

FUTURE OF FOOD IN FLANDERS MOVING FORWARD AS A SOCIETY

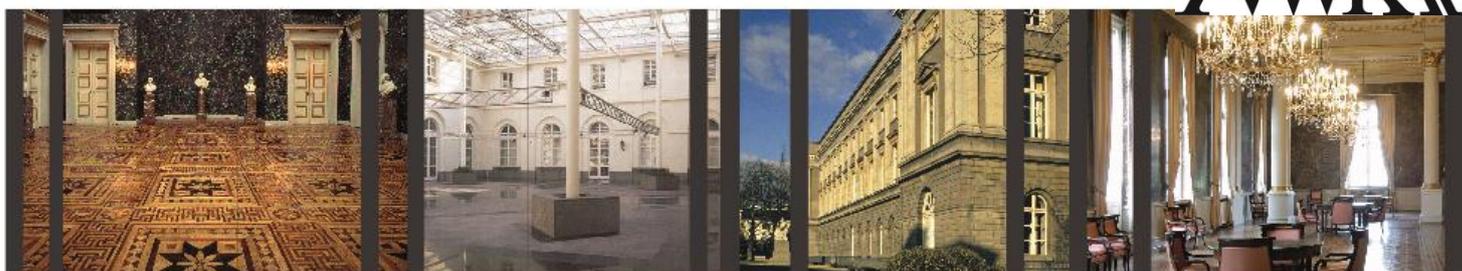
A Thinking Exercise in Flanders

KVAB Thinkers in residence programme 2018

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Preface

The Royal Flemish Academy of Belgium for Science and the Arts organizes two annual cycles of what is known as the Thinkers Programme as part of its service to society. The aim of the Thinkers Programme is to deepen the societal debate in Flanders and to develop a long-term vision on topics of high relevance and on challenges facing the region. The programme is a unique multidisciplinary and future-oriented initiative aiming for high-level social impact.

In a typical Thinkers Programme, one or two highly specialized international scholars come to Flanders on several occasions in the course of one year. As experts in the field, they acquaint themselves with the specific situation in Flanders regarding the topic being studied, they read reports and relevant literature and reflect on the specific features of the Flemish/Belgian case. In a dialogue with members of the Academy and through meetings and encounters with colleagues at the universities, with stakeholders and opinion makers, the Thinkers gradually gain insight into the local situation and reflect on it from an international perspective. Their work results in a position paper that contributes to the further strategic development of Flanders and that offers research-based policy advice to the Flemish authorities. The final report contains an evaluation of the Flemish situation benchmarked by international comparisons and rooted in theoretical and scientific findings. It takes stock of the situation, identifies strengths and weaknesses and formulates recommendations on points that are of particular interest for future policy-making.

The 2018 programme initiated by the Class of the Technical Sciences reflected on the challenges which the food sector in Flanders faces and was coordinated by Jan Delcour and Paula Moldenaers (KU Leuven). Thinkers-in-residence were Margaret Bath and Tiny van Boekel.

Margaret Bath spent over 30 years as a senior R&D executive in the Food Industry and has a strong record of new product launches, productivity, and acquisition integration at two Fortune 500 companies in product and packaging innovation, process development, consumer research, and R&D strategy in multiple food and beverage product categories. She is skillful at building global technical organizations in both strong and difficult times, translating complex concepts, matching consumer needs with technology opportunities to solve consumer problems and drive growth. Her track record indicates a strength in forging strong alliances within the corporate environment and with external partners.

Margaret holds a degree in Food Science from the University of Maryland and an Honorary Doctorate conferred by KU Leuven's Faculty of Bioscience Engineering. She is a Supervisory Board member of EIT Food.

Tiny van Boekel is professor emeritus Food Science & Technology and has also been Dean of Education at Wageningen University. He has been involved in the area of Food Science & Technology for over 40 years and is very well known for his work in the area of Maillard reactions and kinetic modelling of food quality aspects. He actively participates in societal debates around modern food production, and is keen to see much more involvement of food scientists in such debates.

The complementarity of their industry and university backgrounds and expertise of these two scholars has been a source of mutual inspiration for both Thinkers.

1 Introduction

This report is about the present food system in Flanders and particularly wants to address an outlook for the future. Obviously, Flanders is not in isolation and therefore its situation cannot be seen without a global picture, as well as by taking a look at the past.

It goes without saying that food is essential for humans as living beings by supplying energy and nutrients to be able to be physically and mentally active, to build and maintain the body and to protect it from deterioration. Next to that, food has very important social and cultural meanings, not in the least in Flanders with a fine culinary tradition.

Food supply is obviously essential to all societies, regardless of whatever system produces it, and as humans we have come a long way from being hunters and gatherers, from the agricultural revolution some 10,000 years ago, to consumers buying food in a supermarket and finding that very self-evident.

What most people do not realize, however, is the intricate and complicated food supply system that is behind this present day luxury situation when compared to earlier times. As a Chinese proverb states: "if you have enough food, you have many problems, if you do not have enough food you have only one problem". Staying away from this one problem is an important societal goal in general. However, it also has become clear that as a society we cannot neglect other aspects as well, such as the carrying capacity of the earth and biodiversity. There is a responsibility towards future generations, and this is nowadays indicated by the somewhat elusive concept of sustainability. So, also this aspect must be considered in discussing the future of food in Flanders - as well as elsewhere in the world.

Food systems can be seen as a chain, or rather a network, of many actors.

First of all there are the actors that supply resources such as fertilizers, feed, and seed, to farmers. Secondly, farmers are central actors because they produce the actual food and its raw materials. A third type of actors are the food processors. They use the products obtained from farmers. A fourth type of actors are the distributors. They organize the transport of produce from farmers to auctions or processing plants, or directly to the retail or consumer. Evidently, consumers themselves are also important actors, mainly through their buying behavior. Last but not least, governmental bodies regulate many aspects concerning food safety, food integrity and rules around advertisements and health claims.

In short, an enormous organization has been built up over the years, and all this is, from the consumer point of view, mainly behind the screen. One important result has been that the situation around food security, food safety and food quality is unprecedented in human history, at least in the Western world. Yet, it seems that many people are unhappy about this situation. If one only reads some discussions on internet, blogs and vlogs around food, as well as in the traditional press, distrust is all around. And admittedly, not all is well, there are occasional food scares and outbreaks of microbial infections, and sometimes there are criminal actions around food. The present abundance of food also leads to unexpected negative health aspects, the diseases of civilization as they are called. And, as already mentioned, there is the sustainability issue that really needs to be tackled, and in doing so, this will have large consequences for the way food is produced.

In this report, we as Thinkers explore what is going on in Flanders but also in the outside world. We do so because many current developments are actually on a global level. This then raises the question whether or not the situation in Flanders is different from, or equal to, or perhaps even influencing the global trends. It was already clear from the start of our investigation that Flanders is an important player in the global food system, based on historical developments. Flanders has drastically

changed, in a short time period, from an agricultural society into an industrialized society where also food production has been highly industrialized.

The basic question for the Thinkers was how Flanders is dealing with global trends as well as local trends, if and how Flanders is preparing itself for current and future challenges, such as limiting resources, water scarcity, climate change, information and communication technology challenges, consumer trends and - not in the least - consumer distrust in the system. It seems that we are at a tipping point concerning food supply, and it may well be that disruption of the present situation is on the way. Ultimately, the goal of this report is to indicate how Flanders can deal with this disruption, how it could influence all this, with the ultimate goal to build a sound and sustainable food system, or perhaps various systems, with involvement of all actors.

This report is built up as follows. First, we explain our way of working, then we analyze the present situation and compare this to global trends. Attention was given to some specific Flemish aspects. Our preliminary findings were presented to relevant stakeholders during a symposium and their feedback is taken up in our recommendations on how to deal with future developments.

Our ultimate goal with this report is to stimulate the discussion in Flanders about the necessary transition of food production systems, in Flanders as well as elsewhere in the world. It is hoped that this report will further enable the Royal Flemish Academy of Belgium for Science and the Arts to engage in a, hopefully, science-based societal discussion about food production and consumption.

2 Our Approach

Our approach was a comprehensive one that allowed us, first and foremost, to conduct both a top down and a bottom up approach – we looked at macro trends and we conducted over thirty key stakeholder interviews. Our knowledge is based on the past, but we know that decisions that are made going forward will create that future, and the approach we took allowed us to learn from the past (also that of other closely related sectors), and to use predictive analysis, scenario planning, and pragmatic stakeholder experience to formulate recommendations for the Future of Food in Flanders.

Through our horizon scanning process, we looked at macro trends to help us anticipate the future and also the pragmatic approach of key actors in the Flanders food/agricultural ecosystem. During our symposium, we had the opportunity to pressure test and brain storm various potential scenarios from the different viewpoints of various actors within the Flanders food system. This brainstorming took place with various people in the Flanders community, many of whom are experts in their field, stakeholders, and of course, all were consumers. Figure 1 summarizes the approach.

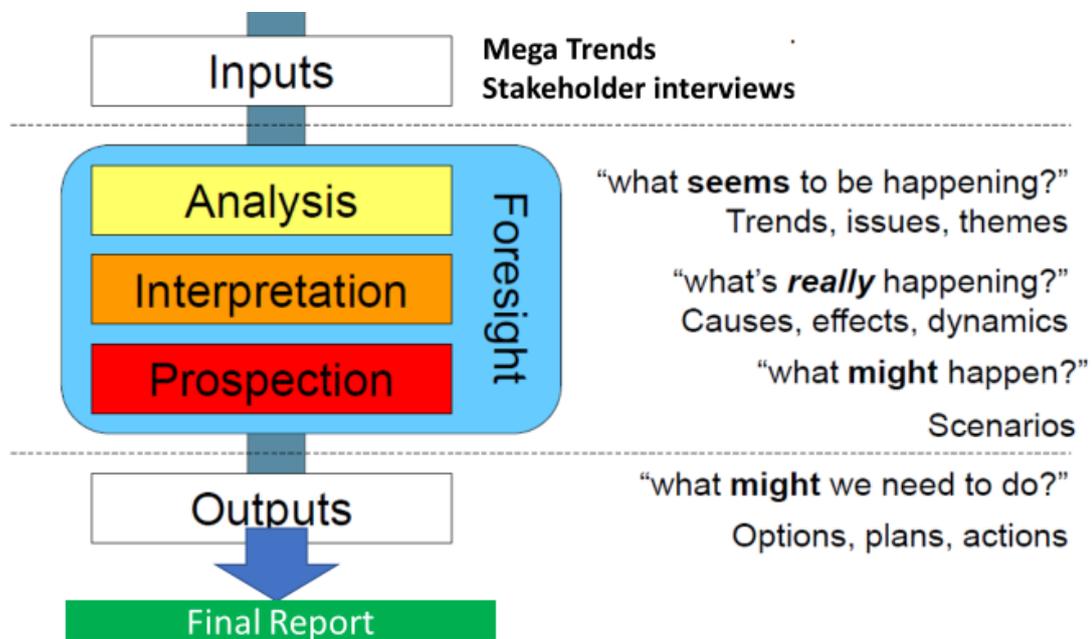


Figure 1. Approach of the Thinkers in Residence

This final report focuses on what is possible and hopefully, will be most helpful to Flanders society – citizens, producers, business (small and large) and governmental entities.

Mega Trends

Mega trends are global forces that define our future world – their impact is far reaching, and in the case of food and agriculture, they are also very relevant to local societies. There are a number of trends impacting food and agriculture, both globally and within Flanders. These pose challenges to our future food security, climate change, and health and well-being of the citizens of Flanders. This is particularly the case for the most economically vulnerable citizens of Flanders. A full section on megatrends is included in this report.

Key Stakeholders

Beyond the mega trend analysis, the second major input was key stakeholder interviews. Figure 2 lists the stakeholders who were interviewed at length.

The two Thinkers are grateful and appreciative for the depth and breadth of discussions with all of the stakeholders who participated in their visits.

