FEEDING TOMORROW'S CITIES 2.0

.....and making them green

METROPOLITAN
FOOD SECURITY

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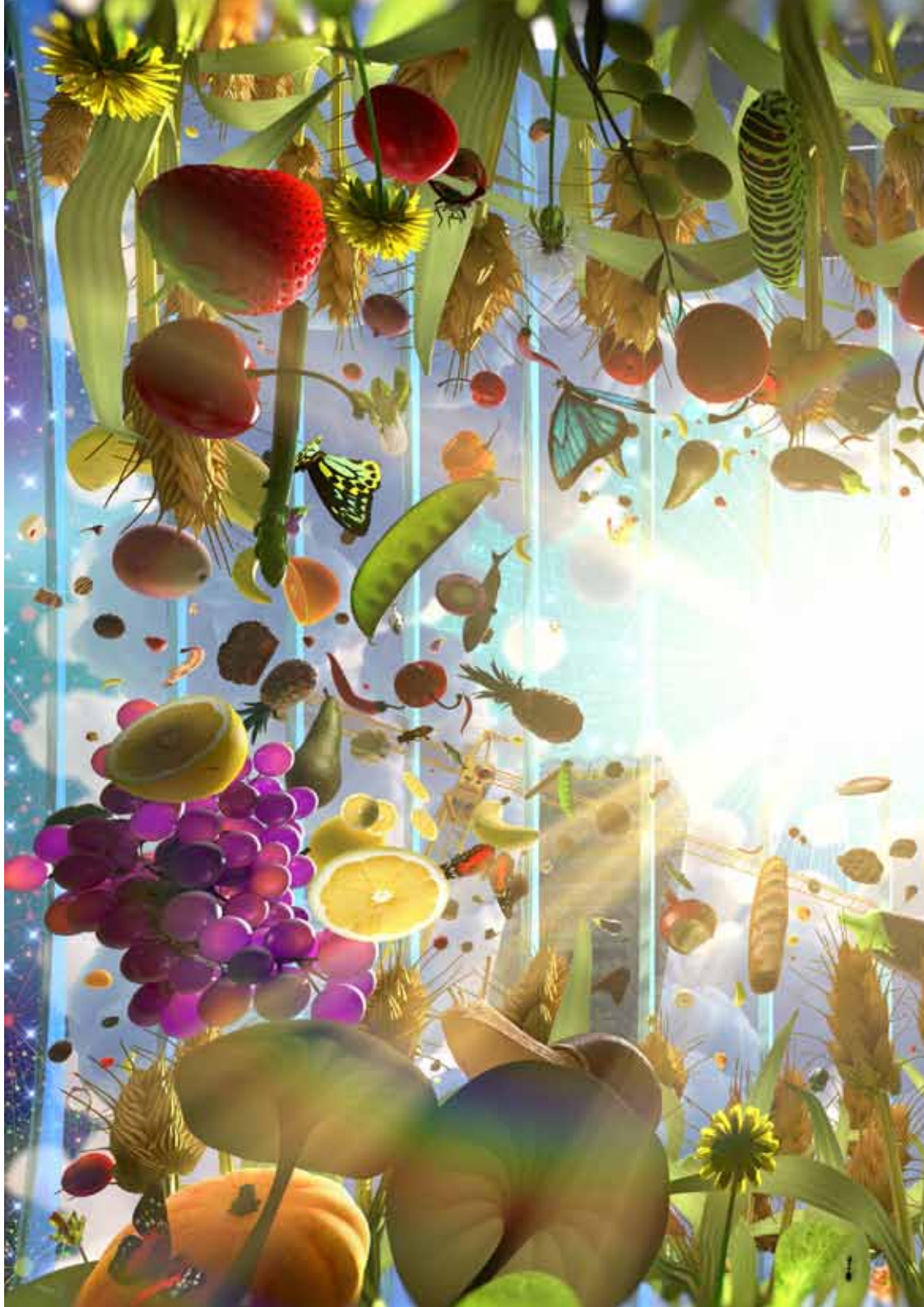

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Human civilisation and its society on our planet is undergoing major transitions. The global population is still increasing, although there are regions were the increase is not only slowing down, but even a decrease is in sight. The continent with the fastest growing population in the decades to come is Africa. All over the globe people are moving to cities. In Asia huge megacities with over 10 million inhabitants are already no exception. Similar developments can be observed in Latin America and in Africa.

Urban middle classes in emerging economies are growing by about ten percent annually. Together these developments lead to an unprecedented growth in food demand and thus production in and near the urban areas. Paradoxical most urban areas were and still are created on the fertile land in the river deltas all over the world.

Not only the growing food demand pressures the food production, also its housing needs and infrastructure have a negative impact on het area available for food production.

Urbanization also creates a great number of challenges to secure a healthy living environment in the metropoles. Smog and dust are already threatening inhabitants in a lot of cities these days and insufficient sanitation and inadequate food chains may cause outbreaks of pandemics.

These interdependent challenges constitute the subject of the second issue of this book: to ensure food security in tomorrow's cities. How and where will it be produced, stored, processed and transported, without great losses in both quantity and quality? Simultaneously, rural populations are decreasing in numbers and are aging. Harsh labour and lack of status of farming drive young people to the cities. To encounter these trends, we need a new generation of skilled agricultural entrepreneurs and modernized farming operations at an economically viable scale. Fortunately science and technology are advancing rapidly: especially sensor technology combined with 'smart' designed robot technology will definitely come up with solutions. Already drones and automated harvest techniques make life for the farmers easier to bear.

Agricultural and food sciences are shifting their attention from rural areas to cities, because the challenges intertwine. We already have ways, methods and systems to ensure healthy food security in the near and further future. But we must develop new and more sustainable agricultural practices and implement them in our societies. Wageningen UR, as one of the leading institutes in the field, is ready to share its insights. I hope the second issue of this book will contribute to the awareness of the great importance of the issue of how to feed tomorrows cities.

Prof. dr. ir. Louise O. Fresco,
President of Wageningen UR

Amsterdam is located in a fertile river delta, open to a densely populated “hinterland” and the trade routes overseas. The city has traditionally been a supplier of food, foodstuff, plants and flowers. Not just nationally but also to its European neighbours and increasingly to other continents.

However, a growing awareness has risen that our current food system is far from sustainable and just. In order to fight global warming (and meet the objectives of the Paris climate agreement), a food transition is needed. Many of the UN Sustainable Development Goals have an direct link to food.

The failings of the current food system that emerge in the form of soil degradation, loss of biodiversity, health problems, extensive food waste and social injustice increasingly play out on an urban scale. Emissions caused by the food system contribute almost 30% of global greenhouse gas emissions. A change is needed to decrease our consumption of animal proteins, to diminish the many ‘food kilometers’ of our meals and the amount of food that is wasted. A shorter food supply chain, where food produced in the region finds a market in the city and organic waste streams are locally re-used.

Local initiatives, social entrepreneurs, civil society organizations and individuals form networks and communities on topics like urban farming, reclaiming food waste and marketing locally produced food. Entrepreneurship, innovation and cooperation are the keywords. They are often working together with the municipality and knowledge institutes, like AMS institute, where technological Institutes from Wageningen, Delft and Massachusetts (MIT) combine forces. Through its triple helix approach and the concept of ‘Living Labs’ cities like Amsterdam can become a testing ground for new concepts that can enhance quality of life and the sustainability of metropolises across the world. In the project Rumore AMS and many other local parties and innovative SME’s work together on the transition to a more circular agri-food chain, upworthing organic waste streams and creating a market for the consumption of new plant-base proteins.

In 2015, The Milan Food Policy Pact was signed by my predecessor Eberhard van der Laan. In this pact many of the issues on sustainability and social justice mentioned are addressed and I fully subscribe them. Also Amsterdam’s membership of the C-40 group of world prominent cities provides us the possibility to share our experience with many partners abroad.

But in the end we have to remember that food is also culture, enjoyment, diversity, inspiration. Feeding tomorrow’s cities is a challenge we have to face together, as a society. On an urban, national and global level. I hope that the joining of forces in this book will contribute to a necessary transition to a more sustainable, circular and healthy food system.

Femke Halsema,
Mayor of Amsterdam

Source: Expo 2022 Floriade Amsterdam – Almere / MVDRV

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THE NETHERLANDS:

History and position in Agro & Food

The history and geographical location of the Netherlands has led to the success of its food system

Cooperation and co-creation are deeply rooted in Dutch history. The geographical situation of our country is part of the explanation for this attitude. The Netherlands - or Low Countries - can be seen as a densely populated smaller size state. Zoomed out, its appearance is that of a sprawling city, interspersed with water and intensively used “green”. Its position in the delta of the Rhine, Meuse and Scheldt rivers provided good connections to both open sea and the hinterland and enabled early development of international transport and trade.

The fertile lands in the delta were also well suited for agricultural production. The combination of trade and agriculture created the country’s present cityscape surrounded by a mosaic of natural habitat and areas of agricultural production.

These production regions had to deal with a growing population and with limited space.

Over the years, therefore, an intensive and efficient type of agriculture developed. A common feature for the different disciplines involved was to aim at adding value. This enabled substantial agricultural exports: pig, veal and poultry meat, dairy products, genetic material, vegetables, flowers and potted plants. In 2016 these exports added up to over 85 billion Euros, 1/5 of total Dutch exports.

The equipment that the system’s efficiency required has in the meantime also become an export commodity by itself. In 2016 the exports of agro-related machinery - for production, preservation, processing and transportation - added up to over 13 billion Euros.

So, the relative disadvantage of a small size country in a risky delta region turned into a driver of agricultural success. How did this happen?

Cooperation

Since the Middle Ages the Netherlands have had to face the fact that the sea threatened large parts of the country. Regional Water Boards were set up to deal with all aspects of water management. Consensus building was a prime requirement and later became known as the ‘Polder model’.

Cooperation is also paramount in the development of the Dutch agro and food system. Investments in infrastructure and education, two essential elements of modern agriculture, often are generated by a public-private partnership.

A “Golden Triangle” cooperation of companies, research and government has been set up to drive knowledge creation and innovation.

Northwest European Delta

The Netherlands is part of the larger Northwest European Delta region. Apart from the cost of keeping “dry feet”, Dutch agriculture has substantially benefitted from this position. Access to open sea on one hand and to the Rhine and Meuse rivers on the other, provided links to a densely populated ‘hinterland’ and put the country right at the nexus of important trade routes.

Most food related trade develops within a circle of approximately 300 km radius. This comprises the densely populated area between London, Paris and the Ruhr region. Both its seaports, Rotterdam and Amsterdam and the productive agricultural sector helped the Netherlands to a pivot position in the vast Northwest European Delta region. It taught us to appreciate the value of clean (river) water as well.

Continuous innovation

Since the start of modern agriculture, the Netherlands has consistently opted for an open economy. Unlike most of its neighbours it did not close its borders in the event of crisis. This choice left no alternative but to go for continuous innovation to stay ahead of the pack.

This strategy worked out well. Publicly funded research and education, combined with a willingness to share knowledge within producer organizations generated innovation leads. Healthy competition in processing and distribution made the system robust. Continuous innovation did not only lead to ‘doing things better’ but moreover to ‘doing better things’; in short to a rather unique agro and food system.

THE DEVELOPMENT

of an Agro & Food system

The Dutch Agro & Food System was developed over 150 years

The development of modern agriculture in the Netherlands started after the crisis of 1880. The European markets got flooded by imports of grain and other commodities from the New World; the effect of steamship development. This marked the end of traditional agriculture that had lasted for several centuries.

In the Netherlands with its tradition in trade, continued open door policy combined with additional innovation efforts were the deliberate reaction. As a trade nation the only way to keep up with global developments is trying to take or at least be part of the lead. In agriculture this led to fundamental public investments in research, education and extension.

Research, education and extension have driven the development of the system.

The foundation of an agricultural university in Wageningen and a number of schools for 'green education' at different levels helped to develop a skilled and trained agricultural workforce. An extension service (now taken over by private parties) helped to bring results of field tests into practice.

Banking helped farmers to invest in new production methods. For certain commodities (such as dairy and sugar) bottom-up cooperatives sprang up to help secure a stable supply and income for their farmer-members.

