'; which is addressing this innovation challenge. The formation of the SFI would be a great opportunity to accelerate the programme, on mild processing and optimal use of biomass, far beyond this ambition.*

## Innovation challenge

# Minimize food waste

Many sustainability issues are about achieving closed circles. Prevention of food waste is a key issue for the food industry.

The challenge is to minimise downstream food waste, at point of sale (retail and food service) and by the consumer. For remaining waste, effective valorisation should be developed and packaging materials should also become circular in (re)use.

### Research scope

- Identify long-term potential of waste-prevention technologies and develop proofs of concepts for most-promising technologies
- Processing for shelf-life extension
- Fermentation for 're-cycling' of unsold products and by-products into food
- Packaging
- Develop proofs of concepts for feedstock flexibility in food processing and related B2B acceptance of side streams
- Develop proofs of concepts and business cases for logistical optimisation solutions
- Collecting and distributing of side streams and overripe products
- Optimised buying algorithms for retail and foodservice
- Social-innovation model: how to enable consumers to avoid food waste as much as possible and accept less-standardised food products?

### Projects

The previous TiFN-projects *Reduction of spoilage in fresh and chilled products*, *Red discoloration in fresh and chilled products* and the current project *Sustainable packaging supply* valuable insights for the further development of this innovation challenge. We aim to partner with the recently formed Task Force Circular Economy and Food in shaping the program that will address this challenge.

Industrial parties are cordially invited to join in the definition of projects. More info can be obtained via Wouter-Jan Schouten, Theme Director Sustainable Food Systems (schouten@tifn.nl).

### Financial ambition

At the time of writing we have not yet defined a financial ambition for this programme; the ambition will be determined later based on input of the Task Force Circular Economy and Food.

## Innovation challenge

# Integrated measurement and modelling of nutrition, health and sustainability

What exactly is health? And how would you define sustainability? At present there is no scientific consensus around either concept. Without this consensus it is extremely difficult to develop sound measurement systems, exchange data and results and assess which options offer the best solutions



It is the challenge to develop a common language for health and sustainability in food, to end this confusion. This lingua franca should form the basis for the integrated measurement of sustainability and health performance in

our food production and consumption systems, facilitating science-based recommendations for policy and businesses, surfacing important trade-offs that may need to be made between different health and sustainability objectives, and science-based targets and performance management by business and governments.

### Research scope

- Combining existing methodologies and datasets into a holistic methodology to adequately measure performance and set improvement targets for:
  - o Sustainability of production
  - o Gap between existing diets and diets optimised for health and sustainability
- Develop model to apply this holistic methodology for a specific
  - o Production area (across all relevant agricultural sectors in that area)
  - o Supply chain (across a number of different sourcing markets)
  - o Consumer market (across all major food categories in that market)
- Methodology development
- Applying big data analysis together with complexity science to formulate cross-domain models based on correlational structural networks at different scales

### Projects

The earlier TiFN-programmes *Valorisation of raw materials and process efficiency* and *SHARP* have provided valuable insights for this innovation challenge. Cooperation with the initiatives One planet thinking and The Sustainability Consortium could be very valuable. Industrial parties are cordially invited to join in the definition of projects. More info can be obtained from Erik van der Linden (vanderlinden@tifn.nl).

### Financial ambition

It is the ambition to maintain a programme funded at about € 1 million per year.

# Farmers as caretakers of animals, plants and ecosystems

STAKEHOLDER'S VIEW

Hans Huijbers

“Efficiency and upscaling has been the paradigm for the agriculture sector for the last 50 years, with farmers receiving lower and lower prices for their products and with continuous pressure on their business models. Moreover, examples from the USA show that enlarging a farm or introducing extra technology is no longer guaranteed to increase yields and certainly does not resolve current sustainability challenges.

Our global climate is changing at an unprecedented speed, with periods of extreme rainfall interspersed with intense drought. The area of land suitable for food production is decreasing, as is soil fertility. Vital organic compounds in the upper layer are being

eroded and soil compacted, reducing hydration, due to the impact of heavy agricultural equipment.

#### Rapid urbanisation

Then there is the people element of sustainability. The rapidly growing world population is becoming increasingly urban; according to the United Nations, within thirty years 66% of the global population will live in urban areas. This will increase demand for cheap food products and reduce awareness of food origins and sustainability, further feeding the trend towards efficiency and upscaling. Moreover, in the countryside the relationship between farmers and non-farmers is increasingly disturbed and difficult.