Key Stakeholder Interviews/Visits

- Colruyt – Halle
 - Mr. Jef Colruyt, CEO
- Fevia – Brussels
 - Mr. Chris Morris, Secretary-general
 - Mrs. Nadia Lapage
- Flanders'Food – Brussels
 - Mrs. Inge Arents, Director
- ILVO – Melle
 - Mr. Joris Relaes, Administrator-general
 - Mrs. Lieve Herman, Head of Technology and Food
- La Lorraine Bakery Group – Ninove
 - Mr. Guido Van Herpe, CEO
- Lotus Bakeries – Lembeke
 - Mr. Jan Vander Stichele, Chair of the Board
- Mulder Natural Foods/Maselis – Roeselare
 - Mr. Patrick Maselis, CEO
- Boerenbond – Leuven
 - Mr. Pieter Verhelst, Member of the Board
- Puratos – Groot-Bijgaarden
 - Mr. Filip Arnaut, Head R&D
- Greenyard – Sint-Katelijne-Waver
 - Mr. Hein Deprez, CEO
- Imec – Leuven
 - Mr. Luc Van den Hove, CEO
 - Mr. Kris Van de Voorde, Innovation Program Manager
- FWO – Brussels
 - Prof. em. Willy Verstraete, Chair
 - Dr. Hans Willems, Secretary-general
- VLAIO – Brussels
 - Mr. Eric Van Zele, Chair
 - Mr. Luc De Buyser, Head of Innovation Support
- Milcobel – Kalle
 - Mr. Peter Koopmans, CEO
 - Mr. Dirk Van Gaver, Group R&D
- IBM – Brussels
 - Mr. Walter Stiers, Enterprise Architect
- Roundtable with universities
 - Mrs. Imogen Foubert, KU Leuven
 - Mr. Erick Vandamme, UGent
 - Mr. Frédéric Leroy, VUB
- Soubry – Roeselare
 - Mr. Michel Soubry, CEO
- Tiense Suikerraffinaderij – Brussels
 - Mr. Thomas Hubbuch, CEO
- Vandemoortele – Ghent
 - Mr. Jules Noten, CEO

Figure 2. List of Stakeholders Interviewed by the Thinkers

3 Mega Trends

The mega trends, combined with the stakeholder interviews, set the stage for our investigation. The key global trends are highlighted in the slide below by Frost & Sullivan.



Figure 3. Megatrends Impacting Food and Agriculture. Green Arrows Mark the Trends Relevant for Flanders. Source: Frost & Sullivan - *World's Top Global Mega Trends to 2025 and Implications, 2015*. <https://www.thegeniusworks.com/wp-content/uploads/2016/01/Megatrends-2025-Frost-and-Sullivan.pdf>

The most relevant trends to Flanders are marked with the green arrow in Figure 3. The next few pages provide additional insight on selected megatrends.

Generally, food systems are very fragmented. There are over ten million farms in Europe. Europe relies on small agriculture producers to produce the majority of food. But many of these farms are not well connected to the broader supply chain and therefore have limited opportunities for advancing their economic standing.

With regards to resource scarcity, arable land is shrinking while the population is growing. Today, 70% of arable land is dedicated to feeding livestock and another 20% to agriculture. Water is another precious and finite natural resource. Over 50% of water used today is for agriculture and livestock. Lastly, over one third of edible food is wasted. This equals a big opportunity for new business models, creating value added products from what has traditionally been viewed as waste and now is more appropriately named as valuable side-streams or co-products.

Flanders has a tremendous opportunity to lead the way in transforming Europe's food system by becoming a progressive role model for the future. A new revolution in food has the potential to create healthy food systems that sustain our planet and thereby our society. Existing innovations and emerging technologies present opportunities to tackle these challenges, but they will raise new questions and their impacts will not be evenly distributed. Knowledge transfer between sectors and within a given sector is a big opportunity, and actually a necessity. Utilizing digital building blocks such as the internet of things, blockchain, sensors, etc. coupled with advances in science and reforming the physical infrastructure have the potential for a better tomorrow. It is indeed an exciting time to be in food and agriculture!

Demographic Shifts - Urbanization, Population Growth, an Aging Population, and the Impact of Diet

Demographic shifts are increasing and changing the demand for food across Europe. In examining the mega trends, we find three demographic shifts that will significantly impact Flanders – population growth and aging of the population, further urbanization (creation of larger cities) and then the triple burden on society that we see from food and lifestyle – under nutrition, over nutrition and micronutrient deficiencies. Although all of these megatrends may not physically occur in Belgium at the same rate, the impact is or will certainly be felt and should be prepared for by the Flanders society.

It is expected that by 2050, there will be over 600 million of people in Europe and over 70% of European society will be urban. We also face an aging population in Europe and Flanders is no exception (see Figure 4).

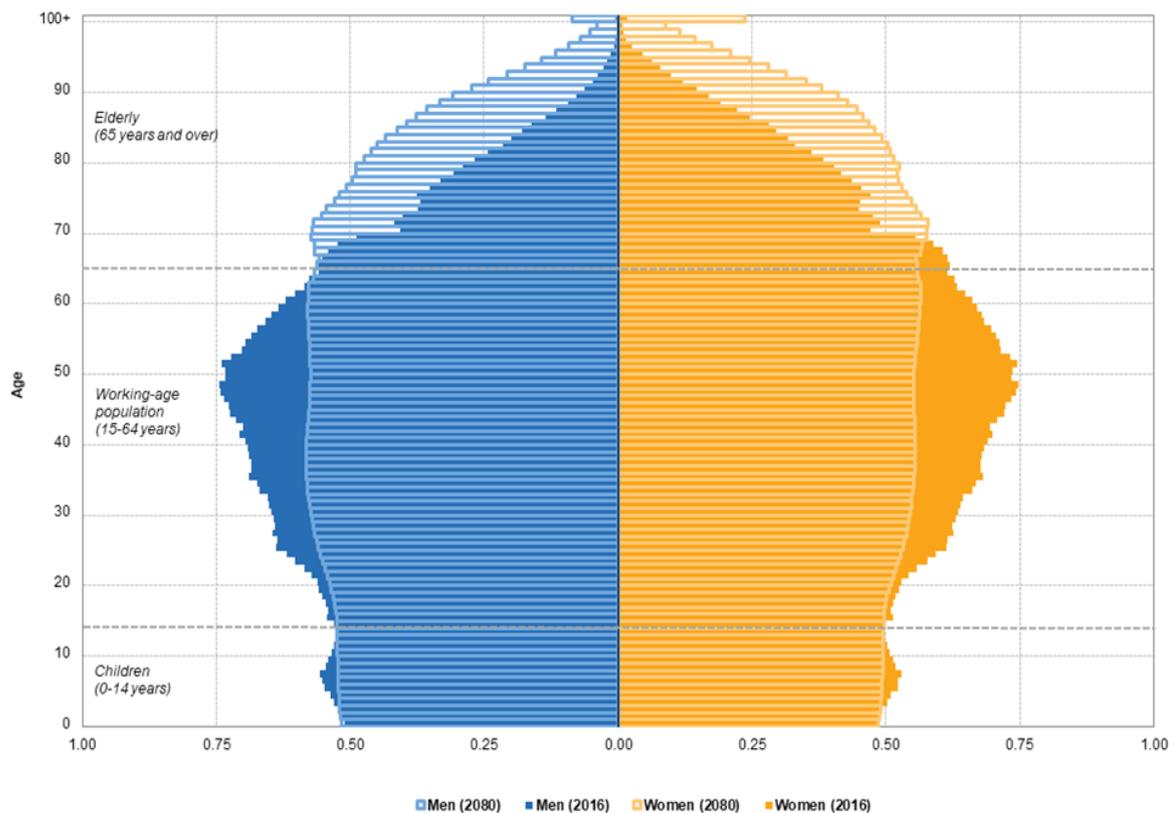


Figure 4. Europe's Shifting Population. Source: https://ec.europa.eu/eurostat/web/population-demography-migration-projections/population-projections-/main-tables_4. Population Pyramids, EU-28, 2016 and 2080.

The future of the city is the future of our society. By 2050, 70 per cent of the world's population is likely to be urban, with many living in megacities of more than 10 million people. The urbanization occurring all over the world and in Flanders is both an opportunity and a challenge. Today, Belgium, situated in the heart of western Europe, is according to international standards considered as urbanized (OECD, 2011). As illustrated in Figure 5, further demographic growth is expected (Schockaert, 2015).

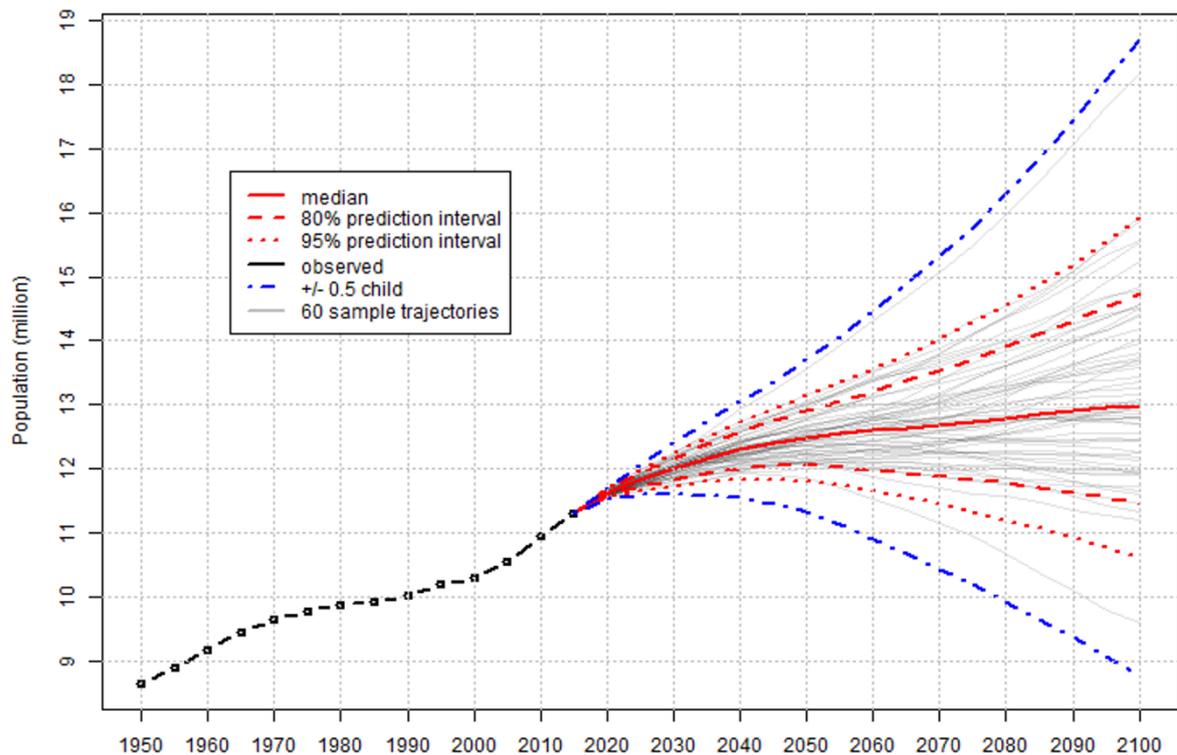


Figure 5. Expected Demographic Shifts in Belgium. The Chart Shows Estimates and Probabilistic Projections of the Total Population for Belgium. The Population Projections are Based on the Probabilistic Projections of Total Fertility and Life Expectancy at Birth, Based on Estimates of the 2017 Revision of the World Population Prospects. The Probabilistic Projections of Total Fertility and Life Expectancy at Birth were Carried out with a Bayesian Hierarchical Model. The Chart Displays the Probabilistic Median, and the 80 and 95 Percent Prediction Intervals of the Probabilistic Population Projections, as well as the (Deterministic) High and Low Variant (+/- 0.5 Child) of the 2017 Revision of the World Population Prospects (<https://population.un.org/wpp/Graphs/Probabilistic/POP/TOT/>).

In Europe, 25 per cent of the population is already aged 60 years or over, and that proportion is projected to reach 35 per cent in 2050 and 36 per cent in 2100. Populations in other regions are also projected to age significantly over the next several decades. The number of persons aged 80 or over is projected to triple by 2050, and by 2100 to increase to nearly seven times more than in 2017. Globally, the number of persons aged 80 or over is projected to increase from 137 million in 2017 to 425 million in 2050, and further to 909 million in 2100. In 2017, 27 per cent of all persons aged 80 or over reside in Europe.

Given these megatrends, there is a strong probability of the following:

- i) decreased productivity of the population as a whole and increasing costs for the remaining working population to maintain all productivity – which can lead to further increases of the retirement age,
- ii) physiological changes in ageing people leading to different nutritional needs which may lead to nutritional problems on the one hand but will also provide increased opportunities for product development,
- iii) increased health care costs

Beyond the population growth, an aging population and increased urbanization in the Flanders Region, there are many far reaching implications of population growth and migration. The current problem of migration that Europe is struggling with is strongly related to this (see Figure 6).