Government - and sector funded research, through field experiments in specialized institutes or otherwise, provided the basic ingredients to keep all elements of the value chain up to date.

Seeds and genetics

Plant breeding and selection are part of a long lasting tradition in the Netherlands. Already in the 17th century, unique tulip varieties were auctioned (origin of the stock exchange system) and exported worldwide. An open innovation system based on the regulation of breeder's rights led to the development of globally operating seed companies.

Also in the livestock sector much attention has been spent on selecting favorable genetic strains in dairy cows, pigs and chickens. These entrepreneurial activities benefit fully from the collective investment in academic institutions and specific research programs aimed at understanding the process of selection and breeding.

Primary production

Given the limits of the area suitable for arable farming in the Netherlands, much attention has been paid to specialization into high value products. Most notably this can be seen in the horticulture sector. In open field horticulture and in greenhouses the main focus is on fresh fruits, vegetables and flowers. Arable farming mainly focuses on seed potatoes, vegetables and animal feed. Sugar (beet) and starch (potato) remain of regional importance.

The livestock sector has developed high yielding and efficient systems that are keeping up with tightening requirements as to animal welfare and environmental constraints. Under the scrutiny of critical consumers the production systems of pigs, poultry, veal and dairy set standards for efficiency and environmental awareness worldwide.

Processing

The development of the processing industry has gone through impressive transformations during the last decades. Nowadays, a large fraction of fresh agricultural raw produce is transformed into convenience products. Vegetables and fruits are washed, sliced and packaged. Meat is cut, seasoned, cooked, grilled, smoked, and packaged in numerous ways. The processing industry takes care of all those different activities.

This has led to carefully controlled production, processing and outlet channels in which high quality food products are is being provided to consumers. As a result, the level of food safety is very high.

Value-added logistics

Trade and transport have always been prominent in the Netherlands. Agro-logistic systems see to it that primary producers receive their raw material in time, that primary produce finds its way to (secondary) processors, that they can draw on a sophisticated packaging industry, that distribution centers are being supplied and that shops, supermarkets and consumers receive their products fresh and with best feasible shelf life.

Together, tailored transportation, effective storage, fine-meshed distribution and responsive control see to it that the chain of raw materials, primary products, processed goods and consumer products operates without a hitch. Good standing of the chain-participants and trust among them are of cherished value.

ICT

All elements of the agricultural production chain rely on knowledge and information. Traditionally carried by agricultural craftsmen, ICT has partly taken over: allowing to capture and manage information needs and to digest responses, it enabled further professionalization.

Growth or feeding cycles in primary production get monitored with ICT systems. So do yields, in quantity and quality, and the occurrence of pests and diseases. Sophisticated systems regulate all aspects of greenhouse production. Orchestration of agro- logistics, including tracking and tracing, is only possible with the help of computers.

ICT and increasingly also big data have become an integral part of the agro and food system.

Organization

Collaboration between different stakeholders is needed to manage the chain from field to fork. Producer's organizations have been active for many years.

During the last decades new forms of collaboration have been set up that reflect a more demand driven and market oriented character.

In fresh produce a shift from commodities towards branded products is apparent. This calls for new modes of cooperation between producers, service providers and retailers. And - as mentioned before - a degree of trust among chain- participants is a must; or, as a backup, at least a fast and correct dispute settlement mechanism.

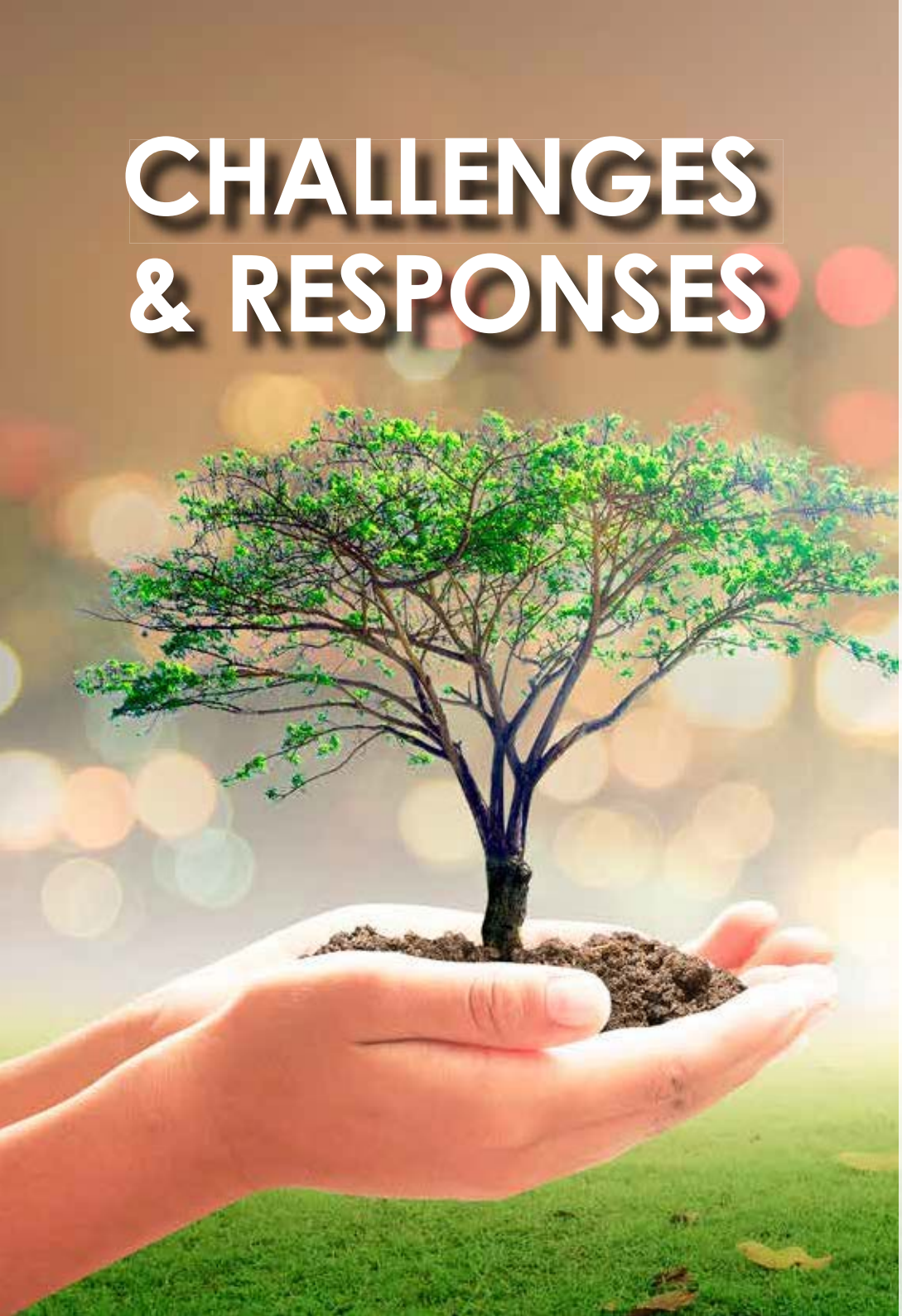
More than food

The modern agro and food system is more than a chain that supplies food. Agricultural activities are part of a regional network, connect to other sectors of the economy: water management (uptake, discharge), energy (use, supply), transport (a third of lorries on our roads) and ICT to name a few. Next to that agriculture and all its related sectors are providing jobs and income for a large number of people.

Most of the green space in between the built-up area in the Netherlands still is farmland, to be managed under European (CAP) sustainability rules. Sometimes in tandem with non-governmental organizations aiming to preserve nature and biodiversity. Accordingly agricultural activities also provide cities with "breathing space" and the urban dwellers with a green environment in which they can recreate.

Dutch farmers therefore cannot be seen as purely individual economic actors, but inevitably are part of a larger whole. This point of departure marked the way in which Dutch agriculture is being developed and managed. It is accentuated by the sector's responsibility to contribute to CO2 reduction as part of the national targets resulting from the Paris Agreement on Climate. Awareness to belong to a larger system, constantly calls for consideration and for collaboration with others; it has become part of the success of Dutch agriculture.

CHALLENGES & RESPONSES



A number of global trends co-determine the developments in the agro and food sector. The effects of these trends are complex, since most also influence each other. A good understanding of them as they present themselves today, helps to assess the potential of the agro and food sector in the future.

In the next chapter several authors describe the current state of affairs. Some look ahead, some even far. The overview shows that the challenges for the agro and food sector at present are already considerable. And it is safe to say that they will only increase in the decades to come.

Indeed, feeding tomorrow's cities is a complex and formidable task. Policy making will help but can hardly provide the real life solutions by itself. At best create conditions for them. For that purpose it will draw on science and rely on enterprise to respond to new opportunities. It is for that reason that in this book insights were collected from both quarters.

Some 15 contributors from the world of science or applied knowledge helped to sketch the problems the world is facing; the "demand for solutions".

The "supply" was solicited from Dutch enterprises and educational institutions conscious of the challenge of mega-city food supply. They have been asked to think ahead and conceive how their potential could help supply answers.

There too the response has been more than encouraging. Some 60 companies and organizations present their potential. It ranges from genetics, breeding and cultivation, via handling, processing, packaging and storage to trade, urban planning, finance and education.

With the overview that follows, of challenges and responses, this publication wishes to highlight the importance of an integrated approach. For science this means taking into account all relevant angles. For enterprise how to cooperate in the chain. In the end this country, its companies, schools and scientific institutes can best jointly make a difference in the feeding of tomorrow's cities.

WORLD POPULATION TRENDS & PROJECTIONS

It took about 200 thousand years for homo sapiens, living as hunters-gatherers to reach a population size of 4 million, which is about the population size of the municipality of Los Angeles today. Birth and death of the earliest humans almost leveled out and growth was very slow or absent. The Agricultural Revolution, about 10 thousand years ago, meant a slight increase in the speed of growth, because of the availability of a better diet. Between the years 0 and 500 the world population stagnated at a size of about 200 million. In the Middle Ages the growth path was still bumpy, such as in the 14th century, when plague and war took some 30 million lives. After the 17th century world population growth started to take off. Today, some are drawn to the conclusion that the world is no longer able to sustain current massive population growth, which has mushroomed since the 20th century.

See figure 1: The explosion of the world population size.

The process behind this growth is called the Demographic Transition: a first stage of very slow growth where both the number of children per woman (fertility) but also mortality is high, leading to very small or zero growth; a second stage of high growth, in which mortality is decreasing, whereas fertility is still high; and a third stage of slow or zero growth again in which both fertility and mortality is low. All developed countries have arrived in the third stage, and most developing countries are in the fast-growing second stage today.

See figure 2: Population size in world regions 1950-2100.

Mortality has decreased substantially, not only in the developed, but also in the least developed regions of the world. Life expectancy in the least developed countries has increased with 6.2 years between 2005 and 2015, from 56.4 to 62.7, compared to an increase of 'only' 2.8 years, from 75.6 to 78.4, in the more developed regions. Although the gap in life expectancy between developed and developing regions is still large, it is narrowing.

The key question for the future development of the world population is how fast fertility will drop in the least developed regions of the world, especially Africa. This is the component surrounded by the highest uncertainty for the future. Although according to the UN all countries will converge towards a value around 2 children per woman in 2100, especially in the least developed countries current levels are still far off from this target, and

small differences in fertility will have large effects on the projected size of the population.

The UN expects the population of Africa to be 4.5 billion in the year 2100, based on the assumption that the number of children per woman will reduce from its current rate 4.7 to 2.1 in 2100. However, if the fertility rate reduces to 'only' 2.7, this will make a difference of 1.7 billion more African inhabitants (6.2 billion), a difference which is much more than the current population size of the continent (1.1 billion). However, other world population projections are less alarming.

The key to reduction of fertility is universal education, reproductive rights and family planning. Education has many benefits: higher incomes, better diets, housing and hygiene, as well as healthier lifestyles. This reduces infant and child mortality and therefore the need to have many babies. When taking into account the mitigating effect of future levels of education for each country, the total world population may not grow to 11 but to nine billion inhabitants in 2100. The population of Africa will in that case increase with "only" 2 billion. That, of course, although still a major challenge, would be good news for this continent, and for the prospects of feeding its inhabitants in the coming century.

