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THE FUTURE OF FOOD

**A new recipe for
the food sector**

**Lannoo
Campus**

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FOREWORD

Let's eat!

What did you have for breakfast this morning? Perhaps it was a low-carb granola with berries and skyr, washed down with an oatmeal drink – or, if you are a fan of green tea, with a chai latte. Maybe for lunch you will tuck in to a tasty avocado salad with quinoa and pomegranate seeds. Or do you prefer a vegetable burger? Just twenty years ago, none of this would have been thinkable. Food is something personal. Often, it is a family story, with recipes and customs being passed down from generation to generation. But not any more. Eating habits rooted in tradition are now changing at lightning speed.

Nowadays, we regard it as normal that we have instant access to the most delicious food products from the four corners of the world. However, we are gradually becoming aware that this process of globalisation also has a darker side. Food comes at a price. It has an impact on our health, on the environment and on society as a whole. What will happen when we have ten billion mouths to feed in 2050? Food production will need to double, but we only have one planet of limited size. This means that we will need to do things differently – and better. Technology can help, but what we really need is a structural transformation. The entire food system must be redesigned.

The farmers in the South who grow the cacao for our delicious Belgian chocolate are unable to earn a living wage from their labours. The farmers closer to home who invested in pig farming have seen the price for their meat rise and fall like a roller-coaster as a result of international market mechanisms over which they have no control. Global warming is endangering coffee production. A fungal infection might clear the shelves in Western supermarkets of people's favourite variety of banana. A strong increase in demand from growing markets – not least from China – risks knocking world trade out of balance and threatens to create shortages of some natural resources and foodstuffs.

THE FUTURE OF FOOD

Supermarket chains publish fine-sounding sustainability reports, but at the same time continue with promotional stunts for products that are neither sustainable nor healthy, seeing this as the only way to remain competitive in a fierce market. In the Western world, obesity is now a more serious problem than hunger. The food industry is unintentionally making us ill, with its development of a huge range of super-sophisticated, near irresistible but seriously over-processed goodies at knock-down prices. As a result, a counter-movement is now gaining ground that hopes to bring more organic, vegetable, gluten-free, lactose-free, allergy-free, sugar-free and clean-label products to supermarket shelves.

The corona crisis has moved all these changes into overdrive. Consumers have become more demanding than ever. They increasingly distrust multinational food and retail conglomerates. They want guarantees about the safety and quality of their food. They insist on transparency about the origin of ingredients and the working conditions in countries where food products are made. They expect faultless service and seamless ease of use. Ideally, they want their groceries delivered at home in fifteen minutes.

The corona crisis has also taken the digitalisation of our world to the next level. This has had huge consequences for the food sector. Online shopping for groceries has finally made a major breakthrough. The chances of things returning to the way they once were are zero. New digital distribution models now pose a serious threat to the traditional supermarket channel: it is now much easier for brands and start-ups to approach consumers directly, with no need for intermediaries.

Another change that is here to stay is the way in which consumers have organised their lives since the outbreak of corona. Health and safety are now more prominently on the agenda than ever before. This is something that manufacturers and retailers will need to take into account. Similarly, the fact that many more people will continue working from home – even after corona – will have a lasting impact on eating and shopping habits. The traffic at traditional commuter locations such as city centres, industrial estates and train stations will fall significantly, with unwelcome consequences for the turnover of the shops and catering outlets at these locations. New eating and purchasing moments will increasingly be transferred

to the home or the local neighbourhood. The frequency of visits to physical stores will decline still further.

More than ever before, there is a growing awareness that everyone is connected with everyone else in a globalised food ecosystem. Notwithstanding greater interest in short chains and local production, consumers and retailers will not be willing to give up the benefits that globalisation has brought them. However, a degree of adjustment is certainly necessary. During the pandemic, we have all experienced the vulnerability of the global distribution networks at first hand. Moreover, the relegation of the climate crisis to the background during the corona period was purely temporary. It will soon re-emerge centre stage, and with a renewed sense of urgency. We cannot continue to exhaust the planet as we have done in the past. It is not possible to maintain a resilient food system unless all the partners in the ecosystem receive a fair share of the resultant produce – not only to allow them to live a dignified human existence, but also to give them the opportunity to invest in a sustainable food future.