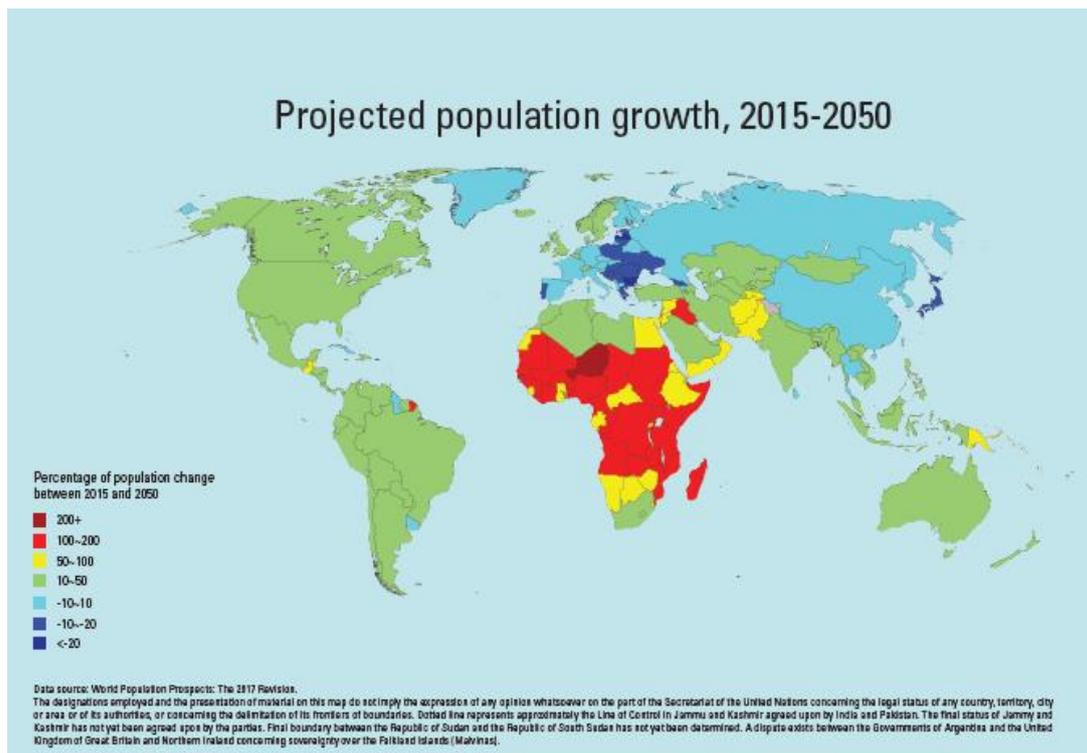


Figure 6. Projected Population Growth Worldwide. Source: United Nations, World Population Prospects: the 2017 Revisions. <https://www.un.org/development/desa/publications/world-population-prospects-the-2017-revision.html>

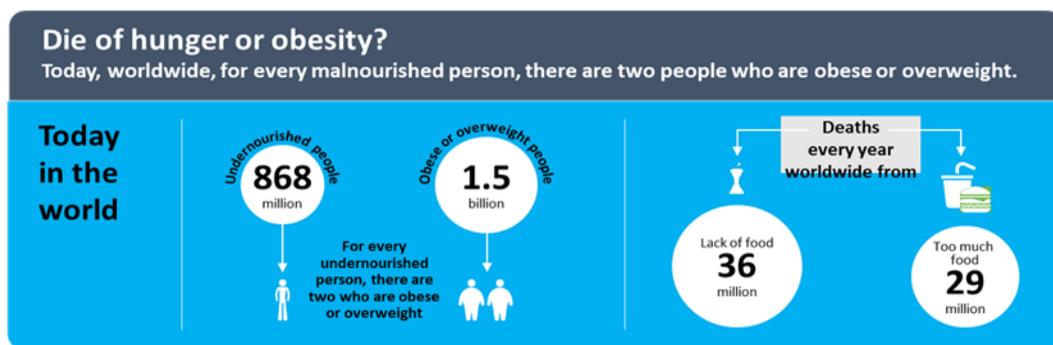


Figure 7. A Present-Day Paradox of Food and Nutrition. Source: Eating in 2030: Trends and Perspectives, Barilla Center for Food and Nutrition, 2016. <https://www.barillacfn.com/m/publications/eating-in-2030-trends-and-perspectives.pdf>

Diets have shifted dramatically over generations in the past 50 years or so. Today's typical dietary patterns are linked to several chronic disease states that place a burden on society via increased healthcare costs associated with diseases such as type II diabetes and also place an undue burden on the environment. Furthermore, there are many citizens who face hunger and malnutrition.

As the population continues to age and expand, and healthcare costs place heavier burdens on gross domestic product, change will increasingly become a necessity. Flanders (and, for that matter also Belgium) is not immune to these phenomena and needs to ensure adequate planning to minimize implications.

Scarcity of Natural Resources and Climate Change

Food and agriculture are an important part of Europe's bio-economy. This is also the case in Flanders. The 2015 EU-28 analysis of the bio-economy shows a turnover of 2.3 trillion Euro and over 50% comes from food and agriculture. Together, they are by far the largest employer of the European bio-economy.

Based on the analysis, there are several factors converging into the perfect storm: climate change (rising temperatures, intensifying natural disasters, see Figure 8), shortage of both water and arable land (see Figure 9), excessive food waste, and biodiversity.



Figure 8. Effects of Climate Change 1.5 C versus 2 C <https://www.vox.com/energy-and-environment/2018/1/19/16908402/global-warming-2-degrees-climate-change> Source: Schleussner et al. 2016 in *Earth System Dynamics* 7: 327-351.

Greenhouse gases are a major contributor to climate change. Data indicate that cows alone contribute more to global warming than cars (fig 9a and 9b). Cattle's emission intensity is massively higher than for other species because of the vast amounts of methane they generate and emit during digestion (their digestive process is enteric fermentation). Emission intensities vary significantly between feeding the in grazing and mixed systems. Meat and dairy are very important components in the Flanders food system and all key actors of the Flanders food system must come together to transform this portion of the food system.

Cows contribute more to global GHG emissions than cars

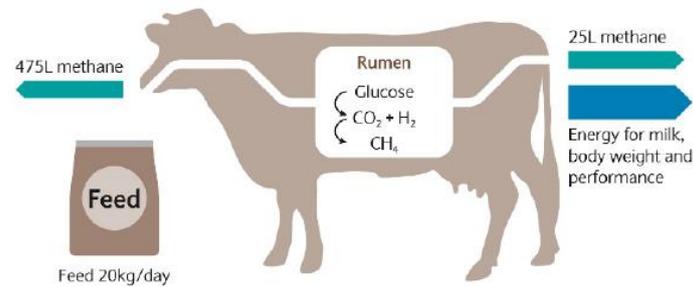
Pollution from enteric fermentation is the equivalent of 1.5 billion cars...



...50% more than the 1 billion cars on the road today

Based on avg. car emissions of 130g CO₂/km x 50km per day x 250 days p.a.
Source: Barclays Research

The average cow emits 500l of methane every day



Source: DSM, Barclays Research

Figure 9: Cows versus Cars and Average Cow Emission. Source: Winds of change: the next environmental debate, Barclay's Equity Research, Feb, 2019.

To mitigate this troubling footprint, there are many options – from the farm to the consumer.

Our scenario analysis shows that addressing cattle emissions can only be achieved through collective efforts

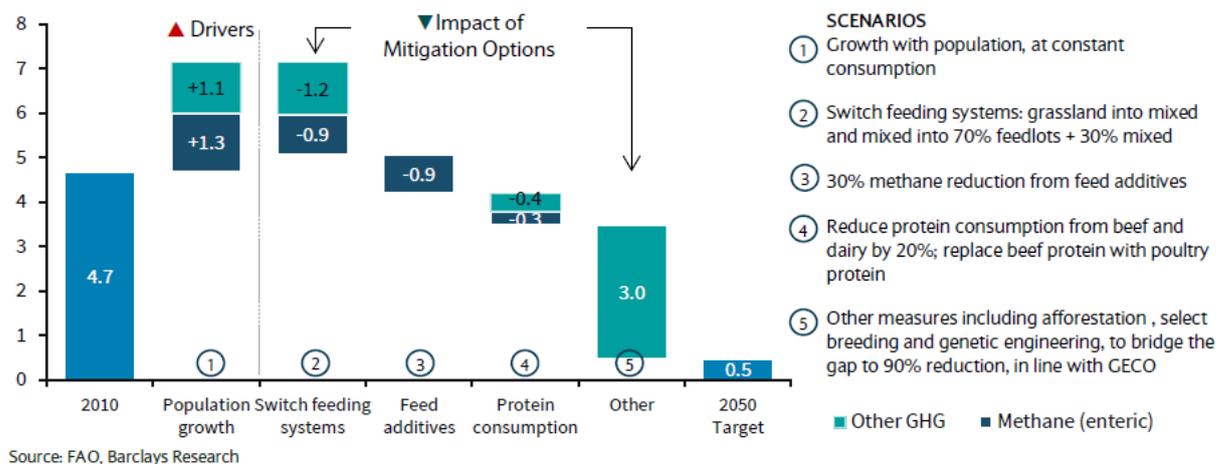
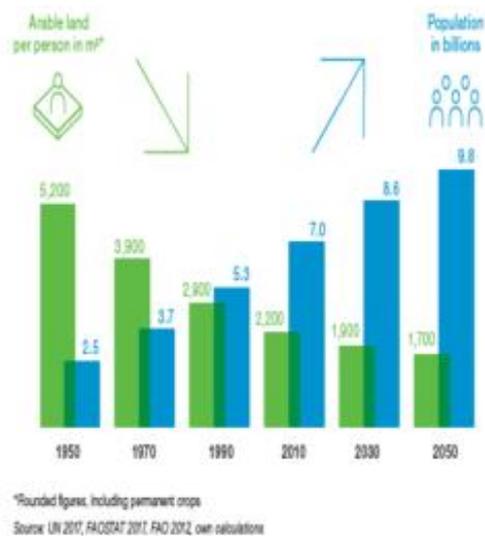


Figure 10: Cattle Emission Mitigation. Source: Winds of change: the next environmental debate, Barclay's Equity Research, Feb, 2019.



Arable land is precious

The amount of arable land available for food production per person is limited and constantly decreasing. This is due to population growth, but also factors such as urbanization, erosion and desertification.

Only a small part of the Earth's surface is arable land

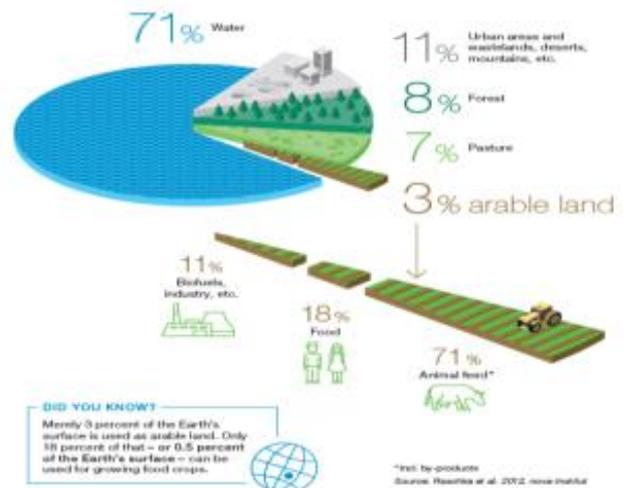
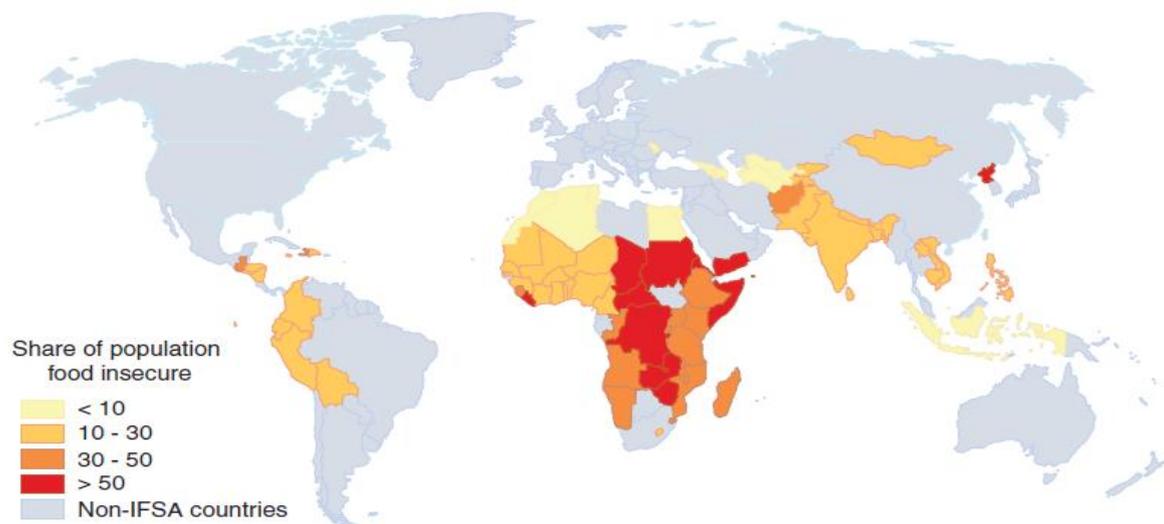


Figure 11. Trends in Arable Land Availability. Source: *The Future of Food and Agriculture*, Bayer AG, 2016. <https://www.bayer.com/en/the-future-of-agriculture-and-food.aspx>

Figure 12 highlights the current state of food insecurity. The “heat map” would suggest that the potential for food insecurity in Africa could lead to major disruptions in Europe, including Flanders. This shows clearly that we have to act globally; decreasing the yield gap in Africa has a direct effect on Europe/Flanders in the long run.