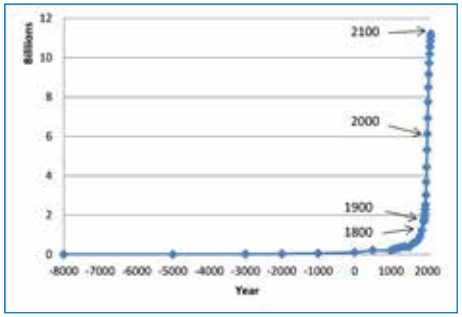
See figure 3: Number of children per woman by world region 1950-2050.

A growing world population also means more migrants, although the share of the migrants in the total world population has dropped from 3.5 per cent in 1990 to about 3 per cent in 2015 (290 million). Most of the migrants have moved for work, study or family reasons, but especially in the developing countries the number of refugees has increased dramatically in the last decades: from 20 million in 2000 to more than 60 million today.

War, famine and increasingly also climate change are triggers that force people to leave their home region. It is no coincidence that the most fragile countries are also the fastest growing countries, especially in Africa, which has led to large refugee flows. Most refugees settle within their country of origin, as internally displaced persons, only a small part becomes international refugee (25 per cent), an even smaller part asylum seeker (10 per cent), and those granted asylum (asylum migrants) are again only a fraction of the total number of asylum seekers.

Compared to the population growth in Africa the migration component is small, but for especially Europe migration makes the difference between population decline and stabilization or growth.

Figure 1: The explosion of the world population size. Source: Weeks, J. (2005) Population: an introduction to Concepts and Issues, Wadsworth.Belmont CA, table 2.1; UN, Department of Economic and Social Affairs, Population Division (2015). World Population Prospects: The 2015 Revision, custom data acquired via website.



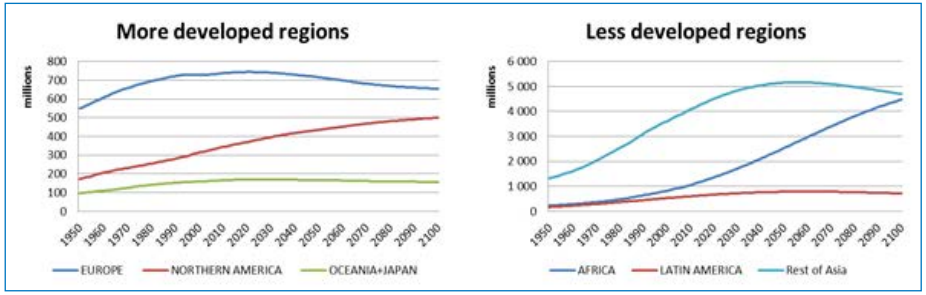


Figure 2: Population growth in world regions 1950-2100. Source: United Nations, Department of Economic and Social Affairs, Population Division (2017), World Population Prospects: The 2017 Revision

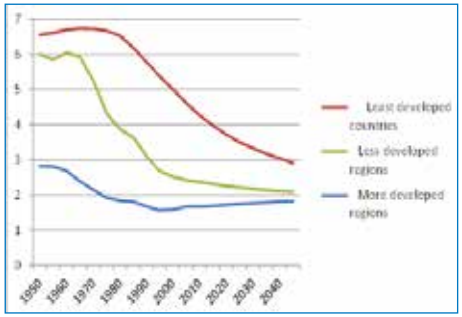


Figure 3: Number of children per woman by world region 1950-2050. Source: United Nations, Department of Economic and Social Affairs, Population Division (2015); World Population Prospects: The 2015 Revision, custom data acquired via website

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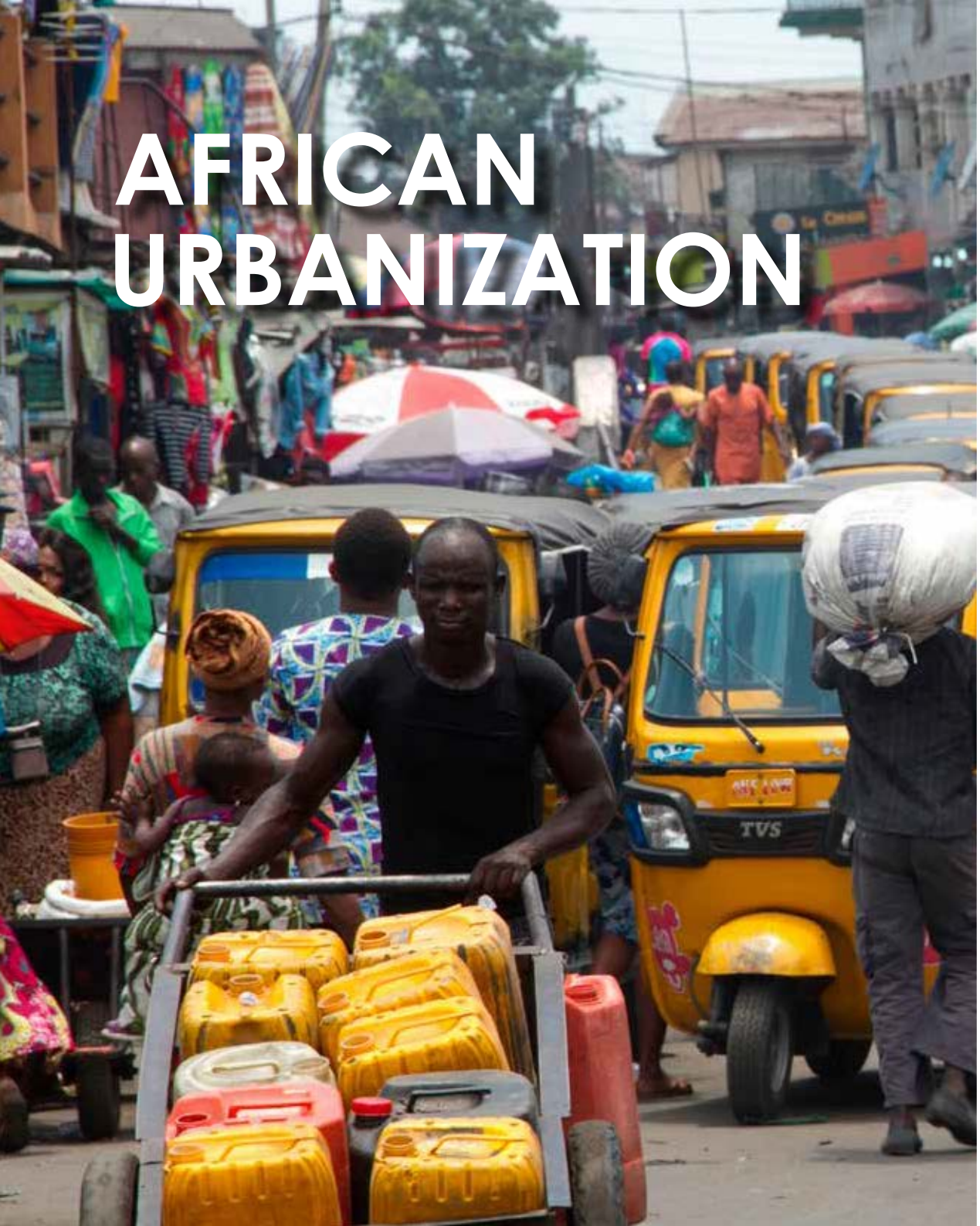


AFRICAN URBANIZATION

Africa's population growth is stunning. After centuries of stagnation around 100 million inhabitants, the 20th Century meant an almost tenfold increase. Currently Africa's population is close to 1.2 billion. In 2050 it will most likely be 2 billion. In 2100 3 or even 4 billion. Of course there may be dramatic epidemics, and many more victims of famine, wars and violence. But these dramas also hit Africa in the 20th Century and despite that, the African population exploded. Although the number of children per woman is gradually going down now, there are so many young women in Africa that even with lower average fertility the population increase will be higher than anywhere else.

An even more rapid population change is Africa's urban explosion. Around 1960 Africa was rural. Only 20% of its population (65 million) lived urban lives. Currently there are 475 million urban Africans: a sevenfold rise. In 2050 there may be 1.2 billion. In 2100 at least 2.1 billion. This implies that in the next 35 years urban services and livelihoods have to be organised for another 725 million urban dwellers. And while there were few cities with more than one million inhabitants in 1960, there are more than 50 now, and there will be many more in 2100.

Two remarks must be made to put these observations into perspective. First, weak statistical services and a very mobile population, of which many live both urban and rural lives, lead to notoriously unreliable data. Second, urban Africa recently became the engine of economic growth and urban incomes in Africa are rising steadily. Of course there are many poor people in cities, and the living conditions for many of them are appalling. But many other Africans live rather luxurious lives and it is not difficult to find urban areas of affluence populated by an emerging middle class, with rising expectations.

Africa has been the economically fastest growing continent during the last few years, even faster than Asia. Although nothing is certain, it can be foreseen that the enormous social and economic energy created by many relatively young, healthy, well-educated and well-connected urbanites has created a momentum of self-sustained growth.

Even if the global demand for Africa's resources will become lower than in the recent booming decade, this growth will continue.

Although Africa's cities do produce food (urban agriculture!), and although many African urban people do have family linkages to rural food suppliers, by far the largest part of urban food demand has to be provided from elsewhere.

Africa's agricultural growth figures reveal that during the last decades the production of basic food has increased almost everywhere: both in area and in yields. And also the production of luxury food, such as dairy, eggs, meat, fish, fruit and vegetables shows very rapid growth in many places. Many opportunities exist for food providers in the hinterland of African cities to provide urban consumers with basic and luxury food. Thriving urban markets, shops and supermarkets are a testimony to that trend.

There are challenges that have to be dealt with. Food imports have risen sharply to provide for the urban food consumers. And a proportion of those imports can be regarded as dumping that undermines the competitiveness of local production. On the other hand, Africa provides the world with coffee, tea, cocoa, flowers, palm oil, animal feed, and many other products, sometimes undermining local food security. African governments hardly invest in local food production and the budgets for agro-support are much too low. All these challenges need to be taken into consideration when trying to provide answers on how to feed tomorrow's cities in Africa.

But there are also many opportunities for those who want to support the food boom in Africa. The current approach to support value-chain improvements is a step in the right direction. It could even be better if the approach would be widened to become an agro-innovation-system approach: connecting the energy of food producers (farmers and agro-industries; employers and employees), with the transport and trading sector, and with the many types of input providers, banks and insurance companies, food safety agencies, the agro-education, extension and knowledge sector, both public and private.

Em. Prof. Dr. Ton Dietz

African Development, Leyden University, former Director African Studies Centre

POPULATION, CLIMATE AND MIGRATION

Climate change and population growth are closely related to questions of food (in)security. These developments have the potential to significantly affect migration trends and pose a challenge to current and future governments. To address the complex character of migration, the Netherlands government has formulated an integrated six pillar approach (see figure). Especially the root causes of underdevelopment, as well as human, social, political and economic insecurity are closely related to the drivers of migration. At the same time, it must also be recognized that the understanding of how climate change, food insecurity and population growth are exactly linked to migration trends is still under development, and there is a great need for evidence-based policies on these issues.

Certain is that sudden extreme rises in temperature, changes in rainfall and other climate variabilities have the tendency to lower crop yields, which can significantly undermine food security and access to food. Drought especially, causes more than 80% of the total damage and losses in agriculture and particularly affects countries on the African continent (FAO). According to the FAO, the number of extreme climate-related disasters, including extreme heat, droughts, floods and storms, has doubled since the early 1990s.

The social and economic insecurities involved have a devastating effect on vulnerable communities in rural areas that depend on agriculture for their livelihoods. They can fuel displacement and migration as people look for ways to secure their food supply and, where possible, seek to diversify their income stream. At some occasions these pressures even escalate into local conflicts over resources.

However, we must also realize that most migration and displacement actually takes place within states and within developing regions, instead of intercontinentally. Almost two thirds of the total number of migrants stays in the same country or in the neighboring region. For refugees, this number is even higher. According to UNHCR 68.5 million people were forcibly displaced in 2017, of this number 85% was hosted in developing countries. Most people in circumstances affected by food insecurity will simply not have the resources to travel further away. In responding to these described challenges, we therefore need to pay attention to the local context in which these processes take place.