In the decades ahead, it is crucial that all the links in the food chain respond quickly and flexibly to meet these challenges. We need organisations that are capable of mobilising worldwide networks; of inspiring younger generations; above all, of thinking outside the box. New business models will throw down the gauntlet to established market leaders. Digital natives will look at market relationships through Google glasses. Technology will be a game changer for the entire chain, from farm to plate. Brands and service models will no longer require a physical footprint to make their presence felt. The interaction between producer, retailer and consumer will be shifted to the cloud.

The content of our diet will also be very different in twenty years' time. Will we still be eating animals? Or will seaweed be the new protein of the future? Will we still cook our food? Or will we leave that to 3D printers, which will develop personalised recipes based on our DNA and our microbiome? Will we be willing to swallow – both literally and metaphorically – ingredients that are prescribed by machines to support not only our physical but also our mental health? Will we still do our daily and weekly shopping? Or will this be delegated to our fridge, smart algorithms and self-driving delivery vehicles?

One thing that almost certainly will not change is the connective power of food: the stories that we tell while consuming our daily meals around the family table, the recipes we exchange with friends, the experiences we share over a glass of good wine, the chocolates that we give to each other to celebrate special occasions ...

In this book, we will take you on an exciting journey, a voyage of discovery through the food system of tomorrow. Enjoy!

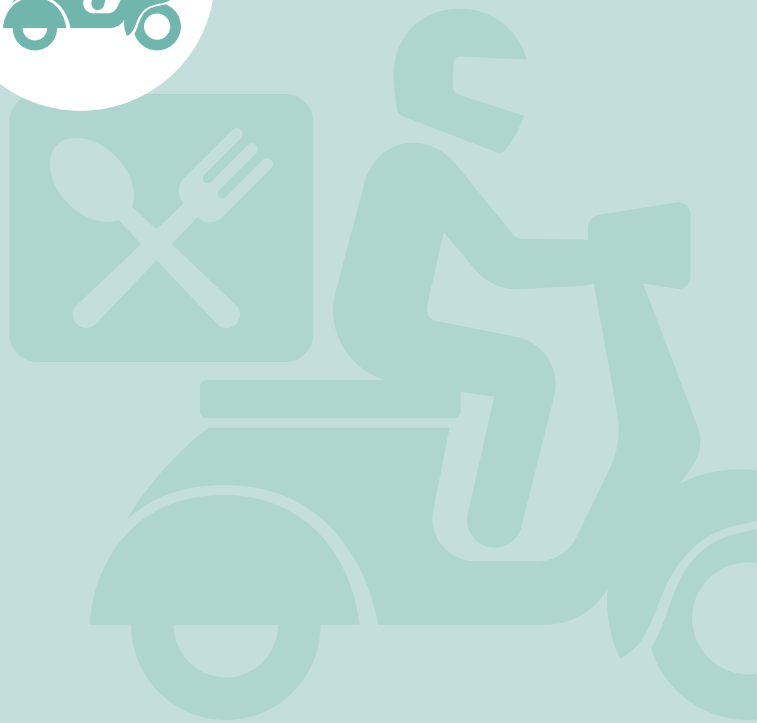


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Writing a long and richly filled book is a huge undertaking. But you don't really know just how huge until you start! We have several months of intense effort behind us, but the enthusiastic responses of the first proofreaders have left us feeling proud, pleased and even somewhat emotional. We have been fortunate (and are very grateful) that a number of respected top managers from the food sector have been willing to read our book and comment on it critically. In particular, we would like to thank Frans Muller (Ahold Delhaize), Jef Colruyt (Colruyt Group), Koen Slippens (Sligro Food Group), Nils van Dam (Milcobel), Hein Deprez (Greenyard), Wim Destoop (PepsiCo), Dirk Van den Berghe (ex-Walmart) and Lieven Vanlommel (Foodmaker) for their constructive suggestions!

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Jorg & Stefan



Major challenges on the menu

The food system under pressure

Welcome to the anthropocene. We live in the age of humans, the animal species that has firmly established itself at the very top of the survival ladder. It has to be said: we have done very well for ourselves. We control and rule this planet. Thanks to the industrialisation of agriculture, the production of food has never been as efficient as it is today. Safe and high-quality food is available all around the world on a scale never previously seen, both in terms of price and ease of consumption.

Even so, you get the sense that something somewhere is not quite right. The fact that human beings are now lord and master of the planet has had a number of unforeseen consequences. Disease and pandemics? Thanks to a few bats in China, the entire population of the world has had to stay a metre and a half away from one another for more than a year. Natural disasters? The emissions from factories are melting the icecaps and people are being drowned on Thai beaches. The world is facing some serious global challenges that can no longer be denied.