Share of population that is food insecure, 2018



IFSA = International Food Security Assessment.

Source: USDA, Economic Research Service.

Figure 12. Food Insecurity and Climate Change. Source: USDA, *International Food Security Assessment 2018-2028*, June 2018. www.ers.usda.gov

There is also a significant opportunity to minimize food waste in Flanders. Although Figure 13 is a global slide, the trend is the same in Flanders. This represents a tremendous opportunity for the bioeconomy, creating value added products of benefit to society and improve the economic prosperity of producers (including farmers and small businesses).



Figure 13. A Present-Day Paradox of Food and Nutrition. Source: *Eating in 2030: Trends and Perspectives*, Barilla Center for Food and Nutrition, 2016.

Given the importance of the food and agriculture industry to Flanders, and more broadly Europe, it's critical to point out that resource scarcity is a threat to its long-term vitality in the region. Unfortunately, arable land is shrinking while the population is growing. Today, the majority of arable land is dedicated to feeding livestock (70%) and another 20% to agriculture. Water is another precious and finite natural resource. Over 50% of water used today is for agriculture and livestock. Lastly, over one third of the edible food is wasted. This equals a big opportunity for new business models, creating value added products from what has traditionally best viewed as waste. This is an important area to explore when planning the future of Flanders. In addition, new techniques and technologies will need to be deployed to ensure a vital food and agriculture industry for decades to come. In doing so, careful consideration should be given to promoting and employing new tools of the fourth industrial revolution. The topic of the fourth industrial revolution is covered in a separate section of this report.

Consumer Expectations/Behavior

In this section, we focus on three consumer areas:

1. evolving consumer expectations,
2. seismic transformations – private label and path to purchase alternatives, and
3. the delicate balance of the ecosystem and the dangerous trend of decreasing cost of food.

Figure 14 gives an overview.

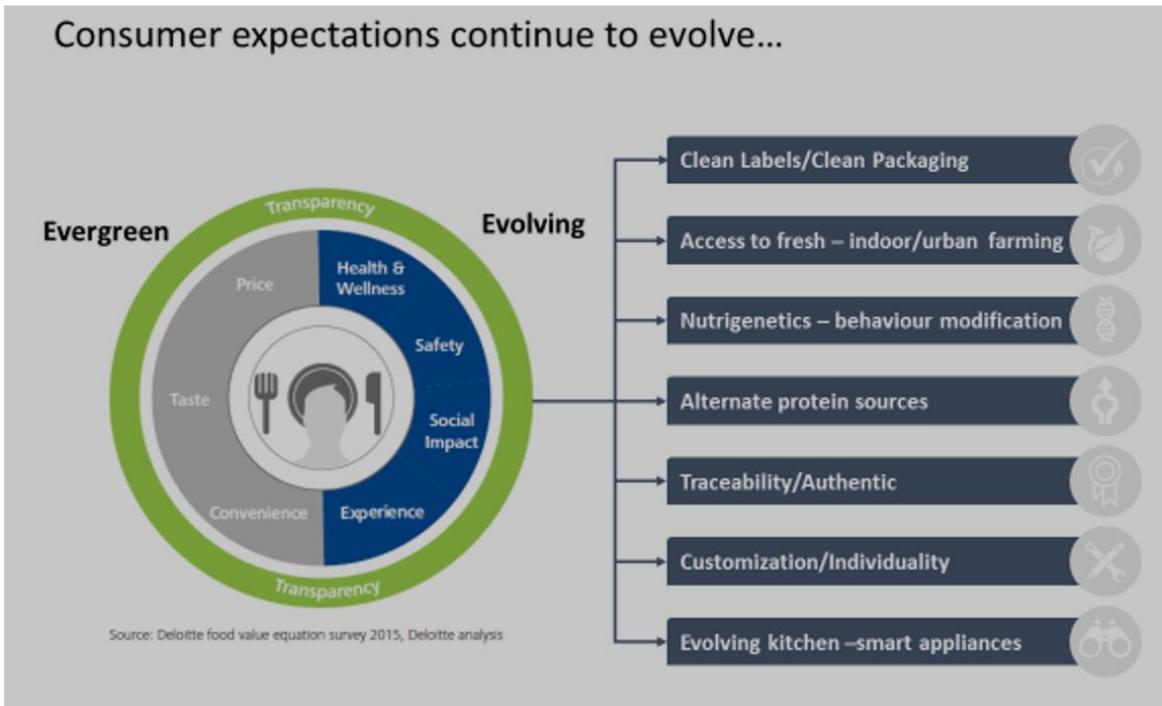


Figure 14. Overview of Consumer Expectations. Source: <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/consumer-business/us-fmi-gma-report.pdf>

Consumer expectations are evolving. There are three macro trends that are evergreen. Consumers want food that is tasty, convenient, and at the right price! Historically, performing well in these three areas led to a stable and growing relationship with consumers. Doing all three well is no longer enough. Consumers are voting with their wallet and the expectations of today's consumer are transparency, clean labels, and clean packages, access to fresh, products with a social impact, customization, alternate sources of efficacious protein and, of course, a nice eating experience!

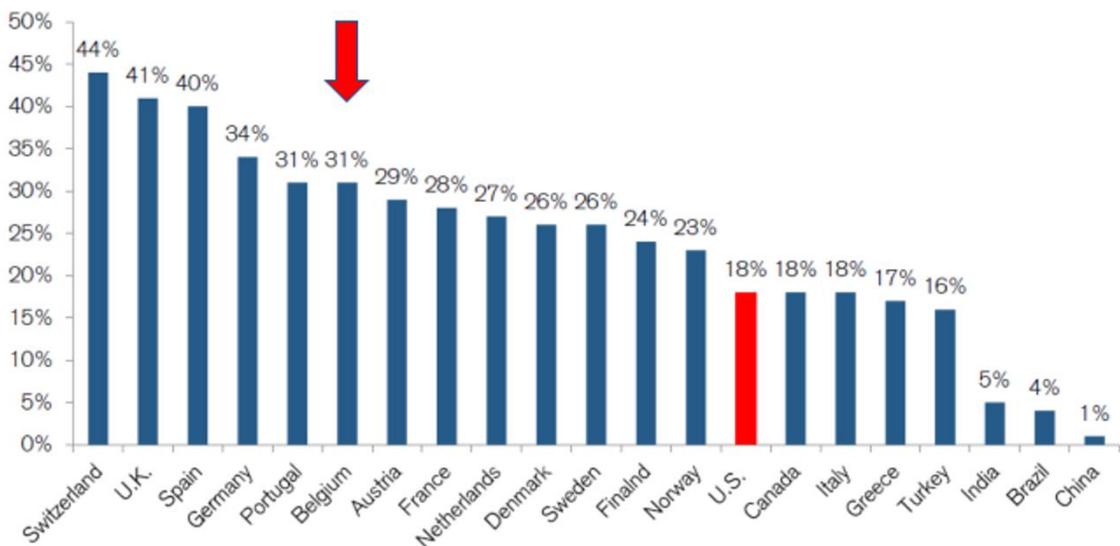


Figure 15. Private Labels across the World. Source: Nielsen Data, 2017, Credit Suisse Analyst Report.

A new revolution in food has the potential to create healthy food systems that sustain our society and our planet. Existing innovations and emerging technologies present opportunities to tackle these challenges, but they will raise new questions and their impacts will not be evenly distributed. Knowledge transfer between sectors and within a given sector is a big opportunity. Utilizing digital building blocks such as the internet of things, blockchain, sensors, etc. coupled with advances in sciences and reforming the physical infrastructure have the potential to create a better tomorrow. It is indeed an exciting time to be in food and agriculture!

Many countries in Europe have already reached the tipping point on private label, including Belgium. Historically, one of the biggest drivers of growth that multi-national food companies have had was the power of the brand. Today's consumers are increasingly brand agnostic (over 1/3 of the products sold in Belgium are private label – store brand) to counteract this trend, it is important that products be differentiated and offer true benefits to consumers. Going forward, research and development in the food and agriculture industry will need to be increased. We discuss this in the fourth industrial revolution section.

One of the most disruptive trends in the food and agriculture industry is the path to purchase with the shift to e-commerce providers such as Amazon (see Figure 16 a and 16 b). This trend will continue to accelerate. Figure 16 a and 16 b is from Goldman Sachs and based on Nielsen data. The current projection is that over 70% of consumers will utilize e-commerce for purchasing consumer goods by 2022, in the case of food, this will be particularly the case with dry and shelf stable foods. The trajectory of this trend is impressive. In the future, consumers will have an “infinite shelf” with unprecedented choices.

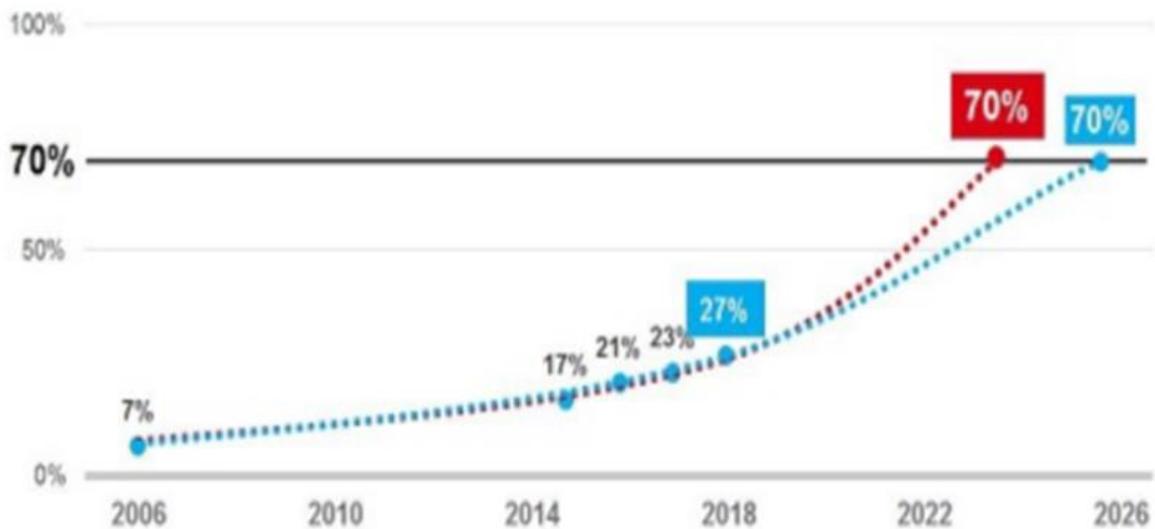


Figure 16 a. E-Commerce for Consumer Goods will Saturate within Five Years. Projected Effects of e-Commerce. Source: Goldman Sachs Analyst Report, Jason English, May 14, 2018.