In that regard, the added pressure on food production caused by rapid population growth requires our particular attention. According to the UN World Population Prospects Report of 2017, the total world population is expected to grow to 8.6 billion in 2030, 9.8 billion in 2050 and 11.2 billion in 2100. Most of this population growth is expected to occur in the poorest countries in the world, due to their relatively high level of fertility of circa 4.3 births per woman.

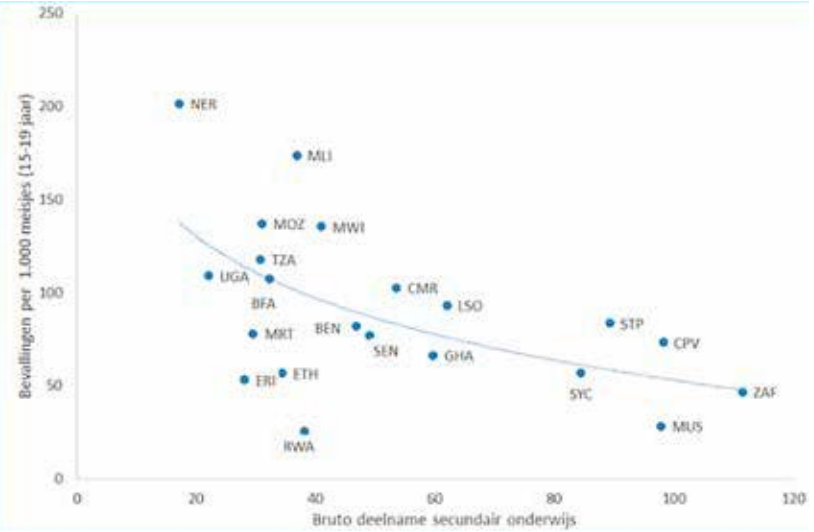
Increasing access to education for girls (European Commission, 2018, IOB, 2018), as well as improving sexual and reproductive health rights and family planning is key. An increase in secondary education leads, first of all, to a considerable drop in the number of girls who already have a child at a very young age. In addition, higher educated women also tend to have fewer children. In countries such as Niger and Mali (see figure below), low participation in secondary education correlates with a high fertility rate at a young age.

On average, a 50 percentage point higher participation in secondary education is associated with a decrease of about 90 births per 1000 girls aged 15-19 years.

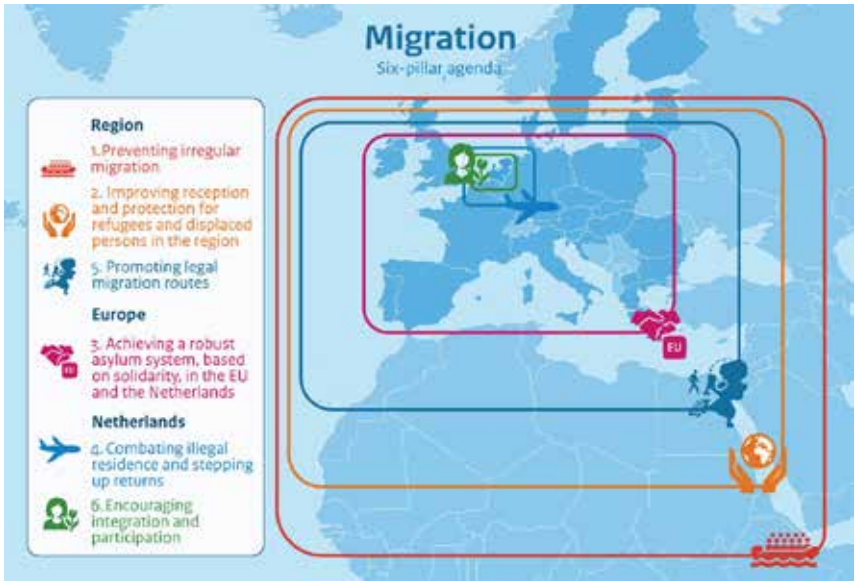
Moreover, empowering women and giving women the same access to resources as men, may also help to reduce the gap between food supply and demand. It could raise, FAO estimates, the total production in agriculture in developing countries by 2.5 to 4%, which can reduce the number of hungry people in the world by 100-150 million people, and have long-lasting effects on poverty reduction.

In conclusion, the nexus between population, climate and migration is closely linked to food security. However, more research is needed to generate concrete data and evidence-based policies that offer comprehensive responses within the local context.

Education participation
little girls and labour under young women



* Gross participation in secondary education and number of births by 1,000 women in the age of 15-19 years. Source: WDI



Linda Piersma

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APPROACHES TO AGRICULTURAL
development

The western part of the Netherlands is a metropolis that is home to 7 million people. Like many other metropolitan areas it is located in a fertile delta with excellent transport facilities. Through the ages the region has fostered interesting links between its farming community and demanding citizens, resulting in a strong position of the agri & food sector.

One of the major challenges for all expanding cities in the world is the question how to feed a growing population. Agri-logistics play an important role in the solution, but also the organization of food production in agriculture. And questions arise. Are large production units needed, or should small family farms fulfill the growing demand? How to organise the food chain? For policy makers who have to decide on these questions, the first option seems attractive: entice large investors for turnkey projects, let them buy up-to-date technology in countries like the Netherlands and leave the risks with these developers.

The alternative of transforming smallholders into a productive family farm system often poses a bigger challenge since it requires intense policy development.

However, such an approach can be rewarding as it provides livelihood for the farming community, so the temptation to relocate to the city will be less.

Which option - or mix of options - will be most attractive depends on the specifics of the case. The sheer presence of these and other related questions makes it clear that governments have a role to play in feeding tomorrow's cities. They must decide to which extent the public sector wants to be involved in the needed developments.

Adriaan Geuze, an internationally renowned Dutch landscape architect associated with Wageningen University and Research, recently made an interesting comparison of government responses in this respect. In the 1920s the United States of America, Russia and the Netherlands made very different decisions on how to increase agricultural production as a reaction to rising prices in the previous decade. In the USA the development of the western plains was put in the hands of the private sector without much guidance from the government. It contributed to the dust bowl, an environmental disaster. In Russia the state went for full central planning, and that contributed to a food crisis with massive starvation. In the Netherlands the government reclaimed new areas from the sea with a mix of state and private initiatives in a trial and error setting by taking small steps and learn from the process. In this way, large-scale disasters were prevented and process of gradual improvements was made possible. This is not to say that the Netherlands has no environmental problems or challenges in the area of climate change.

But a rough comparison shows that The Netherlands has interesting lessons to offer on how to feed the city by stimulating interactions between public and private stakeholders in the food chain. It is reflected in policies that made farmers organize themselves in producer organizations (cooperatives) and farmers unions; in institutions that organize land markets and credit systems; in adequate tax laws for income taxes and inheritance of farm assets; in modernization policies like land re-allotment schemes and agricultural knowledge and innovation systems; and in governmental agencies for food safety and inspection services for product quality.

Everything changes over time. Neither nature nor agriculture is a static entity, so continuously new challenges arise. As a consequence, our agri & food system is still evolving. Recently, new technologies like ICT and genetics have shown to have a potentially major impact on how we organize the agri & food system. A system that evolved over a century in the Netherlands cannot be just copied to other parts of the world. But the experiences and lessons can be adapted to local needs and help to speed up the developments that are needed for feeding tomorrow's cities.

History shows that it is worth trying to work together in the common interest to find the optimal mix between large-scale farming and family farming and between private initiative and governmental action.

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CLIMATE CHANGE & CITIES

The 2014 assessment report of the Intergovernmental Panel on Climate Change stated “warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level.” The human-induced warming has reached approximately 1°C (±0.2°C likely range) above pre-industrial levels today and will continue to rise if no action is taken.

Climate change caused by emissions of greenhouse gases such as Carbon Dioxide, Methane and Nitrous Oxide will affect all regions and sectors. The observed recent changes in climate are primarily linked to human interference in the climate system and not to natural causes. The human interference is mainly related to the use of fossil fuels and change in land use. Climate change manifests itself in various ways: from higher temperatures and less cold periods, changes in rainfall patterns and intensities, more and prolonged droughts and heat waves, sea-level rise and more extreme events such as heavy rainfall and hail spells, storms and hurricanes. The exact impacts vary per region or location.

Currently just over 50% of the total population lives in cities and this is projected to increase to almost 70% in 2050. Cities are responsible for 70% of the carbon dioxide emissions. With higher productivity and higher per capita income, cities will determine how we consume and produce food and utilise the earth’s resources. Urbanisation creates opportunities but also comes with problems such as air pollution, waste and health most of which are directly or indirectly aggravated by climate change.

Cities around the world are vulnerable for climate change and at risk of floods, droughts and heat waves. The number and intensity of heat waves are likely to increase and are amplified in cities: build-up areas absorb more heat, high-rises block cooling winds and limited green space provides less cooling through evaporation. Heat waves combined with air pollution can have substantial impact on human health; the 2003 and 2010 heat

waves in Western Europe and Moscow led to thousands of casualties. As the atmosphere warms, it also holds more moisture. This leads to heavier rainstorms and inundation if drainage systems are unable to cope rapidly with the excess water. Many cities replace archaic drainage systems in order to deal with this challenge, but often not soon enough.

For many cities along the coast or in deltas, the projected sea level rise will enhance the hazard of floods, storms and hurricanes that put buildings, infrastructure, health and the social fabric of cities at risk. Even if effective levees and barriers are constructed, flooding might still occur if barriers are closed against high tides and extreme river runoffs strike simultaneously. Such synergetic situations are not uncommon. Nature-based solutions that use ecosystems services at landscape level can be used to reduce risks and vulnerabilities. In the tropics, warm ocean water also feeds energy to storms, hurricanes and typhoons. Katrina in New Orleans, Sandy in New York and Haiyan in the Philippines swelled to devastating strengths due to warmer ocean water. In Europe, the floods of 2018 killed 69 people in Italy, France, Spain, United Kingdom and Portugal.

Also the impacts of climate change on food production vary per region. In parts of Europe and Asia, over the last 10 years, changes in precipitation have led to more frequent droughts and reduced water availability for (food) crop. And this will intensify and continue. In selected places with abundant surface or ground water, water shortage can be balanced by enhanced irrigation or improved water harvesting techniques (as developed in climate smart agriculture projects). However, IPCC assesses that climate change undermines food security in dry areas. This immediately jeopardizes the food and water supplies to cities in the regions concerned. In coastal areas, agriculture can be threatened by sea level rise and saline intrusion.

Moreover warmer winters and summers have a crucial influence on crop growth: the timing of germination, crop establishment, growing, flowering and seed filling. Extreme high temperatures during the early seed-setting period will irreversibly stop grain filling and will significantly reduce yield. Warmer winters can limit some crops like wheat to induce flowering. Some areas, on the contrary, will become more suitable to grow specific crops. See vineyard expansion in the Netherlands, England and even southern Sweden. Although IPCC acknowledges such positive effects, it concludes that globally the negative impacts of climate change dominate. Around the world research is working on innovative solutions to deal with these challenges: drought and saline tolerant crops, climate services, adaptive water management, sustainable soil management.

The most recent findings seem to indicate that our climate changes faster than earlier projected. If true, this makes it all the more urgent to put in place effective response actions both for reducing the emissions and for dealing with the impacts. Urban greenhouse gas emissions are influenced by a range of factors of physical, economic and social nature, by development levels, and by histories specific to the individual city, the city-DNA. In cities of medium and low-income countries the per capita energy use and emissions tend to be higher than those in cities of high-income countries. As the largest urbanization will be in medium and low-income countries, improved energy efficiency of the transport system and energy grids is a high priority.

And with innovation a rapid development of alternatives can be undertaken, such as electric transport combined with smart grids. In the C40 initiative already eighty cities are committed to actively innovate and address the challenges of climate change. They want to shift to carbon neutral energy system by 2050. The landmark Paris agreement set in motion various initiatives and provided a global platform for the cities to present their climate action for the first time.