What has all this got to do with the daily purchases that we make in our local supermarkets? Quite a lot. In the near future, we will be using more of everything than our planet can sustain. The critical point of no return will be reached roughly halfway through this present century; the point when it will no longer be possible for nature to recover. More than five hundred species of land animal are on the point of extinction as a consequence of human activity. Most will probably disappear for ever within the next twenty years, more than disappeared in total during the preceding hundred years. Scientists refer to this as the sixth wave of extinction and it is (so far, at least) the tragic culmination of the anthropocene era – the age

in which human beings determine the fate of the Earth. And the fifth wave of extinction? That was when the once omnipotent dinosaurs died out ...

Food is the strongest lever

In a relatively short period of time, the way in which we organise food production and agriculture has become a key determining factor for the future of our planet. The loss of genetic diversity is making itself felt in the food system. The amounts of nitrogen, phosphorus and carbon already exceed the limit of what the planet can support and the irreversible decline of biodiversity threatens to drastically change the biosphere. Equally drastic changes in the climate are causing new diseases (as we have discovered on an unparalleled scale with COVID-19), poverty, natural disasters and conflicts. Expenditure on health care is now one of the most significant economic burdens in both developed and developing countries, and was so even before the corona pandemic.

There are now so many of us, and so many more are on the way, that our planet is coming under increasing pressure. Meeting our essential basic needs is becoming an ever greater challenge. In short, how can we keep feeding the world? Food and the food system form the link between health and ecological sustainability. Both are crucial for the future of our species. It is therefore something of a paradox that food production currently poses the most serious threat to the environment. Today's food production accounts for no less than a quarter of all human greenhouse gas emissions. Each year, the conversion of uncultivated land into agricultural land is responsible for one-sixth of these emissions, resulting in the eradication of more animal and plant species than those lost through climate change (Funabashi, 2018).

'Food is the single strongest lever to optimise human health and environmental sustainability on Earth. However, food is currently threatening both people and planet.' This was the stark warning contained in the EAT-Lancet report (2019), compiled by 37 leading scientists from 16 different countries. To keep on feeding an ever-growing world population, we not only need more food; we also need healthier and more sustainable food.

The trilemma of the 21st century

The realisation that these challenges are inextricably connected with each other has meant in recent years that food has risen to the top of the agenda, both for companies and for politicians. Protein strategies (Flanders), national food strategies (England) and 'farm-to-fork' plans (EU) now follow each other in quick succession, while the business world is equally convinced of the urgent need for a 'food transition' (Carrefour).

Already in 2017, Wouter Kolk, a top executive at Ahold Delhaize, warned of the risks of food shortages caused by the increase in world population and the changes in demand patterns in developing countries. 'The Chinese are now knocking at the door of our mandarin supplier in Spain. They also want to buy his harvest. So where will I get my mandarins from in future?' (Rijlaar, 2017). The first tangible effect of this increased competition: rising prices.

In its 'Act for Food' programme, the French retailer Carrefour identified four key pillars that need to be addressed for a successful food transition: food waste, the full cost price of food, soil-conserving agriculture, and new trade and retail models. The changing lifestyle and standards of the worldwide consumer are setting new demands in terms of how, when and in what form their food reaches them.

We are facing a global trilemma between food, the environment and health, a trilemma in which it currently seems that one of the three elements needs to suffer for the benefit of the other two. If we wish to solve this trilemma and achieve a sustainable solution, a drastic and fundamental reform of our food system is inevitable, and this along the entire value chain: from production through distribution to consumption.

Producing for tomorrow

Indoor versus outdoor cultivation

If we carry on as we are, we will soon exhaust nature – both literally and figuratively – and create more and more desert: dry and infertile land from which all life has been drained. Solutions to continue agricultural production without the need for additional agricultural land, with all the negative consequences this implies, are looking increasingly at the possibilities of vertical farming (in vivo) and the production of cultured meat in laboratories (in vitro). In the long run, we could even grow our salad in this way.

Even so, this ‘indoor cultivation’ cannot fully answer all our food and climate challenges. Our existing ecosystems also urgently need help to bring the current decline in the ecological condition of our planet, with all the associated health risks this involves, to a halt. These high-tech food innovations are still only in the test phase, so that our knowledge is both limited and fragmented. For example, we do not yet know enough about new pathogens, such as allergies and nerve diseases, or what the impact of these new foods and cultivation methods is likely to be.