TOTAL FMCG E-COMMERCE SHARE AND READINESS INDEX

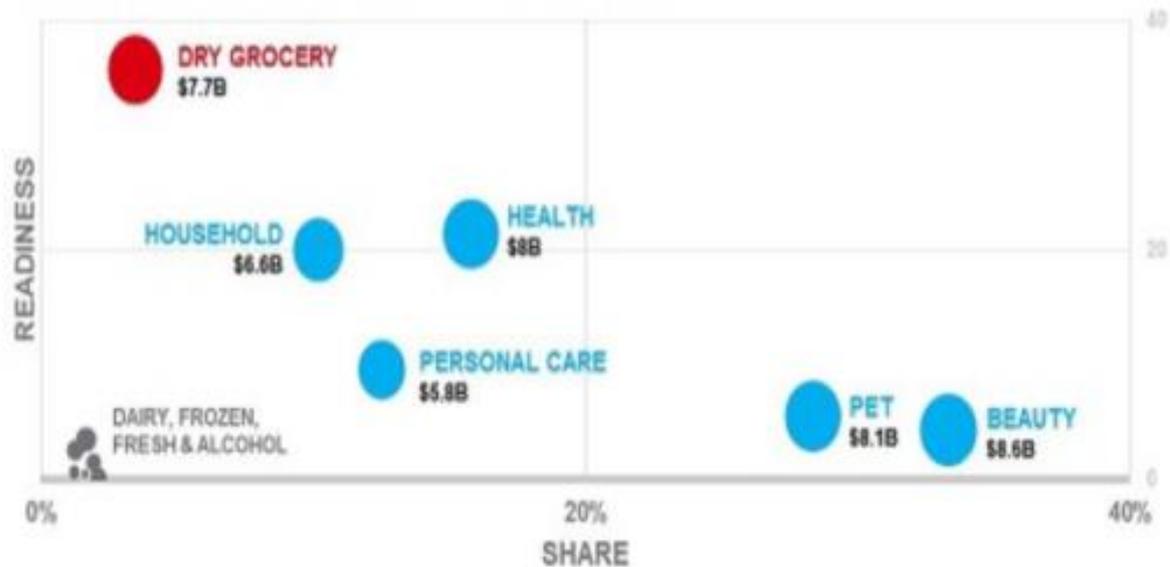


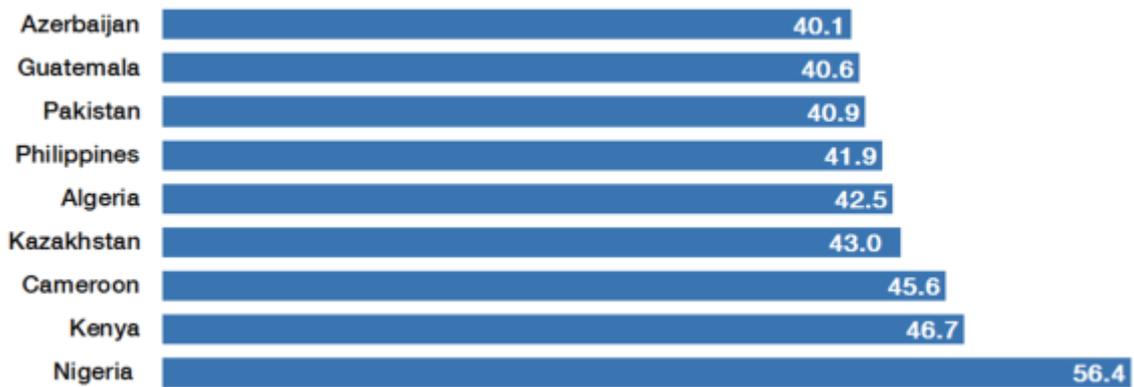
Figure 16 b. Consumers are Ready to Buy Packaged Food Online. Projected Effects of e-Commerce. Source: Goldman Sachs Analyst Report, Jason English, May 14, 2018.

The last topic of this section centers on the implications of food prices. Figure 17 demonstrates the declining percentage of disposable income that goes towards food. This graph shows the USA data, but the trend in Flanders is very comparable. From 1960 to 2000, food budget as a percentage of disposable income continued to decline. Because of the overall rise in income, and the consistent shrinking of food prices adjusted for inflation, we have far greater non-food disposable income than our grandparents did.

There are only eight countries in the world where less than 10% of the household income is spent on food. The ones in Europe include the UK, which is third at 8.2%, followed by Switzerland at 8.7%, Ireland at 9.6% and Austria at 9.9%. Belgian households spend 10-11 % on food (World Economic Forum, 2016).



A. Countries that Spent the Least on Food in 2015.



B. Countries that Spent the Most on Food in 2015.

Figure 17. Consumer Expenditures on Food in Various Countries. Source: USDA Calculations Based on Data from Euromonitor International.

The data in Figure 17 do not suggest that food is more expensive in Nigeria than the USA, in fact the opposite is true. What the bar graphs do represent is the amount of the household income that goes towards eating at home. Generally speaking, the more developed a country is, the smaller the percentage of household income it spends on food. Extrapolating this data, when food crises happen in places like Nigeria and other parts of Africa, food insecurity is magnified with elevated costs and supply issues.

Figure 18 further highlights the “squeeze” of the farmer. Although it varies greatly by product, generally speaking the more processed an end product is, the lower the percentage given to the farmer in terms of cost paid by consumer. These data also highlight the opportunity that exists in Flanders to connect the farmer directly to the consumer.

	Real farmer share	Perceived shares	Deviation of real and perceived shares	Fair shares	Deviation of perceived and fair shares
Milk					
Farmer	38.8 ¹	24.65 (11.19)	-14.15	45.05 (11.71)	+20.36 (11.56)
Dairy	-	32.88 (10.75)		29.23 (7.34)	-3.61 (11.43)
Food Retailer	-	42.46 (15.61)		25.71 (10.17)	-16.76 (14.48)
Bread Roll					
Farmer	7.00 ¹	15.45 (9.64)	+8.45	29.14 (11.20)	+13.77 (11.27)
Cereal trader	-	15.82 (6.59)		15.95 (5.85)	+0.14 (7.48)
Corn mill	-	15.70 (6.54)		16.98 (5.50)	+1.28 (6.63)
Industrial bakery	-	23.70 (9.70)		18.99 (6.87)	-4.74 (9.72)
Food retailer	-	29.33 (13.75)		18.94 (9.03)	-10.45 (11.64)
Schnitzel					
Farmer	24.6 ¹	21.93 (11.24)	-2.67	37.19 (11.52)	+15.29 (11.80)
Animal trader	-	20.81 (6.93)		18.54 (6.86)	-2.29 (8.42)
Slaughterhouse	-	23.56 (7.60)		21.75 (6.75)	-1.85 (8.12)
Food retailer	-	33.70 (13.34)		22.51 (8.65)	-11.15 (13.18)
Mean for all products					
Farmer	-	20.72 (8.62)		37.15 (9.59)	+16.49 (9.46)
Cereal trader/animal trader	-	18.27 (5.44)		17.22 (5.49)	-1.05 (6.64)
Dairy/Corn mill/industrial bakery/slaughterhouse	-	23.87 (5.64)		21.69 (4.15)	-2.23 (6.02)
Food retailer	-	35.07 (12.30)		25.80 (8.18)	-12.75 (11.01)
Values are expressed in Euro Cents of the food dollar. Values in brackets indicate the standard deviation.					
Source: ¹ Wendt (2012); own calculations					

Figure 18. "Perceived" Fair Share from the End Consumer Standpoint. Source: Real Farmer Share, Perceived Farmer Share and Fair Distribution in Food Chains from a Consumers' Perspective, *Journal of Economic Psychology*, 55, 2016, 149-158.

A farmer's share varies highly between different commodities. Generally speaking, the farmer share decreases with an increasing degree of processing, and the shares are higher for animal products compared to crops (Elitzak, 1996; TI, 2014).

Conclusions about Mega Trends

1. The mega trends we face today create the "perfect storm". The need for food worldwide will only increase and our current ways of producing this food as well as our food choices are not sustainable.
2. Although much of the world's population is flat to stable, areas such as Asia and Africa continue to experience tremendous growth. Food security is increasingly becoming an issue in those areas, driven by population growth, food cost as a percentage of household income and climate change. Europe needs to prepare for Africa's increasing reliance on them for food.
3. There is a disconnect between what farmers are paid for a given product and what consumers perceive that they are receiving. In today's industrialized food system farmers and consumers are separated by many middlemen. There are too many steps in the industrial food supply chain, where large processors, retailers and restaurant chains can pad their margins. The economic viability of the average farmer in Flanders is under seize and needs to be addressed.

4. On a global scale, climate change will affect food production, food security and nutrition. The amount of arable land and available fresh water will decline and diets and growing practices will need to evolve to ensure adequate supply.
5. The 'triple burden' of malnutrition, which consists of undernutrition, micronutrient deficiencies, overweight and obesity, affects large proportions of the population worldwide. Flanders would benefit greatly from communication/education that reconnects citizens to food and where it comes from – particularly at a young age. Flanders citizens would also benefit from a trusted voice when it comes to educating citizens on balanced diets.
6. Consumers (citizens) have become increasingly brand agnostic and channel agnostic – as demonstrated by the increase in private label consumption and the growth e-commerce channel. These trends demonstrate consumer distrust of big brands due to brand promises not delivering what the consumer expects as well as longer global supply chains that have an impact on the environment. Flanders would benefit from more integration of the knowledge triangle (the knowledge triangle refers to the interaction between research, education and innovation, which are key drivers of a **knowledge**-based society), – turning research into commercial opportunities that benefit companies and citizens, alike.
7. The key issues with regard to agriculture and urbanization are whether the growing and changing demands for agricultural products from growing urban populations can be sustained while at the same time underpinning agricultural prosperity. Better understanding this trend and the major changes in how demands are met, including the farmers, companies, corporations, and local and national economies who benefit (and who lose out) would be of benefit to Flanders society. Although the majority of the citizens in Flanders live in urban cities, these cities could be better connected with rural agriculture and in turn those participating in the rural agriculture need greater opportunities for economic advancements in today's knowledge economy (circular economy, path to market – direct to consumer, etc).

4 Flanders and its Governance

Status quo will not create the future. There will be a need to impart fresh thinking, innovation, risk taking, and disruption. A major driver will be R&D funding. R&D funding comes from two sources: public (government) and private. The Thinkers envisage that more R&D funding from both sources are necessary for the food and agriculture sector. The large and complex problems to be faced will not be solved without new ways of doing things.

We would like to acknowledge the great work and importance of public funding and public policy – there are many initiatives underway. However, the food and agriculture sector has historically been underfunded. This is particularly true in the private sector where on average, funding spent on R&D activities is lower than 1.5% of annual turnover. In a household products company such as Procter & Gamble or Unilever (minus their food business) the R&D expenditure is closer to 2-3%, and in the pharma sector the R&D expenses run closer to 10%. There is a close association of underfunding R&D in the food and agriculture space with low levels of true innovation that will transform the system.

Governance of Food Systems in Flanders

There is an interesting intertwining of public and private activities in the food sector in Flanders. Since food is a public good, it is clear that governments in general have a say in food production, and this is naturally also the case in Flanders. It results in all kinds of rules and regulations around agriculture, feed, food processing, distribution, catering, advertisements, health claims. The private sector produces the commodities, processes them, develops products and distributes and sells the products to consumers. When it comes to governance in Flanders, the following landscape evolves. Quite a few organizations are active. Before we come to a conclusion, it is worthwhile to first describe this landscape. As a disclaimer: this overview is by no means exhaustive, but we think we have spoken to the main players.

Fevia is an industrial organization for the whole of Belgium, it acts as an umbrella organization. The main activity is to be an interface between the food industry and the government level. Because of that, it is not always trusted by the public. The strategy is to work on the perspective of the food industry. The biggest challenge which it faces is the negative public perception around food production.

Flanders' FOOD is an industry driven innovation platform. The stakeholders are Flemish industrial partners from the food industry, their suppliers and customers, the academic partners and the Flemish government. Customers are not (yet) directly involved as stakeholder. The main task is to increase the economic value for the industry and boost the export of food products via innovation. The strategic innovation and research agenda developed with industrial and academic partners shows that within that agenda knowledge increase is by far the most important challenge. Directly linked to that is the transfer of scientific and technological knowhow towards companies in the broad area of food. This is by organizing seminars, workshops and events, but also through access to the ILVO/Flanders' Food pilot plant facilities. Flanders' FOOD mediates between SMEs and large companies and knowledge institutes. Flanders' FOOD also expands its international activities and takes the leadership in collaboration with food and technology clusters abroad in smart specialization platforms.