The anticipated changes on food and fresh water supply will best be dealt with in an integrated way. Improved supply systems, water policies, waste management and health system need to address both mitigation and adaptation. City consumers will have a deciding impact on how we organise the production and provision of food. Their diets will determine the shape of our food system including the environmental aspects and integrity of food production. For many cities around the world climate change is a driver to rethink their infrastructures, their relations with the surrounding rural areas and the way they deal with water, food and energy. Many of them now respond and take leadership and turn into living labs in order to become climate resilient and to improve quality of life.

Dr. Jan Verhagen
Dr. Peter Kuikman

Wageningen University & Research

WATER SCARCITY

Trends that challenge the Agro&Food system

The agro and food industries are amongst the most intensive water users, even outdoing domestic consumption. In urbanised areas, people, industry and food production often have to share the same water resources. The pressure on water resources in these areas is high. Climate change and its enormous impact on water is widely recognised nowadays, and globally the areas most prone to the effects of climate change are highly urbanised areas. Further, sea level rise, excessive rainfall and periods of drought result in floods as well as incidental and structural water shortages. Responses to these threats are still blurred. An international carbon reduction policy to avoid a temperature rise of more than two degrees may have been accepted, but its effects will only be felt in the long term. A similar policy to address water challenges is very much needed, but is not yet in sight. The Netherlands may offer an example of how to deal with this aspect of water issues.

Climate change is causing many pressing water management problems. In the short term, demographic changes, economic development and agricultural practices require water management plans that incorporate well managed economic and agricultural development and comprehensive spatial planning, especially in rapidly urbanising delta areas. Mass migration from rural areas to urban delta areas is causing logistical challenges related to water and food. The water infrastructure everywhere needs to be expanded and updated, both to ensure universal safe drinking water and to treat domestic and industrial waste water. But this requires major investments which are not always available. There is a serious financing gap estimated at USD 1,200 billion up to 2030 which cannot be met by public financing alone[1].

Good practice in water management

Good water management in cities must be done at the regional level to ensure enough water for both urban and agricultural needs. It is a myth that most of the water extracted from lakes, rivers and groundwater reservoirs is used for human consumption. In fact, most is used for agriculture - mainly for irrigation in dry areas - and for processing agricultural produce. Crop irrigation is one of the most exhaustive uses of water. In hot climates, the water evaporates, leading to soil degradation and reduced agricultural productivity. Other causes of degradation are the use of salt-

rich water, poor drainage and seawater intrusion, often caused by the overexploitation of groundwater aquifers. Initial steps to improve irrigation practices are training of farmers, introducing new technologies such as smart fertilisation and drip irrigation, and ensuring adequate capital investments. Coupling agriculture and urban water management is essential. Urban water treatment using the concept of cascading water management can provide clean irrigation water and new fertilisers for agriculture.

The over-abundant use of water in agriculture leads to serious water level problems in rivers, lakes and reservoirs. Almost half of China's rivers are drying up rapidly or becoming heavily polluted. Pollution is not only caused by industrial activity and inadequate water treatment, it is also caused by the large-scale leaking of nutrients in intensive farming and agriculture. Smart fertilisation practices, reducing the amount of fertiliser used and preventing run-off are important to keep soil and water sources healthy.

A call for coordinated water management and good financial engineering

When water use is not coordinated in catchment areas, the downstream areas will be victims of upstream activities and profiteering. Similarly, the over-extraction of groundwater by urban populations leads to the rapid sinking of ground-water levels and land subsistence, resulting in higher flood risks. In urban areas, the groundwater used for domestic water supplies must be replaced as quickly as possible by surface water. This requires hard or natural infrastructural measures such as dikes and dams to reduce the risks of flooding in flood prone areas. It also needs a well-managed system and heavy investments.

The Netherlands has adopted a holistic approach that brings stakeholders together to create long term integrated planning. In one example, a river basin management plan involves stakeholders such as municipalities, drinking water companies, citizens, nature organisations and water authorities to improve the water quality of the rivers.

The current challenges of too much water, too little water or too dirty water are pressing. As mentioned above, the rapid urbanisation of delta areas is putting pressure on the agricultural supply. Agricultural systems need modernisation, not only in terms of technology, but also in developing innovative skills. The problem is not so much the availability of technology but the combination of integrating technology in water management and agriculture, and designing projects in such a way that they become bankable and attract private finance when public finance is not available. Institutions, laws and governance practices need to be developed to meet this need. The process of urbanisation in delta areas should be accompanied by the development of adequate governance and early stage financial engineering. If projects are not engineered better financially, it will be very hard to address the challenges. In the Netherlands, a concerted effort is being made by public and private entities to build the Dutch water sector's project development skills and involve financiers at an early stage to increase the bankability of projects. Its governance structure that has matured over the centuries may serve as an example to address water management issues worldwide.

[1] McKinsey Global Institute's report 'Bridging Global Infrastructure Gaps', June 2016 estimates.

Prof.dr. Sybe Schaap

Chairman Netherlands Water Partnership

CITIES AND DIETS

Can good food become the new fast food?

Few factors have more impact on environment and human health than the consumption of food. All over the world solutions are being sought for urban supply. The current world population of 7.6 billion is expected to reach 9.8 billion in 2050 with 70% of the population living in cities. 90% of this urbanization will happen in Africa and Asia.

Progressive urbanization and globalization are leading to the homogenization of urban diets. The global proliferation of transnational retail corporations and fast food chains certainly brought more food diversity. But also a greater exposure to unhealthy foods, stimulating the consumption of energy dense foods high in salt, sugar and fat. As a consequence, the number of people affected by chronic non-communicable diseases (NCDs) related to food consumption is spreading rapidly to the emerging markets of Asia and Africa. Particularly the accelerating rates of overweight and obesity among children is troublesome. Readily 75% of all overweight children under five live in Asia and Africa. With a looming epidemic in NCDs, everywhere in the world, cities are facing the pressing issue of reversing this trend and creating a sustainable and healthy food system.

In the urban food environment, unhealthy processed and fast-food is omnipresent, cheap and convenient. Healthy food choices are constrained by the typical realities of urban living, such as a lack of time for shopping and meal preparation. Moreover, food choice is related to the social and economic status of citizens and linked to disparities in the accessibility of healthy foods. Higher price levels, inconvenience, unavailability and lower food health awareness are among those disparities. Socio-economically vulnerable groups suffer from demonstrably less healthy dietary patterns and poorer health. Overweight and obesity, for example, are strongly related to lower income and lower education levels.

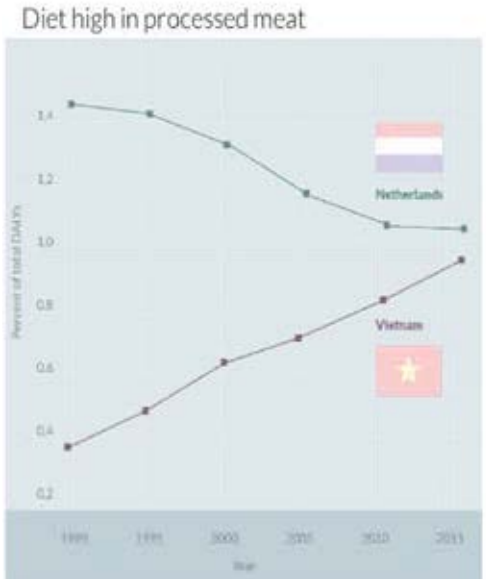
To mitigate the risks of rising inequality especially in the light of the progressing urbanization of poverty in LMICs, urbanization needs to be paired with appropriate policies, institutions, business models and strategies. Ensuring that all urban residents,

including the poor, have access to high-quality diets is a key priority. Urbanization implies that more and more people become reliant on food purchasing. But who's going to capture this growth in an inclusive, sustainable, safe and healthy way?

To what extent can good food become the new fast food?

Ensuring the ecological and nutrition quality of food and diets requires a broad approach. It needs to include the integration of food supply into urban planning, food-based dietary guidelines and labelling, technological innovations and the revaluation of business models and responsibilities. The good news is that health awareness across the globe is growing, in which consumers seek fresh, natural and minimally processed foods. Citizens and consumers tend to be much more involved in food and nutrition. Moreover, in emerging-markets health and safety attributes are specifically highly valued and consumers, including the poor, are also most willing to pay a premium for food safety and health benefits. At the same time, a general rise of food safety concerns and eroding confidence in high technology food engineering, put the industry and policymakers before a major challenge.

Urban economies of scale can make it easier for business to innovate, but technological solutions to ensure urban food security need to integrate societal acceptance for an inclusive fit.

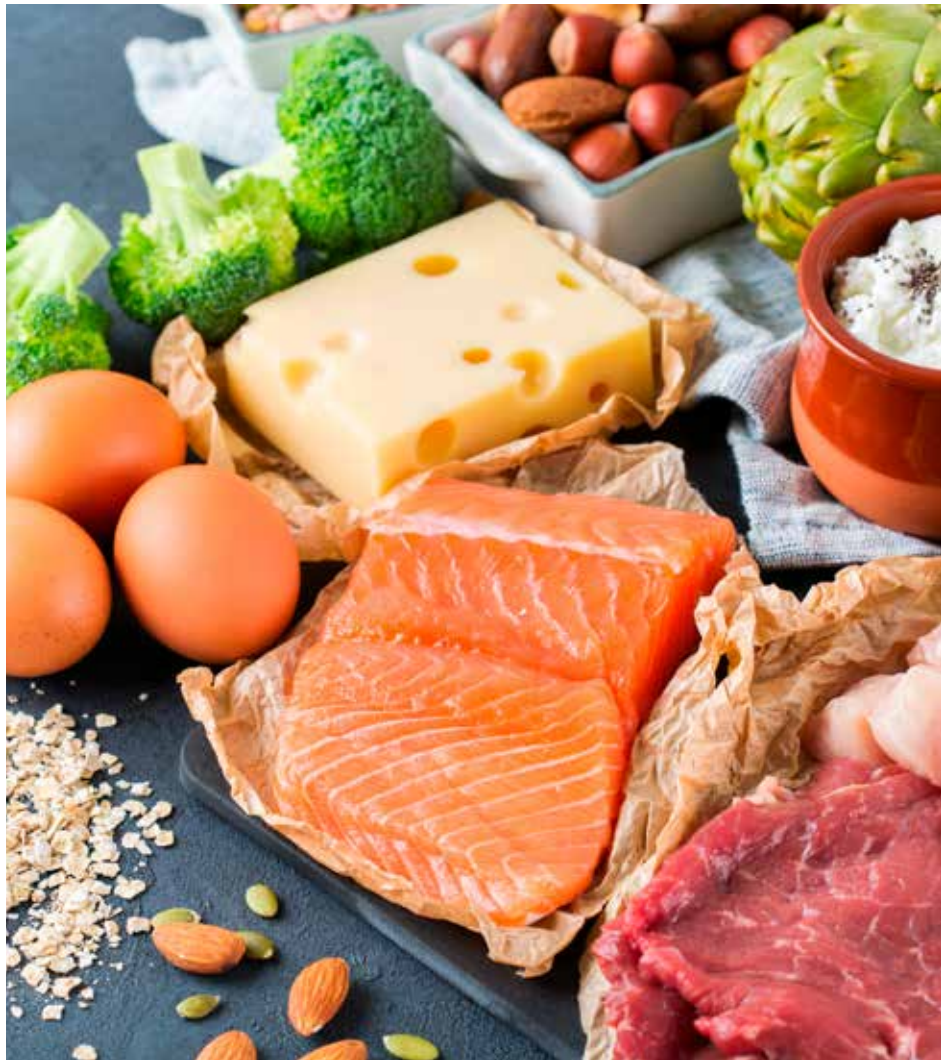


Prof. dr. Sigrid Wertheim-Heck

Food and Healthy Living, Aeres University of Applied Sciences

PRODUCTION OF ANIMAL PROTEIN

in the future: challenges with perspectives



The 20th Century was the era of the so called Green Revolution: to secure enough food (“no more hunger”) by increasing the production capacity, efficiency and intensity of crops, such as wheat, rice, corn etc. This was so successful that a substantial part of this crop production was used to produce animal feed, next to human food. This led to intensification of livestock production systems.