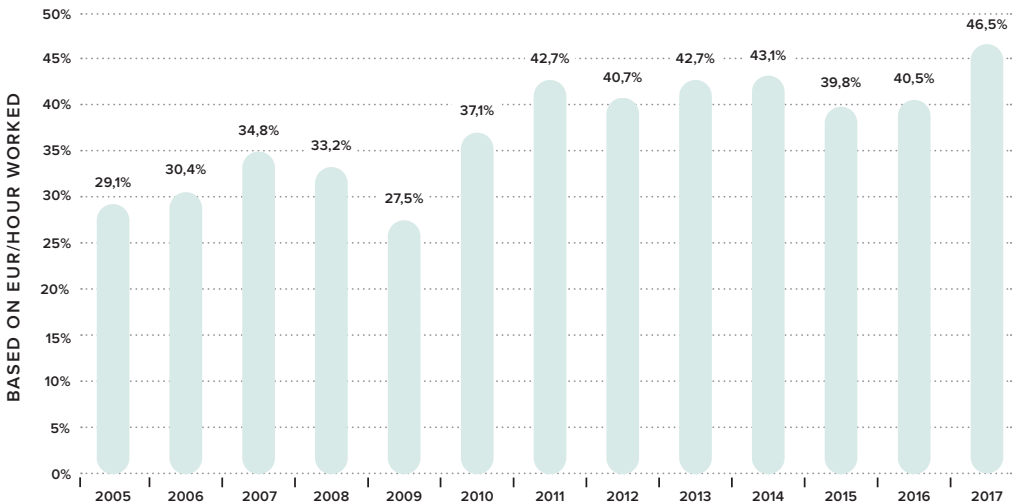
Moreover, at the present time 77% of basic products and foodstuffs is produced by small or medium-sized agricultural enterprises. Some 87% of all agricultural land is still cultivated by small-scale farmers working on family-based farms. You don’t need to be a genius to realise that this type of farming cannot be expected to immediately make the switch to capital-intensive and high-tech vertical greenhouse facilities with hydroculture.

If we wish to feed more than 9 billion mouths by 2050, a large proportion of the food will still need to come from these small-scale farmers. For this reason, a combined approach will be necessary. Fortunately, experiments in Japan have shown that it is possible with new methods to grow a wide variety of crops on as little as 3,000m² of land, producing results for which traditional agriculture would require an entire region. This 3,000 m² would be enough to maintain the natural balance of the region in which it is situated.

From 30 to 30,000 edible crops

The agricultural industry has undergone a major transformation in recent years. Thanks to modern technology, agricultural yields have increased exponentially. Better weed suppression, crop control and the cultivation of new and more productive varieties have resulted in record harvests that meet the strictest quality expectations. New technologies, such as artificial intelligence, drones and data-driven ICT systems, have created high-tech farms, where 'smart farming' allows precision agriculture to be implemented. In fact, artificial intelligence is already capable of running a farm on its own.

For farmers who want to stay in the game, some degree of scaling-up seems inevitable; all the more so when bearing in mind the current miniscule margins that result from worldwide competition. Mega-farms first appeared in the US, but are now common everywhere. At least 72% of all poultry and 55% of pork is produced in this kind of factory farm (Harvey e.a., 2017). Their huge economies of scale not only dramatically cut production costs, but also force their smaller rivals out of business.



FIGURE

Entrepreneurial income per family work unit compared to average wages in the economy, EU-28

Source: EU DG Agriculture and Rural Development, Agricultural and Farm Income, p.15 (2018).

In 2017, the family income of farmers amounted to less than half the average wage. During the economic crisis of 2009 it was even worse: they earned only a quarter of what they could otherwise have earned outside agriculture, which was a clear sign of the sector's volatility and sensitivity to economic fluctuations. Similarly, the wages of agricultural labourers also amount to less than half of what other kinds of labourers are paid. These low incomes explain why in Europe fewer and fewer agricultural enterprises are able to survive and also why reform measures in favour of health and the environment meet with resistance from the sector.

Of course, none of this changes the heart of the matter: the farmers of the future will need to make significant progress if they wish to feed all the world's hungry mouths. Roughly 85% of the necessary growth in world production during the next ten years must be achieved through increased yields resulting from the more intensive use of the means of production, greater investment in production technology, and improved cultivation practices (OECD & FAO, 2020). More intensive use of the land by harvesting at least twice per year can achieve another 10% of the target growth, while the remaining 5% will need to be accounted for by an increase in the area under cultivation (a much smaller proportion than in recent decades).