#### Back to their roots

In order to establish a sustainable production system, farmers and growers should get back to their roots: as caretakers of animals, plants, soils and ecosystems. This requires social innovation – farmers should make a shift in their way of thinking from efficiency towards caretaking and regeneration. Smart technology is important too. Imagine alternatives to conventional crop rotation that restore soil fertility, or smart technology for weeding and monitoring the condition of crops and soil.

Whatever approach they choose, farmers must generate sufficient income and be long-term sustainable. This requires the development of business models that go beyond efficiency, with governments having a crucial role to play in enabling this shift. Today, many governments, including the European Union and the Dutch government, give generic subsidies, for example per hectare of land. They also set detailed regulations on input variables, limiting farmers' entrepreneurial opportunities. At Land en Tuinbouw Organisatie Nederland (Dutch Agriculture and Horticulture Organization) our plea is for less regulation of input variables and moving from generic subsidies per hectare towards paying farmers for positive impact, such as an increase in levels of organic compounds in the soil.

#### Mother nature

TiFN's draft research programme, *Regenerative farming business models*, has many of the social and technical elements I believe are essential to establishing sustainable food-production systems. It also covers the element of ecology: what can we learn from nature in the design of new agricultural production systems? In the natural cycle, autumn is the time of falling leaves and the beginning of regeneration. Current agricultural policies forbid farmers to put manure on their fields at this time of the year. This is understandable in light of the current (Dutch) national manure surplus. However, from a nature-cycle perspective, it would be wiser to develop new ways to process manure so that it can help us close cycles and regenerate the soil.

#### Changing perceptions and practices

TiFN's collaborative engagement of research and industry can be fundamental in changing perceptions and practices. Working together in different coalitions, on different themes, while sharing larger goals, is essential if we are to make a true shift, to food-production systems in which people, the planet and profit are in balance with each other.”

#### Hans Huijbers,

Board Member LTO Nederland, portfolio holder Sustainability and Chairman of ZLTO

## Floor Uitterhoeve & Jaap Petraeus

**“The signing of the Dutch Commodities Agreement (Grondstoffenakkoord), by so many parties, shows that awareness of renewable raw materials is growing. The challenge now is to align the ambitions of this agreement with existing initiatives, and develop a joint action plan.**

For food companies, scarcity will be the main driver of investment in renewable raw materials. They need scientifically-sound scenario analyses, dynamic modelling and credible business cases, so they can actively contribute to ensuring future supply security. How to deal, for example, with our - now commonplace - extreme weather circumstances, that become ever more unreliable? How to make sure certain key crops remain available and affordable so the Dutch agrifood sector can compete in the global marketplace? How can development towards a circular economy ensure security of supply? What does it take to eventually achieve zero waste?

### **Broad perspective**

TiFN's research in the Sustainable Food Systems theme will have a broad perspective, utilising a decade of experience in multidisciplinary working. Its portfolio closely connects science and industry, and the three key elements in the supply chain - farmers, processing, and waste - are central. The Regenerative farming business models programme is comprehensive, encompassing and integrating topics like preserving soil health, and greenhouse gas reduction. In terms of processing, the distinction between food and non-food production from biomass will become less distinct, forcing companies to redefine their purpose and added value.

STAKEHOLDER'S VIEW

**Urgent shift  
needed to  
renewable raw  
materials**

**Floor Uitterhoeve**





**STAKEHOLDER'S VIEW**

**Urgent shift needed to renewable raw materials**

**Jaap Petraeus**

We are looking forward to working with TiFN and its stakeholders in shaping the new research programme. We believe the final programme should also include scenario analyses/decision-support models and address the future: what new challenges will emerge in the long term and how might companies deal with them? What might we learn from or contribute to regenerative farming models in countries with complex, less-organised chains than the Netherlands? And how can sustainability of food systems be measured in an integrated way, accounting for trade-offs between potentially contradictory sustainability values?

**Future generations**

The agrifood sector needs to find a balance between the new business opportunities of a growing world population versus the food security of future generations. Therefore it is essential that, together, we shift towards smart use of raw materials as soon as possible. We are convinced TiFN will drive and support industry to make major advances."



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**Jaap Petraeus Msc,**  
Manager Corporate  
Environmental affairs &  
Sustainability at Royal  
FrieslandCampina, member  
of the FNLI Sustainability  
Committee and Chairman  
of the Raw Material Group  
of the Dutch Employer  
Association VNO-NCW

# OUR PARTNERS

At the moment of writing, we work together with the partners mentioned below. Of course we are open for new partnerships.

## Knowlegde partners



## Industrial partners





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