Now, in the 21st century we are moving into a Protein Revolution, to secure healthy nutrition (“no more malnutrition”) in the form of a White Revolution (more milk and dairy; or white meat such as poultry) or Blue Revolution (more fish, other seafood and seaweed). An increase in protein production is to be expected as more middle class people in developing countries can afford to shift to a more protein based diet. Urbanization provides better logistical perspectives for animal protein supply from farms in the metropolitan areas. The trend to consume less meat in developed countries will hardly have any effect on this expected increase.

The Dutch livestock sector is world famous for its efficiency, with a doublingof the production capacity since 1960 while at the same reducing the environmental emission intensity. The sector is characterized by a high adaptive capacity to new technologies (genomics, biologicals, feed processing, barns, sensors, robotics) and to societal challenges such as the need for climate smart production, health concerns, animal welfare and impacts on the environment. This integrated approach is based on the scientific concept of “Livestock Farming with Care”. Stringent quality control safeguards the undisputed quality of these products. As a result, substantial volumes are traded for an orderly price.

Nevertheless, we are again on the eve of a radical shift in mind-set regarding the food production system to broaden our focus from merely production efficiency by sustainable intensification, towards a more ecological and efficient, smart use of resources.

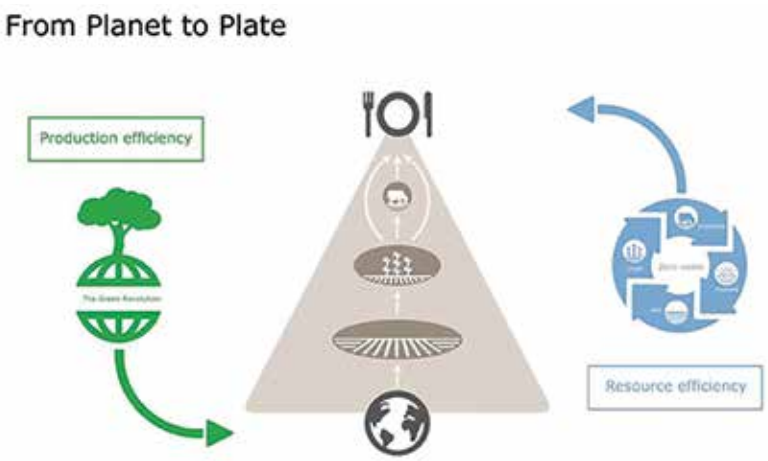
Optimizing the use of resources like nutrients, sun, water, soil, microbiome, nature, to name a few, is to ensure that production remains within the carrying capacity of the planet.

Agricultural systems analysis clearly shows that natural resource use and associated emissions can be reduced substantially by switching to a modern, circular food production system.

For animal protein production this means that livestock production systems will be more aligned with residual biomass resources from crop and food production (ovals, swill, byproducts), in addition to ecological intensification of grass based livestock production. It also will contribute to closing loops in the food system; fertilize agricultural soils primarily with high-quality organic matter produced in agriculture, such as animal manure. Good manure based organic soil quality paired with a balanced groundwater dynamics can do a lot of things: contribute to higher yields, serve as a buffer for extreme weather conditions, limit losses to the air and ground & surface water and contribute to ecosystem services such as biodiversity and mitigation of climate change by sequestering carbon in marginal and eroded agricultural soils.

Land and land based resources are limiting factors for animal protein production. However, 70% of the earth's surface is covered with water. Fish and other seafood is a major source of essential proteins, omega-3 fatty acids and micronutrients., while currently it only supplies 17% of the animal proteins in human consumption. In addition, seaweed provide an important stock of feed and fertilizers. Both fisheries and aquaculture need to be led to a well-governed form of ocean farming allowing use of the full marine and fresh water production capacity in a sustainable manner. It might lead to a doubling of the current waterborne protein production.

In conclusion, the key to smarter resource use can be found in the proper understanding of the ecology behind food production, and in using novel technologies to foster these ecological principles in an integrated, resilient circular agroecosystem. In line with what in Wageningen is referred to in our adage "*to explore the potential of nature to improve the quality of life*".



Dr. Martin Scholten

Wageningen UR, Board of directors
Animal sciences & Marine research

PLANT PRODUCTION

Continued population growth and urbanization pose new challenges to agro-food systems, and to the agriculture that must supply them. Put simply, the amount of resources (land, inputs etc.) available to agriculture is limited, meaning that the challenge of ensuring continued production growth, and therefore low food prices, is one of doing more with less.

Without agriculture, population growth, urbanization and increased prosperity are impossible. But they are also competing for natural and human resources and all contribute to and are affected by climate change. The result is an antagonistic system that must be resolved.

Climate change will lead to more extreme and erratic rainfall and temperature patterns, along with a general increase in temperature. Combined with declining groundwater resources these changing conditions will produce a 10 percent handicap to the yields of major cereals by 2050. Without further actions, wheat yield gains will fall below the level of 1.5 percent per year needed to keep up with demand.

Maize and wheat, along with rice, provide half of the world's food energy supply. Urbanization and prosperity are also driving an increase in meat consumption, with the livestock industry responsible for half the growth in demand for cereals, especially maize, the most efficient source of animal feed.

While the cities of the future will have greater calorific needs, the challenge is to ensure that available food also provides adequate nutrition while being affordable within the context of a culturally preferred diet. This means that agricultural science must be responsive to the needs of the market, industry and society, with a direct impact on our investigations right down to the genomic level.

In areas such as Sub-Saharan Africa, where the known gap between potential yields and actual yields is greatest, a great potential can be unlocked by proper application of current agricultural knowledge. Markets, information systems, local food industry and policies must be aligned to provide the conditions needed for improvements. Elsewhere, plant science will have to break new ground to address the decline in yield gains, while accelerating the development-adoption cycle of agricultural science to adequately

respond to the significant challenges that lie ahead.

The falling cost of genotyping-by-sequencing has the potential to revolutionize the pursuit of plant genetic gains by introducing time and resource savings, especially in combination with marker-assisted breeding approaches. However, two bottlenecks persist: the ability to process and model all this data and the ability to phenotype plants in the field.

In the case of the latter, high-throughput phenotyping platforms using remote sensing technologies and modeling are already in widespread use in the private sector. These are able to rapidly collect data on crop performance over time while controlling for environmental and spatial variance. The challenge is to develop these platforms further and spread their use at low cost to the public sector and smaller private enterprises.

Coupled with free exchange of germplasm and more international partnerships, crop breeding can move much faster to develop varieties with greater tolerance to drought, heat or waterlogging stress, and that make more efficient use of nutrients.

Gene editing technologies have emerged that promise a non-transgenic route to rapidly incorporating new traits and crops. In particular, the CRISPR/Cas method is proving to be more versatile and efficient than other methods, while being cheaper and easier to perform. This technology will help breeders broaden their understanding of the function of genes, and the powerful ability to alter that functioning. Finally, important areas of research still remain to be explored, such as increasing plant photosynthesis efficiency. And in some cases, for example the development of hybrid wheat varieties, much greater collaboration within the private sector and with public research institutions will be needed to develop the base technologies required.

For these advances to occur, more investment in agricultural research is needed, in both the public and the private sector. Furthermore, greater use of collaboration and partnerships is required both to pioneer new approaches to agricultural research, and to ensure that new technologies are adopted where they are needed. Only then will the global agri-food system be capable of feeding tomorrow's cities

Prof. dr. Martin Kropff

Director General CIMMYT - International Maize and Wheat Improvement Center, Mexico

GREENTECH FARMING FOR MEGACITIES

Towards a new production paradigm in greenhouse horticulture

Re-thinking the dominant model

These are exciting times. We are reaching a tipping point in greenhouse horticulture. Notwithstanding the fact that advanced greenhouses are still the dominant way of producing vegetables, fresh produce, plants and flowers, the world in horti-culture, and particularly greentech, is changing due to changing demand from megacities.

The rise of novel indoor farming concepts in cities

Feeding megacities will require novel indoor farming concepts and challenge the dominant paradigm in horticulture to think in at least hybrid forms of production systems. Away from production in endless hectares of horizontal greenhouses far from the urban customers, towards a variety of forms of indoor and vertical farming. Feeding the world means more and more securing access to fresh food in megacities where 5 billion people will live in 2030. Most of these megacities will be in Asia, where a growing middle class is up and coming. They have spending power. Access to and availability of fresh and safe food becomes more important than a low price alone.

Yes, there is still a huge demand for building horizontal greenhouses at large distance from cities where land is still cheap. But lots of experiments on novel farming are going on worldwide: vertical farms, container farming and fully controlled climate rooms in buildings. These formula's may offer more sustainable solutions closer to customers in cities, with less waste, less transport and pollution, and absolute freshness. With these new concepts the distance from farm to fork will be minimal.

Public demand

It is expected that public demand, particularly from governmental authorities and city councils of megacities will increase to safeguard the basic needs of a healthy and productive population. They will look for innovative solutions that are quick to install. Long-distance greenhouse production may suffer a loss of 25-35% or more of the harvested production due to transportation and inadequate infrastructure. But this practice is too costly and unsustainable to fit in the Sustainable Development Goals (SDG's) as proclaimed by the UN in 2015. Moreover, it is not necessary anymore with new growth concepts at hand.

Citizens want a healthy style of living

Particularly in the cities a new kind of consciousness is rising to live a healthy life. Sports and exercise is what people do to keep in shape. However, a healthy life starts with a healthy diet: enough nutrition, fresh food full of natural anti-oxidants and vitamins, fresh greens, salads, fruits are the first things that come to mind. In the Netherlands these ingredients abound at affordable prices all over. Comparing to other countries in the world, this it is an exception, because in many places fresh produce is expensive and hardly available for daily consumption; there is scarcity. Room for innovation, therefore, in the way production is getting organized.

Experimental and commercial initiatives all over the world

An international comparative survey*) shows that many experimental initiatives are already being undertaken to fill the gap. In the more advanced stage vertical and indoor farming logically blend with the concept of Smart Cities, being worked on in China, Singapore, and selected cities in India. Although it may look simple from the outside, to create a successful climate controlled indoor or vertical farm requires a lot of combined high tech: climate systems, LED-lighting systems, water systems and growth protocols, all of them based on data and digitalization.

Greentech business in horticulture

What will the integrated concept of advanced urban farming look like? It is a data-driven, at distance monitored growth system where recipes for fresh produce secure stable production through the year.
An integrated concept including advanced knowledge, combined information, construction, installation and relevant data. A different cup of tea from growing tomatoes.

Clusters and networks have to blend into a larger ecosystems where collaboration is key. After all having many specializing companies is great, but creating collaboration between them is even better. Dutch entrepreneurs enjoy the competitive advantage of their world class position in horticulture and supply service to the green house sector.

Cooperation enables them to propose tailor made growth recipes for fresh produce for specific locations/megacities in the world. Allow for a glocalized approach where world class technology and deep inside plant knowledge is combined with local tastes and preferences.

Maybe a bridge too far for some. But it is creating trade with a higher value and leads to a higher quality of fresh produce, more productive and energized populations, as well as an impulse to local employment, local trade and more sustainable logistics in mega-cities around the world. A real contribution towards the World Goals (SDG's).

Inter-generational knowhow is key in the transformation process and it will be applied with artificial intelligence and dynamic innovations in installation technologies, robotics and drones.

Not so much the production of fresh produce, flowers and plants will be the head of the game, as will the knowledge of the systems to produce in stable, high tech climate controlled environments.

Prof. dr. Annemieke Roobeek

Professor for Strategy and Transformation Management at Nyenrode Business University

CEO/Founder of MeetingMoreMinds

URBAN AGRICULTURE

In The Netherlands and worldwide

Urban agriculture, “growing food in the city, for the city and with resources from the city” (UNDP 1996), is gaining prominence, both in high tech (vertical farming) as well as low tech versions (open field market gardening).

Urban agriculture has been part of urban food systems since the very first cities emerged. Over the last decade it has attracted more attention with high food prices sparking off urban unrest particularly in Africa and the Middle East. At the same time in Western Europe and the North Americas the economic crisis left urban land and buildings vacant; available for food production by local communities not reached by conventional supermarket supply (vdSchans et al 2012). Cities such as Toronto, London, New York, and Milan re-discovered their dependency on the global food system, and developed policies to become more self-sufficient. At the same time they stimulate citizens to physical exercise, eat healthily and more sustainably (less food waste, more plant based).