ILVO is a semi-governmental research organization with a basic funding from the Flemish government. As part of its mission, it renders services to different ministries. Another part of its mission is to help actors active in the agro-food chain to apply scientific insights. At the same time, ILVO also acts as a reference laboratory for the government. Last but not least, ILVO participates in the public debate around food, and has a strong communication department for that reason. ILVO is definitely reached by start-ups who have all kinds of ideas. In its experience, funding for start-ups appears to be a problem. The Food Pilot of ILVO/Flanders' FOOD is used a lot and fulfills a need, especially for

SMEs. Here, ILVO is involved in co-creation and being a living laboratory. ILVO is also involved in AgroLink, an attempt to link all actors in the agricultural chain and to have a common voice about the primary production in the agro-food chain.

Imec is the world-leading R&D and innovation hub in **nanoelectronics** and **digital technologies**. It brings together supply chain and brings innovation in sensor technology, incidentally not only in the agri-food chain. Imec recognizes that sensors have great potential for food safety and quality control and in the area of smart farming. Imec builds partnerships and cooperates with Flanders' Food, ILVO, KU Leuven. Imec also interacts with behavioral sciences and has a particular interest in how behavior can be changed when introducing new technologies. Main activities in the food sector are about logistics and packaging. In Imec's view, many opportunities lie in the connection of food and life sciences, in linking different actors. This alternative phrasing has been proposed to Imec.

FWO and VLAIO are bodies that finance science and technology activities in Flanders, including food science. Their budgets come from the Flemish government. FWO supports fundamental and strategic research via fellowships, grants, research projects, infrastructure. VLAIO is more oriented towards practical research for which it makes available subsidies. It also supports training, advice and coaching activities.

Boerenbond is an organization of and for farmers (but is not a cooperative, it started as a movement for forming cooperatives) and represents 70% of the farmers. The organization tries to represent the interests of farmers at the government level but also at that of the general public.

Universities have departments for the ag-food space. In Flanders, the main ones in that respect are the KU Leuven, the Universiteit Gent and the Vrije Universiteit Brussel. They do research and teach in this area and disseminate results and transfer knowledge. Funding comes from the government, from the EU, from private parties. The bigger food companies tend to outsource fundamental R&D to universities.

Many ministries and government agencies are involved in different aspects of the whole agri-food value chain, some of which operate at the federal and/or Flemish level. Together, they influence the landscape because of implied legal regulations, but also because they have an impact on things like infrastructure (road maintenance, dealing with traffic congestion, integration of immigrants in the Flemish society (learning the language, dealing with cultural issues) so that they can participate as workers in the industry.

Conclusions about Governance

While governments are likely to remain the primary mechanism for coordinating human activity, more diverse governance approaches are emerging and it is becoming clearer that as the food system transforms, we must also transform the current governance model. One approach is creating longer-term goals across all governance actors that are in turn driven in a highly collaborative fashion and go hand in hand with the global food transformation that is surrounding all of us. Flanders needs to evaluate their current governance model and determine if adequately resourced for the future needs of their citizen and is effectively and efficiently organized to deliver desired goals. Changing technologies and rules on access to information mean that government choices are increasingly subject to the scrutiny of empowered and interconnected citizens. Flanders would benefit in evaluating additional civil society and business to further complement their governance objectives and attainment. In addition, Flanders would be well served evolving the current system of Science and Policy Cooperation in food, nutrition, agriculture.

Overviewing the current landscape, it can be stated that none of the organizations in itself is doing badly and each has a clear goal as such, but the coherence between these bodies is not always clear – improved coordination, including shared goals is essential. This view was particularly

expressed by people from the food industry during our interviews and, for us as Thinkers, it was also not always clear. There are, of course, various (mainly historical) reasons for this but maybe the time has come to change that.

It seems to us that the government is rather restrictive in its actions, the main concern is about food safety, but much less on the positions of farmers, environmental impact and consumer involvement. Perhaps, the food industry should be more actively involved by the government in the discussions around food and food production, as well as in nutrition recommendations. Government should stimulate activities of private organizations in this respect, and at least engage with the private sector about matters such as the future of food systems, the position of farmers, the education that is needed, and the distrust of consumers in the present food system.

It was several times expressed to us that it is difficult to work and communicate with governmental bodies. According to the people we interviewed, government should actively oppose economic nationalism, even though that seems to be a sentiment in society. Food systems are global and it makes no sense to deny that. This is not to say that local food production has no value, but what it does say is that local and global should be connected. In that sense, governance and leadership is expected from government in consultation with the private sector. A clear vision and policy is needed and the consequences of this should be implicated, in rules and regulations, in education, and in stimulation of innovation via R&D. The Flemish government is also expected to take an active role in this towards the EU.

5 Fourth Industrial Revolution

The Fourth Industrial Revolution is transforming entire systems of production, distribution, and consumption in many sectors and the potential to leverage this revolution is tremendous in the food and agricultural systems.

The rate of change that society is experiencing today is incredible and it is only accelerating. Most likely, 85% of the jobs that will exist in 2030 have not yet been created.

Over the next century, the pace of change will be so rapid that people will learn 'in the moment' using new technologies such as augmented reality and virtual reality. The ability to gain new knowledge will be more valuable than the knowledge itself.

“We won’t experience 100 years of progress in the 21st century – it will be more like 20,000 years of progress (at today’s rate).”

Ray Kurzweil, Founder and Chief Executive Officer, Kurzweil Technologies, USA, in “The Law of Accelerating Returns”

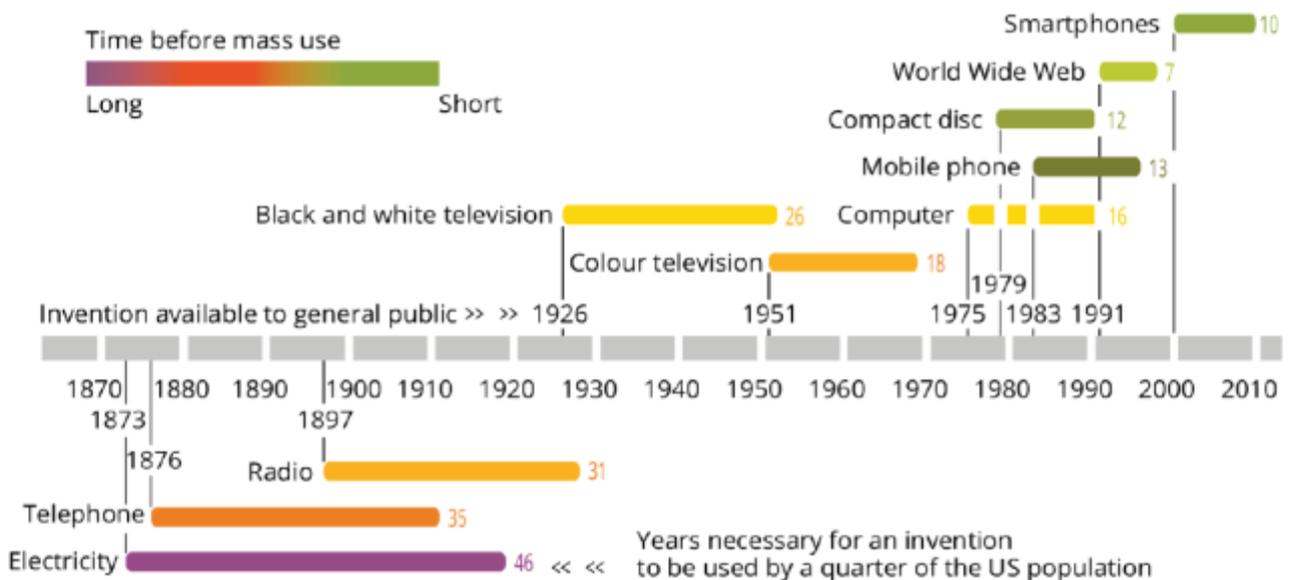


Figure 19. Progress Rates of Technologies. Source: European Environment Agency (EEA), *The European Environment – State and Outlook 2015: An Integrated Assessment of the European Environment*, 2015.

A new revolution in food has the potential to create healthy food systems that sustain our planet and its population. We have the tools and technology to create innovations that could expand dignity and justice to vulnerable populations. To this end, we must continue to build the shared capacity of business, education, and government, to come together to solve the society’s toughest problems.

Figures 20 and 21 identify several technologies as enablers for solving challenges faced in food systems. These fourth industrial revolution technologies were first identified as enablers for improving food systems in a report issued by the World Economic Forum in 2018.

Figure 1: The 'Transformative Twelve' could deliver significant impacts to food systems by 2030

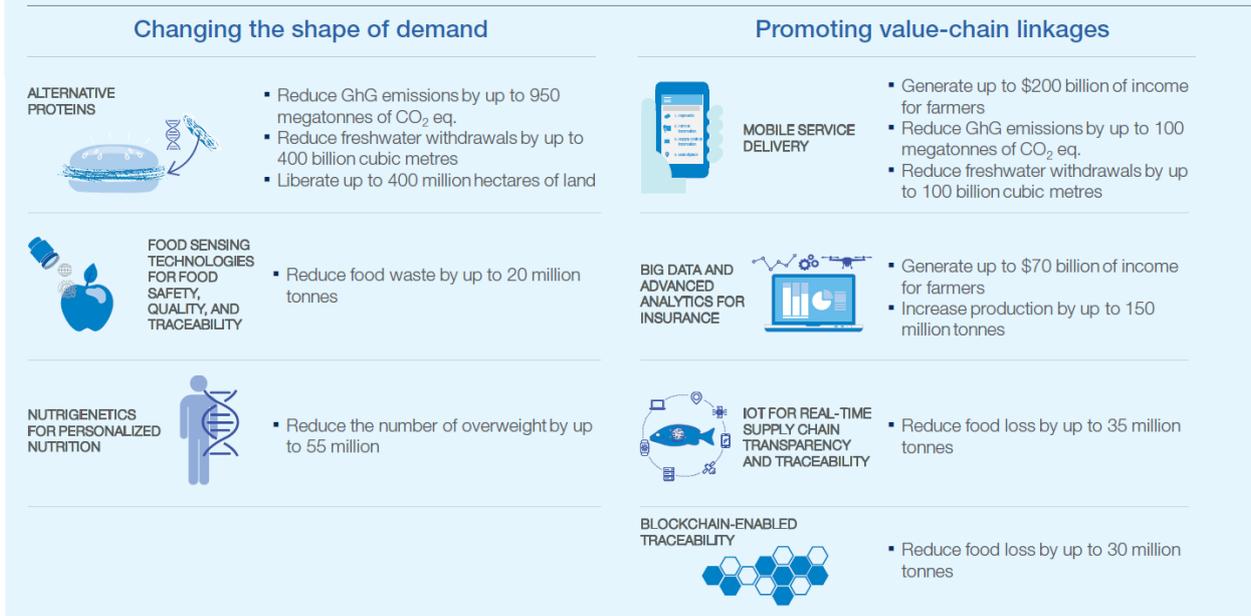


Figure 20. Expected Transformations Affecting Food. Source: World Economic Forum Report, 2018. <https://www.weforum.org/reports/innovation-with-a-purpose-the-role-of-technology-innovation-in-accelerating-food-systems-transformation>

Figure 3: Combinations of 4IR technologies can enable innovation to solve challenges faced in food systems

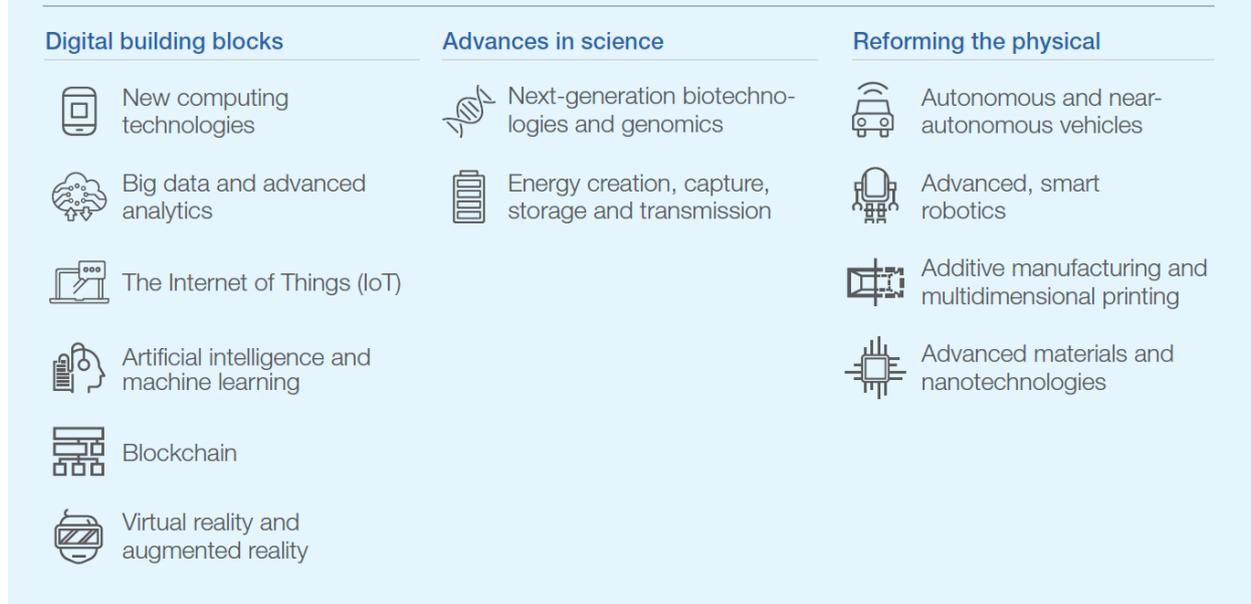


Figure 21. Combinations of Technologies to Enable Innovation. Source: World Economic Forum Report, 2018. <https://www.weforum.org/reports/innovation-with-a-purpose-the-role-of-technology-innovation-in-accelerating-food-systems-transformation>

When exploring the leveraging of these tools in farming, the potential is evident. Farming is one of the oldest vocations on the planet, but it also is one where technology adoption has been limited. While GPS-driven tractors are being adopted, the next phase of data-driven technology will transform agriculture.