Unfortunately, this creates a kind of vicious circle: money for the necessary investments can only be found through scaling up, but this inevitably puts the climate and the ecosystem under even more pressure. In the Netherlands, for example, an attempt to improve air quality means that the government authorities are no longer willing to grant planning permission to enterprises if their expansion leads to an increase in nitrogen emissions. However, this in turn means that agricultural enterprises, who are responsible for some 75% of nitrogen deposition, feel especially targeted, much to their displeasure. Will agriculture ever be able to escape from this downwards spiral? Is there a way to make the farming profession seem more attractive and more profitable? Time will tell.

Greater productivity also has a downside. In 2019, a fungal infection threatened to destroy tens of thousands of hectares of banana plantations, with potentially devastating consequences for supply and prices. Because only one type of banana is grown for the Western market – the sweet Cavendish variety – all the bananas were susceptible to the infection, so that the results were soon catastrophic.

For this reason, some scientists argue that to rely primarily on increasing the scale and the efficiency of today's agriculture will not be sufficient to produce the sustainable solutions we need, not only in terms of feeding the world's growing population but also in terms of combating climate change. The bad news is that this kind of monoculture is currently the most dominant characteristic of our entire food system: worldwide, we derive 90% of our nutritional calories from just thirty different varieties of crop, whereas historically there are more than thirty thousand! But that is also good news: it means that there are still many unused sources of food waiting to be tapped.

Future-proof distribution

Failing global supply chains

The recent corona pandemic made painfully clear that the current food chain is far too long. When people began stockpiling at the start of the crisis, customers were soon confronted by row after row of empty shelves. The global supply chain could not respond quickly enough to the rapid increase in demand. The situation was made even worse by faltering logistics, closed borders and empty factories, whose workers were all infected.

The Dutch supermarket group Albert Heijn is an illustration of how the pandemic helped to redefine the relationship and the relative balance of power in the food supply chain: the retailer is now able to impose a penalty on its suppliers if they fail to make their agreed deliveries – even in the event of 'epidemics and pandemics'. This is now the new normal: producers can no longer hide behind the excuse of *force majeure* or 'act of God'. The chain has learnt its lesson and wishes to ensure that 'customers can always find what they want' (RetailDetail, 2021).

A combination of factors – increasing production costs in developing countries, international trade disputes, sustainability initiatives, etc. – meant that even pre-COVID a growing number of enterprises were looking to move production closer to their home country. The pandemic has simply helped to speed up this switch to local suppliers. A short, flexible and resistant supply chain looks set to become the rule rather than the exception in the years ahead.

The shift to the domestic economy

Consumers are also showing more and more interest in local food systems: they associate 'local' with familiar, ecological, fresh and high quality. But will prices stay the same? And what will happen if they don't? Research suggests that financially insecure consumers, who are likely to be one of the long-term outcomes of the corona crisis, will become increasingly price conscious and value driven (PMA, 2020).

Financial concerns and uncertainties will make consumers cautious when it comes to their purchasing decisions, while at the same time the greater focus on the domestic economy will result in a changed pattern of expenditure. During the pandemic, eating at home became a worldwide norm and it is a habit that many consumers intend to keep once the crisis has passed. Results from research carried out by the Royal Bank of Canada revealed that 66% of Americans and 53% of Canadians prefer home-cooked meals and the majority in both countries said that in future they would only spend the same or even less on 'eating out'. If this trend is confirmed, it will mean a permanent shrinkage of the out-of-home distribution channel and a shift in market share towards the retail channels.

Within the domestic economy there has already been a considerable increase in the number of home-delivered meals. In 2018, these types of meals – think of Takeaway.com and Deliveroo – were good for a turnover of 23.5 billion dollars, but this figure is expected to increase to 99.7 billion dollars by 2027, which is equivalent to an annual growth of 17.4%. In particular, it is the Asian-Pacific countries that are leading the way, mainly as a consequence of changed eating habits among the young and the increase in e-commerce in developing countries (Statistics, 2020).

The focus on the domestic economy will also mean that buying your daily/weekly groceries online will become a permanent feature in purchasing patterns. The global market for this type of purchase is estimated to increase from 189.81 billion dollars in 2019 to 1.1 trillion dollars in 2027. The 'fresh products' category alone is set to grow by more than 22% each year (Grand View Research, 2020).