In the Netherlands we also find urban agriculture projects, both citizen driven as well as commercial. Uitjeeigenstad in Rotterdam grows a variety of produce both out- and indoors. Urban farmers in The Hague grew aquaponics (fish & vegetable) inside and on top of a building, GROWx in Amsterdam is doing vertical farming (microgreens and herbs).

Interestingly however, according to Oxfam International the Dutch already have the most plentiful nutritious healthy affordable diet (Oxfam 2014). The country is more than self-sufficient in many food categories, such as tomatoes (290%), vegetables (241%), eggs (314%), and potatoes (180%). There is overproduction rather than shortage; continuous pressure therefore on prices for conventional farmers. Hence in the Netherlands

urban farming initiatives, that are primarily based on ultra-fresh food production, have a hard time to earn an income. All of the above mentioned initiatives went bankrupt or have difficulties to survive. Notwithstanding the severe economic crisis earlier in the millennium, urban agriculture initiatives connected directly to real estate (re-)development seem to fare rather well (this is called ''place making''). Villa Augustus in Dordrecht supplies a restaurant in a former industrial port area from a beautiful Victorian kitchen garden. Daktuin Zuidpark in Amsterdam is a beautiful rooftop garden on top of a redeveloped office building.

Lessons to be learned from the European experience have been summarised in a Cost Action on Urban Agriculture in Europe (Lohrberg et al 2015). A systematic analysis of the business models employed showed that there are five approaches to earn an income (van der Schans et al 2015):

- the products offered should differ from the mainstream supermarket or catering channels: ultra-fresh leafy greens, very ripe soft fruits, edible flowers.
- diversified sources of income, not just food production but also social and environmental services (social care, job coaching, recreation, education, water buffering, urban heath reduction, biodiversity).
- connection with the circular economy (re-use of unexploited urban resources such as vacant land, waste water, voluntary labour).
- community based models of urban food production/ consumption (consumer groups pooling their food purchases may take a more active role in the chain, even becoming co-owner of the urban farm).
- in saturated food markets, urban agriculture provides possibilities to reconnect with food and offers a meaningful experience that contributes to the quality of life.

Worldwide we see that long supply chains contain an element of risk, providing ever smaller guarantees that food supplies will be uninterrupted and affordable.

- Political tensions (barriers to trade).
- Climate factors (unpredictable mis-harvests).
- Technological risks (computer viruses attacking logistics).

Universal solutions are hardly available, only situation specific solutions depending on local climate, soil conditions, market demand, access to finance, etc. Producing food at home, however, a degree of self-sufficiency, is in the long run to be preferred over too heavy a dependency on foreign supply. Local circumstances will determine the ratio between imports and self-reliance. Hightech vertical agriculture may deserve consideration in a situation where land is scarce or water needs to be saved. Dutch entrepreneurs are already employing their technical skills in greentech projects overseas. Thus further developing their experience and knowhow.

Gradually a new balance will establish itself between urban and rural agriculture, between short and long food supply chains, between high tech and low tech agriculture, between producing or buying, between the city and the countryside. And trade will always be able to provide a temporary backstop.

Table 1. Types of urban agriculture, based on spatial location and level of control over production process

	open	mixed	controlled
building	Microclimates in and around the built environment (mushrooms, vines)	Rooftop gardens (vegetables)	LED light cabinets (vegetables) Urban livestock (rabbits) Aquaponics
inner city	Permaculture gardens (vegetables, fruits, nuts, roots) Urban livestock (bee keeping)	Kitchen and community gardens (vegetables) Urban livestock (chickens, sheep)	Urban livestock (worms, insects, etc.)
city fringe	Forest gardens (vegetables, fruits, nuts, roots)	Market gardens (vegetables)	Greenhouse nursery (vegetables)
periurban	Agroforestry (fruits, nuts) Extensive livestock (beef cattle, sheep) Ecological restauration	Mixed farming (livestock, staples, vegetables) Semi-intensive livestock (dairy)	Greenhouses and precision farming (vegetables, staples) Intensive livestock (pigs, poultry)

Source: Agriculture Economics Institute, Wageningen based on de Graaf (2011)

Dr. Jan Willem van der Schans

Wageningen
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AGRO - LOGISTICS

Many decades ago, food products were consumed close to where they were produced. Due to increasing globalization and urbanization with the rise of metropoles, the distance between production locations and places of consumption has increased significantly. As a result the complexity is multiplying to get food products to the right place, at the right time and in the right quality. Demands on these points are ever rising, and so is demand for food safety and sustainability. Agrologistics becomes an important industry contributing to the Gross National Product and job-creation.

Currently urban food distribution is moving from traditional to modern market channels. Supermarkets as well as convenience stores slowly but surely gain market share from the local (wet-)markets or small grocery stores. The recent developments in internet sales with direct home delivery fit this pattern. So do pick up points, where pre-ordered groceries can be picked up on the way home from work. These modern channels require frequent deliveries of small batches of safe produce with high and constant product quality that traditional supply chains do not seem to be able to deliver.

And so the coming years the focus on food safety, circularity and sustainability in supply chains will increase: smart food safety sensors, valorisation of waste- and side-streams, sustainable transportation and packing (less plastic), efficient reverse logistics, smart ICT systems for transparency, tracking & tracing, ordering and distribution. As a result, there is an increasing differentiation of markets and related value chain networks. They all require an effective logistics infrastructure, founded in a well-tuned in urban planning process. In this way agrologistics will contribute significantly to the UN Sustainable Development Goals.

In many cities the system for fresh food distribution is underperforming. The distribution in itself may already be complex. Add the number of transits and city-congestion, and high logistics costs as well as low responsiveness to customer orders are the result.

Poor packaging, rough handling and inconsiderate transportation further attack product quality. And if cooling is lacking or insufficient, food safety is at stake not to speak of significant food losses. Facilities, infrastructures, vehicles, but also products themselves need to be redesigned to reduce quality loss and to increase transport efficiency.

Comes in the human factor. Decisions need to be taken on the best location to add value within the logistic chain by packaging, quality-inspection, order-picking and bundling. But also on the establishment of cross-dock hubs and the location of pick-up points in case of internet sales. Standardized (modified atmosphere) containers should enable efficient transits and allow the choice of energy efficient multimodal transport options, using water or rail. Temperature control throughout the complete chain allows for product quality prediction and longest shelf life and for pro-active route adjustments if cargo-value is at stake. Shared economy (f.e. Uber) and drones will change food delivery stems in cities. And last but not least, modern distribution requires appropriate ICT systems (with electronic tags and sensors) that enable alignment of logistics practices and complete tracking and tracing of food products, f.e. with Blockchain technology.

Next to planning and the technological innovations mentioned, also organizational innovations are needed. Key is to improve the horizontal and vertical collaboration between supply chain actors. Only in this way the mutual trust can be generated that allows for smooth and well aligned logistic practices, intensive exchange of information, consolidation and bundling of goods from various suppliers. Actors and employees in the chain should be educated and trained to handle the product, aiming for best product quality and safety. They will have to deal with many innovations arriving in parallel, backed up by monitoring systems that control the flow of goods and ensure their safety, quality and traceability.

Agrilogistics and distribution will, in short, not only be important factors in reliable and safe food supply. They will supply income and jobs, high-tech en low-tech, to the expanding city population, old and new inhabitants alike. All in the interest of earning capacity and a viable, sustainable and future-proof logistic system.

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BIO-BASED ECONOMY

55% of the worlds' human population live in urban areas and is expected to increase to 68% by 2050 as a factor of both population growth and rural-urban migration. Urban areas will continue to expand swallowing other land-uses such as agriculture and pristine natural environments. As the human population increases and the living standards in urban areas improve, greater pressure is placed on the environment. The demand for sustenance and consumer products requires further exploitation of natural resources and releases of emissions, which ultimately have consequences for human health and wellbeing.

A transition away from a fossil resource economy to a Bio-based Economy is a solution, that its advocates argue, could help to mitigate environmental destruction. However, such a transition has potential challenges of its own.

The Netherlands provides an ultimate testing ground for such a transition for one particular reason, namely the limited availability surface area. The Netherlands is one of the most urbanized countries on the planet. Although the Dutch population is relatively small (17 million), the limited land mass makes the country quite densely populated. Despite having limited land and natural resources, the Netherlands ranks amongst the top 10 counties out of 199, in terms of the United Nations Human Development Index (HDI). It is also highly ranked in terms of GDP per capita, level of education, life expectancy and gender equality. The Dutch carbon footprint per capita, however, is also relatively high at around 30th out of 200 countries, depending on the data source and year.

Reducing carbon emissions requires changing consumer behaviour, including diet, switching to renewable energy sources and ultimately switching from a fossil-based economy to a Bio-based Economy. The Netherlands is well positioned for this transition. It is already a leader in bio-based innovations and has a sizeable chemical industry, altogether elements which open the way for high value biomaterial and knowledge exports

A Bio-based Economy utilizes biological processes throughout product supply chains and replaces therefore products derived from fossil resources. Organisms like algae, bacteria, commodity crops, crop residues, fungi, yeast and organic waste are the potential feedstock for producing different value streams. Biomass production starts with photosynthesis, converting sunlight, carbon dioxide (CO_2) and water into oxygen, and chemical energy. The plant itself uses this chemical energy for building up plant matter. The plant matter or biomass can then be harvested and transformed into fuels, biomaterials and biochemicals including pharmaceuticals. Essentially the switch from fossil resources to bio-based resources is a switch from one biomass, trapped under pressure beneath the earth surface for millions of years, to another biomass produced on

the earth surface at present. Coal, natural gas, crude oil and lignite, were once plants and living organisms and have accumulated as a large stock of carbon in the subsurface. Extracting these fossil resources and using them for fuels and products means releasing this stock of carbon as atmospheric CO2. The transition to the Bio-based Economy boils down to replacing the extraction of subsurface fossil resources with harvesting biomass from the surface to create similar products: fuel, materials (plastics and manmade textiles) and chemicals (pesticides, cleaning products etc.).

The transition has two key benefits: Firstly, it provides countries who do not have oil reserves but can produce biomass, with resource security. Secondly, biomass production sequesters CO2 from the atmosphere, which is stored until the end product degrades or is combusted (in the case of fuel). In other words, extracting fossil resources increases the stock of carbon in the atmosphere; using biomass from the earth surface allows the existing stock of CO2 to remain constant.

Utilizing biomass however requires surface space exposed to sunlight and this is exactly where the biggest challenge lies. Even algae production requires large surface areas to achieve the economies of scale that would allow it to compete with fossil feedstock in terms of costs.

Ultimately, the replacement of fossil resources with biomass may push for land-use change. Like its competitor, food or feed crops, it may turn previously pristine natural land into agricultural land and cause loss of biodiversity and destruction of natural habitats, that are already under threat due to ever expanding urban centres. The Netherlands does not have surplus natural areas that can be converted to agricultural land. The question is where it will obtain the biomass for powering the Dutch Bio-Economy. 53% of agricultural land in the Netherlands is dedicated to grassland for livestock grazing and 13% is dedicated to fodder crops for livestock. 28% is dedicated to crops for human consumption such as grains, potatoes and sugar beets. The remaining 8% is dedicated to timber, flowers, greenhouses and other agricultural uses. Some of Dutch grassland might be converted to crop production as feedstock for bio-based products, but most low-lying areas do not suit the purpose. Of the arable area worldwide a sizeable part is more suitable for plant conversion through animal husbandry than direct conversion into human sustenance. On marginal land a crop-change may help, fast growing willows e.g. may provide an example.

Worldwide part of the switch is already noticeable: the areas planted with oil-palm or soybean are a case in point. And they point to another factor in the equation, the role of trade. The Netherlands has always had to earn part of its keep outside its territory and rely on trade and investment. Consequently, like the imports of animal feed, some imports of biomass are already taking place. This is largely to supplement or replace coal in suitable energy plants. In addition, biomass from large, less densely populated areas, like its fossil competitors, is becoming subject to the law of comparative advantage.

Final relief may come in the end from a commodity of which the world has enough of and which is hardly being exploited for biomass purposes: the sea and the plants growing in it. Plant harvesting from water (sea or inland) has only just begun. On the Dutch coast, some experimental farming is already taking place. A (sea) weed industry may for food and biomass purposes produce unexpected advantages. Could in secluded areas, and after bio-fermentation, the residues of city-waste and manure from the intensive Dutch animal husbandry provide a boost for further, industrial development?