Precision agriculture is the term often applied to internet of things based farming. What that means is using sensors and other technology to improve agricultural production, involving all fertile land available, and automating as many tasks as possible to leave farmers with more time to analyze and implement technology. For instance, big-data analytics can review weather forecasts and patterns to predict optimal periods to get seeds in the ground and when to harvest. Many scientists believe we could produce 50 percent more food without new farmland by increasing yields, shifting diets, and using water and fertilizer more efficiently.

There are four key areas for precision agriculture: productivity, pest control, water conservation, and improved nutritional value. With improved data and analytics, we will have the knowledge to step change yields in a more sustainable way. A 2017 report from the National Geographic magazine (Figure 21) provides a very nice pictorial of past, present, and future of agriculture.

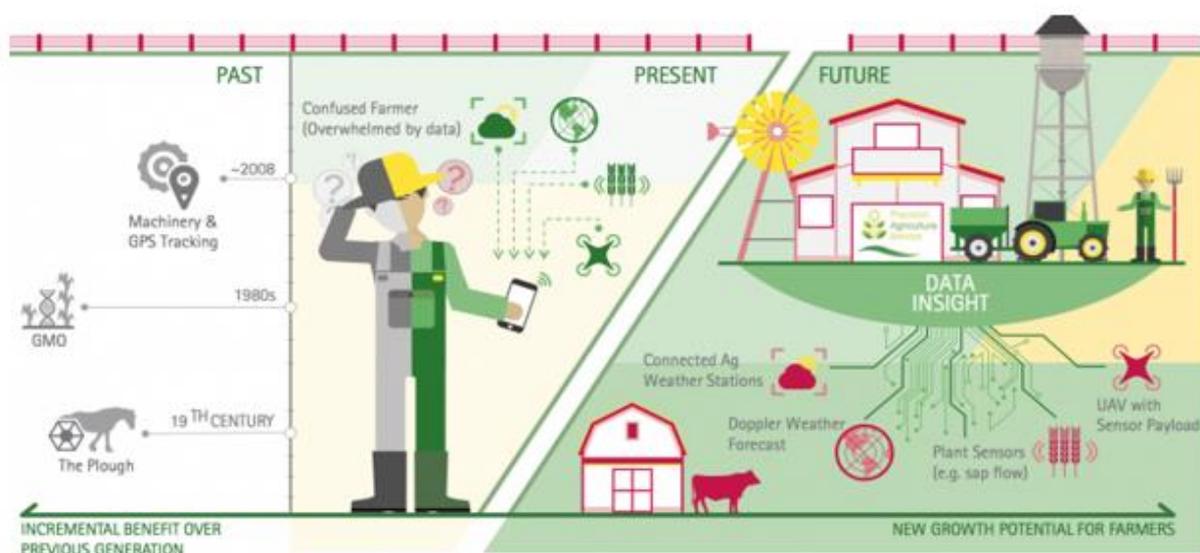


Figure 22. Changes in Agriculture due to the Internet of Things. Source: National Geographic, 2017. <https://www.nationalgeographic.com/foodfeatures/feeding-9-billion> "As Agriculture Becomes Higher Tech, a Growing Number of Farmers are Using GPS-Equipped Machinery Supported by Platforms that Collect Data on Plants, Soil, and Weather. Termed "Precision Agriculture," these Technologies Help Them Identify and Manage Variability within Fields. Armed with Data, Farmers can Fine-Tune their Operations, Potentially Increasing Yields and Profits" – Kelsey Nowakowski, National Geographic, June, 2017.

Conclusions about Fourth Industrial Revolution

1. There are many currently available technological tools that can be redeployed across the food system, however, a holistic approach is warranted to minimize unintended consequences (for example, productivity gains at the expense of the environment is not a good choice).

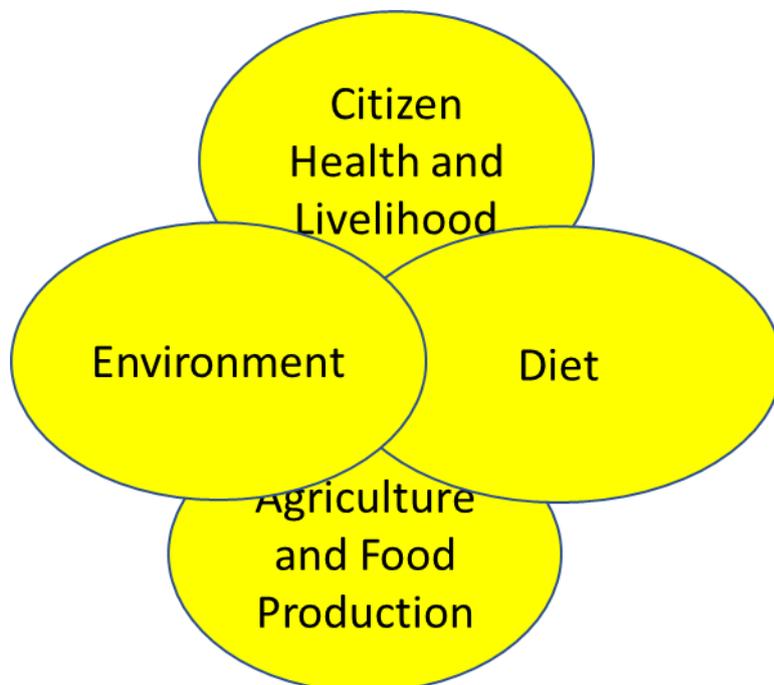


Figure 23. Holistic View on the Future of Food in Flanders

A holistic approach to the future of food in Flanders will be essential to creating a sustainable, high quality food system (see Figure 23). In the technological realm, merely modifying practices to reduce input use is a step in the right direction but does not necessarily lead to the redesign of a more self-sufficient and autonomous farming system. A true agro-ecological technological conversion calls into question monoculture and the dependency on external inputs. Traditional farming systems provide models that promote biodiversity, thrive without agrochemicals, and sustain year-round yields. Conversion of conventional agriculture also requires major social and political changes which are beyond the scope of this report.

2. Flanders would be well served to establish a technology oversight board (consisting of the appropriate members) to examine the biggest impact technology redeployment can have on Flanders citizens. Top suggestions are listed below:
 - a. Empowering farmers via deployment of circular bio-economy tools – turning traditional waste streams into value added streams. Empowering farmers economically will benefit and improve quality of life.

OUTLINE OF A CIRCULAR ECONOMY

PRINCIPLE

1

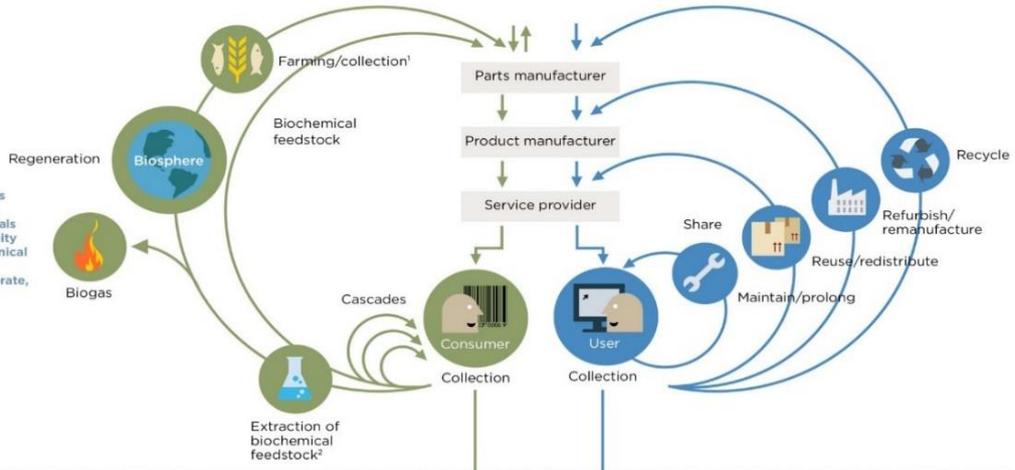
Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows
ReSOLVE levers: regenerate, virtualise, exchange



PRINCIPLE

2

Optimise resource yields by circulating products, components and materials in use at the highest utility at all times in both technical and biological cycles
ReSOLVE levers: regenerate, share, optimise, loop



PRINCIPLE

3

Foster system effectiveness by revealing and designing out negative externalities
All ReSOLVE levers



1. Hunting and fishing
2. Can take both post-harvest and post-consumer waste as an input
Source: Ellen MacArthur Foundation, SUN, and McKinsey Center for Business and Environment, Drawing from Braungart & McDonough, Cradle to Cradle (C2C).

Figure 24. The Circular Economy Infographic. Source: Ellen MacArthur Foundation Website. <https://www.ellenmacarthurfoundation.org/circular-economy/infographic>

- b. The new infrastructure of the future is digital – not bricks and mortar such as highways. The digital highways need to be planned and regulated. If done right, transparency to citizens about their food is an outcome as well as minimization of food safety outbreaks. In addition, it opens the door for farmers to sell more goods directly to consumers. Blockchain is one such digital tool. Walmart, IBM and Nestlé have currently running many test and learn scenarios. It was announced in September, 2018, that Walmart will require all suppliers of certain vegetables vulnerable to food safety outbreaks, such as spinach, to leverage blockchain.
- c. Flanders would benefit from tapping into the EU-funded EUXDAT initiative. This will use the technological infrastructure needed by farmers, scientists and public authorities to take advantage of its potential. The EUXDAT e-infrastructure will serve as a cloud and high-performance computing front end through which a multitude of data, analytics and computational resources can be accessed to monitor soil and crop health, optimize resource consumption, increase agricultural yields and sustainably manage land.
- d. Biologically based solutions for crop protection (while minimizing environmental footprint) and yield should be encouraged.
- e. Flanders should invest in the development of alternative protein sources (beyond meat, etc.) for future generations of sustainable protein sources. This effort should be combined with educating consumers – beginning at an early age.

3. Technology is just one of the many enablers that will transform the food system of tomorrow. Flanders would be well served to work with current food companies and start-ups within Flanders to empower business model innovation by ensuring access to venture capital and subject matter expertise. To streamline subject matter expertise, Flanders may consider establishing a database on the internet of things of subject matter experts.
4. Flanders should position their food systems for transformational innovation (leveraging the knowledge triangle).

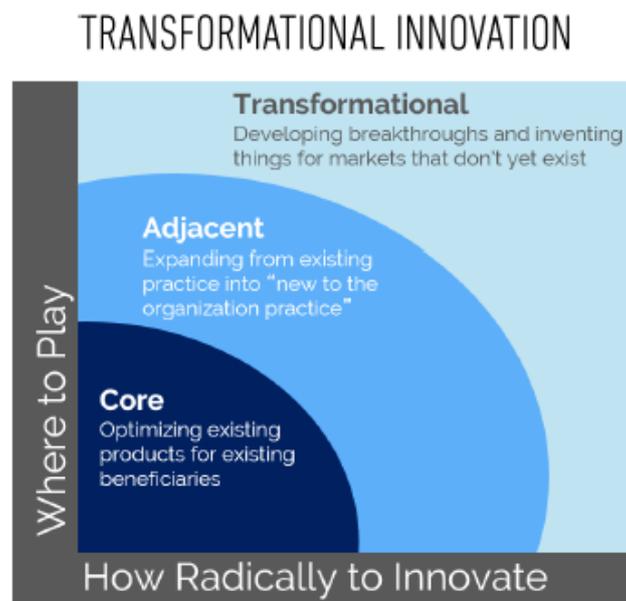


Figure 25. Transformational Innovation. Source: *Managing your Innovation Portfolio*, Bansi Nagii and Geoff Tuff, *Harvard Business Review*, May 2012. <https://hbr.org/2012/05/managing-your-innovation-portfolio>

To adapt to the future possibilities mentioned in this report, the best path forward is creating the right ecosystem for encouraging and promoting transformational innovation (see Figure 25). This will require radical and bold leadership that embraces risk taking and failure.

6 Results of Breakout Sessions

The information collected by the Thinkers and their companions, and the preliminary conclusions drawn from that, were shared with stakeholders in a meeting held in Brussels on June 26, 2018 (see appendix for the full programme). Stakeholders were actively involved by asking them to comment on the findings during plenary discussions and breakout sessions. Here we share the outcomes of the six breakout sessions. The intention was to use additional information and insights coming from these sessions in the present report. The leaders of the breakout sessions and their affiliations are given in the respective subject lines.

1. Position of farmers in the food chain (led by Pieter Verhelst, Boerenbond)

Major outcomes were that farmers have a role in transformation and transition towards a more sustainable food system. At the same time, diversity is a strength of the agricultural system. A dialogue is needed between various farming systems, between farmers themselves but also between farmers and consumers.

2. Role of consumers in the food chain (led by Frédéric Leroy, VUB)

Consumers seem to express that many things are at stake: environmental issues, animal welfare, sustainability. Consumers have buying power with which they can express their wishes. Three strategies are foreseen to strengthen the role of consumers: i) enforce legislation ii) education early on in life iii) engagement and participation. What actually can work nicely is storytelling. There should also be an interplay between tradition and innovation. For all this a platform with a trusted voice needs to be created where all actors can interact with the ultimate goal that people start to think seriously about food systems.

3. Role of retail and the food industry itself in consumer trust (led by Mieke Vercaeren, Colruyt Group)

How to interpret information and how to convey information is key for retailers. Coping with information on labels without causing confusion, with standardization and diversity, with packaging, and price setting are major challenges. A balanced discussion is needed and needs to take into account that Flanders – like any other society – has different social classes. In the end, a shared vision from government, industry and retail is needed to guide the consumer.

4. Role of government and EU in the food chain (led by Bernard De Potter, VLAIO)

Making sure that favourable conditions are created for enough investment in R&D is an important task of the government. Rules and regulations are not always aligned and coordinated at all levels. A plea was made for an information and communication platform. Questions raised included how to deal with distribution of wealth, whether government should intervene in the value chain and whether it is possible to regulate consumer behavior via taxes?

5. Need for a trusted voice in the food chain (led by Inge Arents, Flanders' Food)

First of all, it was concluded that there is no single trusted voice because there are too many voices with conflicting messages. Next, it was recognized that the environment has completely changed because of social media. However, there is still trust among peers and friends, and role models are important. It was concluded that scientists could be trusted voices but they would need to learn storytelling. Scientists can also learn from influencers that it pays off to have a simple message. An important role was seen here for education, thereby empowering consumers so that they can take a more critical look at what is claimed by bloggers and vloggers on internet. Education needs to change in the sense that this should start already with youngsters to make them aware. A shift is

needed from knowledge skills to competence skills. Such a shift should be initiated by governments leading the way in all of this with education programmes.

6. Transparency in the food chain: what does that imply? (led by Filip Arnaut, Puratos)

There were different opinions about what transparency actually is. It is clear that information should be correct and full, the consumer should be able to call upon it. But the big question is how to organize this, and who should do this. Some sort of standardization is needed and the feeling was that modern technology such as block chain can be helpful. Social media are currently perhaps more effective as regulators than governments.

Conclusion from the Breakout Sessions

The breakout sessions were characterized by lively discussions and active involvement of the participants. Overall, the outcomes were more or less in line with what we as Thinkers had concluded preliminary, which is not so strange considering that the findings were partly based on what was heard during the interviews. What was probably the most remarkable addition from the breakout sessions is the possible role of storytelling on various levels.

Everyone in the food chain is struggling with how to reach consumers and how to deal with distrust in the midst of all useful and useless information that is available on internet and via social media. Although scientists may still be seen more or less as authorities, it is clear that their message does not come across if brought in the scientific way. Storytelling might be a good alternative but scientists will have to learn how to deal with this. The Thinkers are of the opinion that the suggestion to create platforms to initiate the dialogue between stakeholders deserves to be followed up upon as was the idea to give more space to diversity.

7 Recommendations

At the end of this report, the Thinkers would like to finish with some general recommendations. The **main points of attention** we noticed are:

- How to deal with distrust of consumers and how to reconnect them to the food system
- Suboptimal cooperation between actors in the Flemish food chain: how to get over fragmentation
- Disinterest of politics in food and nutrition, leading to endless rules and regulations and a lack of willingness to invest in people, infrastructure, and agriculture
- Recognition of sustainability issues of food production and the need to deal with them on the Flemish level

It has become very clear on the one hand that the food system in Flanders is alive and kicking with great potential, but on the other hand also many threats are coming up. It is definitely possible to turn these threats into opportunities but this does not happen automatically. The main conclusion from this Thinkers exercise is that communication between actors in the food chain needs improvement, and in order to do so, a common vision is required about where to head to. Perhaps a platform should be created to make this possible. As Figure 26 illustrates, we are living in a VUCA world: Volatile, Uncertain, Complex, and Ambiguous (VUCA) and the question is how to show leadership in such a condition.

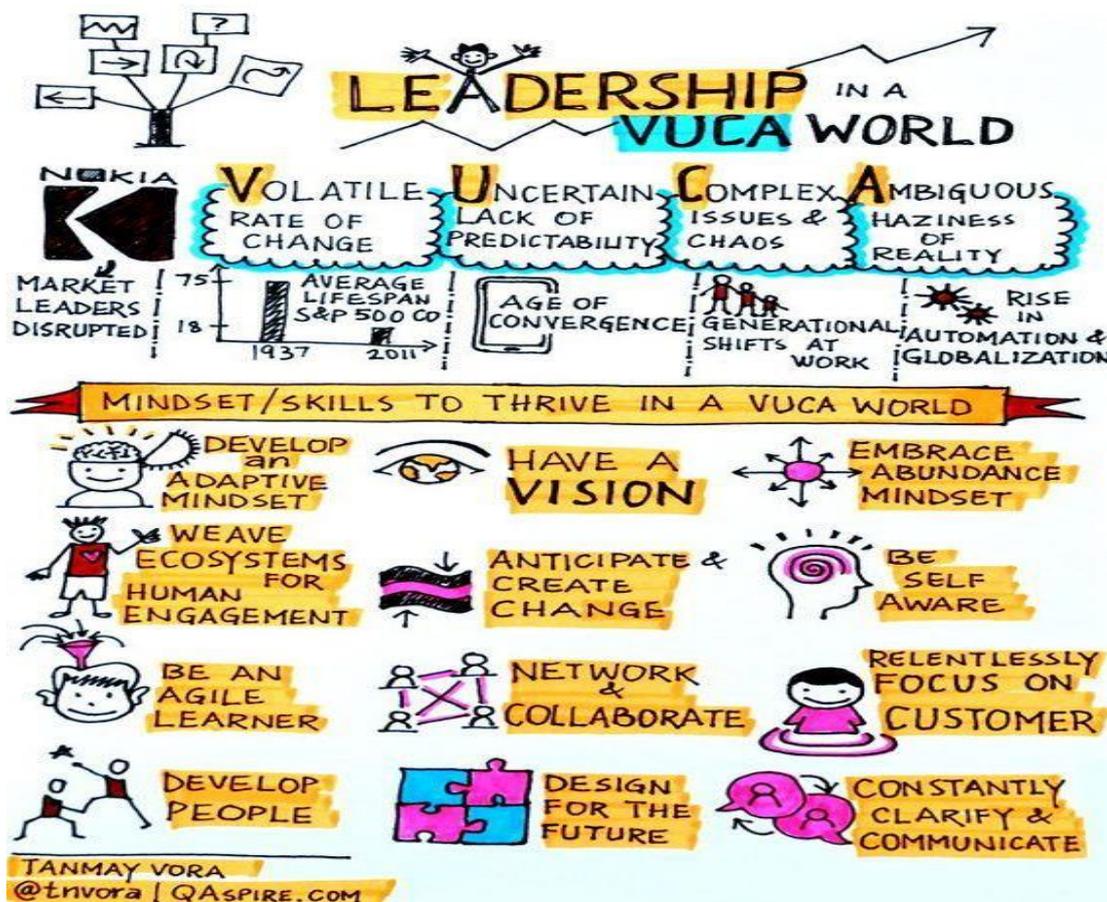


Figure 26. Leadership in a Volatile, Uncertain, Complex, and Ambiguous (VUCA) World. Source: Tanmay Vora, QAspire.com. <http://www.qaspire.com>

There are **Environmental forces** acting: climate change, water stress, soil, land use, biodiversity loss, next to **Economic forces** acting about labor force, urbanization, nationalism versus regionalization and globalization; new operating models – e-commerce, while also **Social forces** are acting about population demand, nutrition transition (changing eating patterns), diet-based ill-health patterns, the triumph of choice culture, high levels of food waste.

However, this does not imply that everything and everyone should do the same: diversity is something that should be cherished, and there is ample opportunity to do that. But some direction on how to realize this diversity within the whole of the food chain is badly needed. We suggest a more active role of the government, not to tell the public what to do and where to go, but as a sort of objective body that tries to do justice to diversity and to give room for this diversity in regulations, recognizing the essential role of each actor in the value chain. Eventually, it comes down to creating opportunities with all stakeholders (including consumers!) for a better food system – that is sustainable, productive and with better outcomes for all actors. Here are our most important recommendations:

- Adapt, apply, evolve, newly developed technologies that transform the food system, invest in R&D, stimulate venture capital. “Business as usual” is not an option, transformative changes are needed to ensure a thriving future society.
- Realize - with all actors in the chain - a shift toward healthy diets and reduce % of GDP spent on health care (especially non communicable diseases). Prevention versus intervention.
- Make it possible to pay fair prices for food for all actors, especially the farmers, making it possible for them to sustainably managing land and water and to work towards zero - food loss and waste.
- Cooperate within Flanders, Belgium and Europe, stay away from economic nationalism. In the next decade or two, the world economics of food will change and food will change the economics of the world. Decisions on where and what to produce will be made on a global basis not by individual market or geography.
- A real task for the Flemish government, in cooperation with the whole food system, is to combine sound policies, regulations and knowledge with targeted investments yielding desired outcomes that create a positive future for all citizens of Flanders.

Closing Comments

The Thinkers would like to acknowledge the great passion of all who are active in the Flemish food chain, it is this passion that gives hope for the future. Having said that, it is also clear to the Thinkers that this passion needs to be steered one way or another in such a way that coordinated actions become possible since fragmentation is also something that we saw. The KVAB has to be praised for taking this Thinkers exercise to investigate "The Future of Food in Flanders". As indicated in the introduction, the goal of this report is to indicate how Flanders can deal with the upcoming disruption in the field of food and agriculture. We have attempted to describe and analyze the present situation and to indicate possible directions for Flanders. Another goal was to stimulate the discussion in Flanders about the necessary transition of food production systems and we have the impression that this discussion indeed takes place. We have seen from our own experience during the meetings, but definitely also during the KVAB symposium on the topic, that the mere fact of bringing people together to discuss such important societal issues as the food production system is very productive and fruitful. So, we would like to finish our report by thanking KVAB for this initiative and especially the members Professor Paula Moldenaers and Professor Jan Delcour who initiated this happening. KVAB needs to be praised for engaging in a science-based societal discussion about food production. We hope and expect that our report will be a catalyst for further discussions in Flanders!



APPENDIX

Brochure of symposium 'Future Food in Flanders' - June 26, 2019.