Time will have to tell.

Alistair Beames PhD

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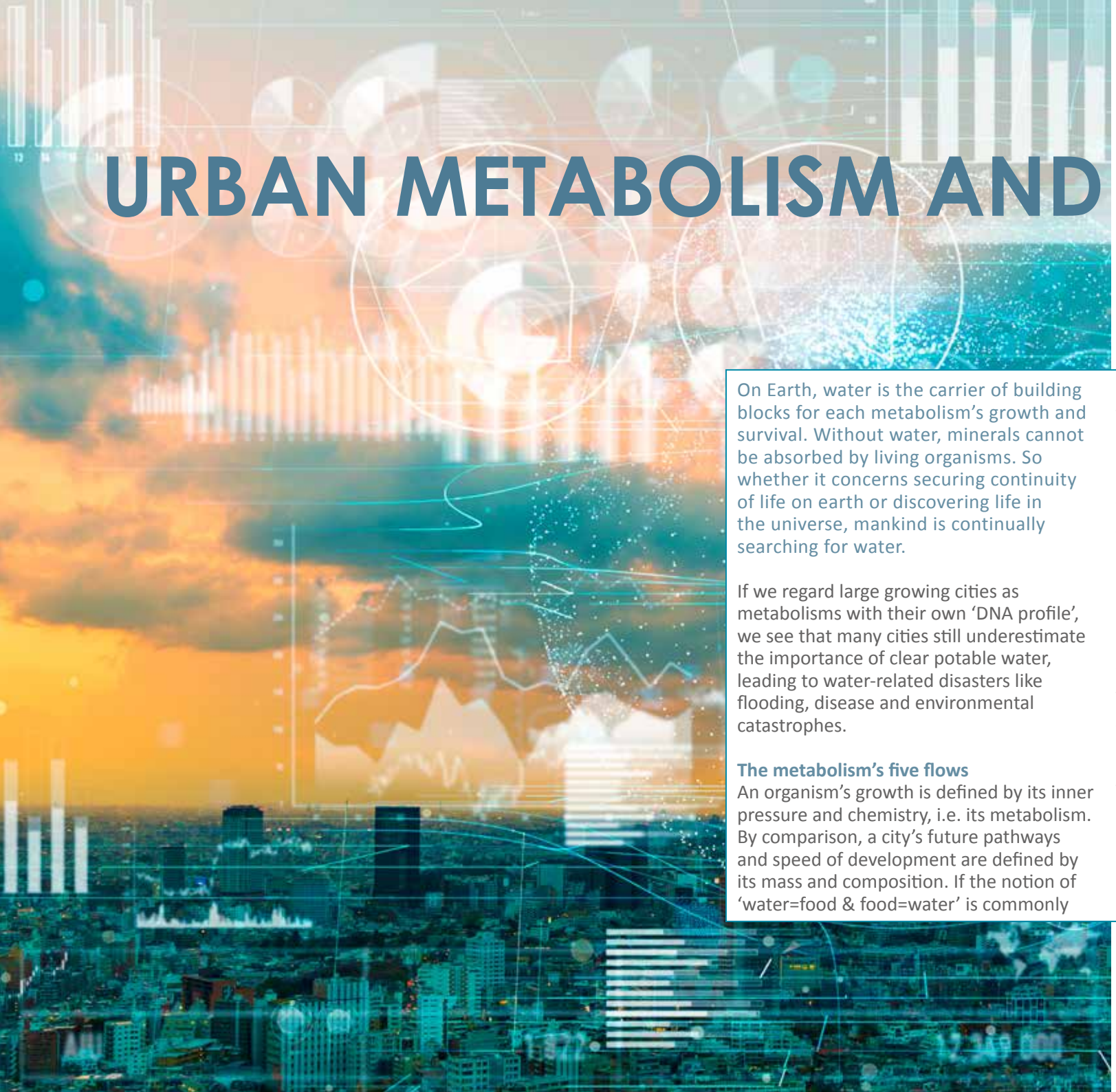
Ate Oostra

Ret. Ambassador & - Director General Agriculture



URBAN METABOLISM AND ITS DNA

On Earth, water is the carrier of building blocks for each metabolism's growth and survival. Without water, minerals cannot be absorbed by living organisms. So whether it concerns securing continuity of life on earth or discovering life in the universe, mankind is continually searching for water.

If we regard large growing cities as metabolisms with their own 'DNA profile', we see that many cities still underestimate the importance of clear potable water, leading to water-related disasters like flooding, disease and environmental catastrophes.

The metabolism's five flows

An organism's growth is defined by its inner pressure and chemistry, i.e. its metabolism. By comparison, a city's future pathways and speed of development are defined by its mass and composition. If the notion of 'water=food & food=water' is commonly understood and forms the guiding principle for developing sustainable cities, then every city should try to understand its DNA by analyzing the metabolism's five flows:
1. Flow of people; 2. Mass flows (e.g. water); 3. Energy flows;
4. Data flows and 5. Value flows (e.g. money).

Separate cities, each own DNA

Cities like Mumbai, New York and Shanghai can be seen as separate metabolisms, each with own DNA profile, when we analyze their flows and differences in climate, geography, historical developments, culture, political systems, economic systems and structures. The same applies to the Netherlands, when viewed as one big city.

Characteristics in common

Nevertheless, these cities also have characteristics in common. They need:

- protection against flooding (from upstream, the sea or severe rainfall) as they are situated in a delta.
- to feed 15 million people or more on a daily basis, requiring appropriate infrastructure.
- dedicated and resilient infrastructure to conduct mass flows throughout the city.
- sustainable solutions for energy security, to maintain the system and prevent chaos.

Main influence is smart use of data

As future cities develop their own specific DNA of hardware, software and orgware, the main influence on their flow dynamics is expected to be the smart use of data. With data as "the fuel of the city in the 21st century" (©: 'Baron & Roodink'), reducing food waste will gain in importance. To find tailored solutions for sustainable environments in 'urban metabolisms', the specific DNA of the local metabolism must be determined. Feeding tomorrow's cities entails urban planning becoming more circular and investment in food and water chain infrastructures being driven by more sustainable business models.

Changes in awareness and behavior

And implementing more inclusive solutions requires changes in awareness and behavior. This means investing in smarter and more dedicated packaging and logistics of goods (especially perishable products!), smarter use of data to enhance adaptiveness to the local DNA, sustainable integration of productivity and flows of fresh products within the metabolism's boundaries (more vertical farming and domestic food production systems, etc.).

Internet of Things will help adapt

IoT offers dynamic, interactive infrastructures with maximum transparency (e.g. Blockchain!), which can be combined with concepts like parametric modeling and adapted to local specifics and functionality demand. Business models will probably also be adapted to more bio-circular and disruptive "glocal" solutions. And for monitoring, controlling and adapting supply chain operations ('from farm to fork'), Digital Twin models will help adapt "glocal" systems to local DNA.

Future model: Bio-nodal network

Cities can thus be modeled as ecosystems and kept in balance with their environment, to promote their population's health and wellbeing. Proper master planning in the chains will improve circular functioning of a 'Bio-nodal network', reducing losses in the fresh supply chain according to Reduce/ Recycle/Re-use. This future model will reduce food waste through realizing Just-in-Time Deliveries and facilitating personalized diet orders. Combined with sensoring, Re-use opportunities will likewise be much easier to implement in society in a food-safe way. Recycling food components into food applications (instead of feed or digestion) will also offer new opportunities, although food safety remains a delicate matter.

Continual development and adapting

To conclude: in the interest of food security the lay-out and infrastructure of future cities needs continually to be developed and adapted in parametric models with learning algorithms, based on data exchange in neural networks and controlled by digital twin models, according to their 'specific city DNA'.

Wil Duivenvoorden

Domain Expert
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TOWARDS A FOOD AGENDA THAT CONNECTS

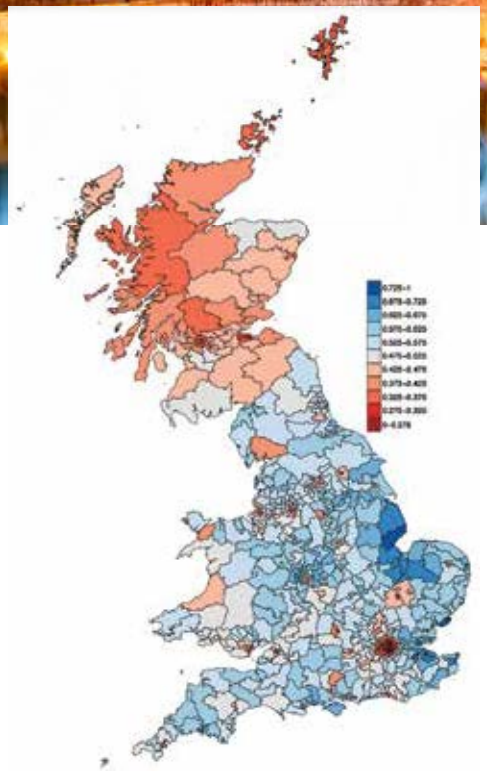

Figure 1: *Brexit vote was won in the rural areas, Remain scored higher in the cities and Scotland (June 2016). Source: YouGov, 2016*

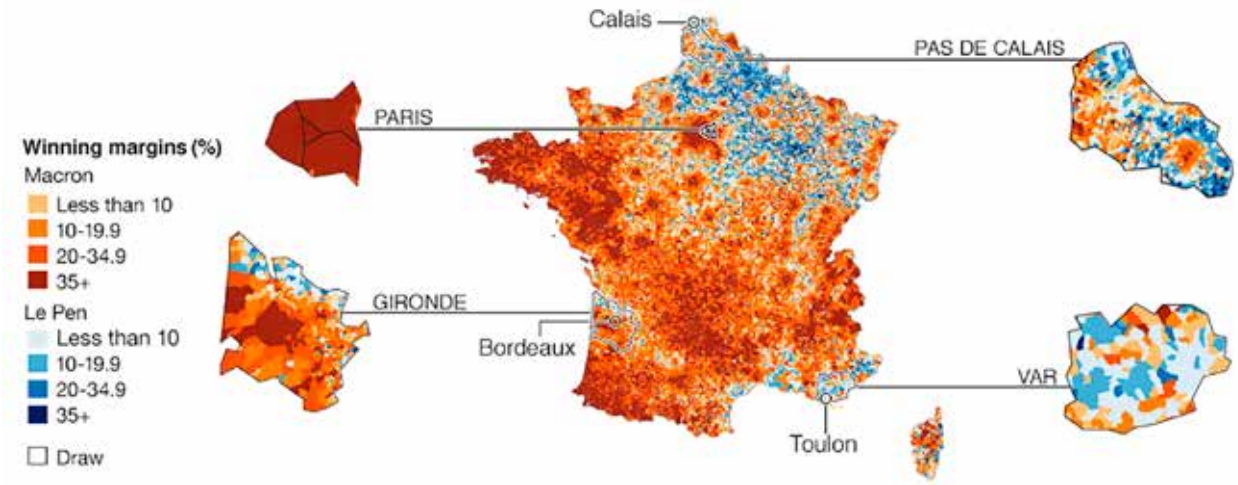

Figure 2: *Macron scored higher in the cities, Le Pen in de rural areas (Spring 2017). Source: BBC, 2017*

Cities play an important role on the world stage. Their environments however must continue to grant them this position. Cities and the villages and rural areas that surround them complement each other. They share a common interest to keep jobs, facilities, sports, recreation, food and nature as easily accessible as possible. After all, a city can also grow at the expense of its environment. Three examples show how important it is for a city and its surrounding country to function in harmony and with respect for each other's roles:

The great appeal of London as a financial centre has contributed to making the city unaffordable. While London and its inhabitants are benefiting from the enormous prosperity, the average Englishman in the countryside does not cash in on this development. Income differences and segregation are increasing. The consequences are known: the elderly, mostly, and the British people in the countryside show antagonism towards London. With the help of the media and populism a referendum was called for and the European Union was cast as the culprit, with an approaching Brexit as result (see Figure 1).

Paris also has problems with major contradictions between the inner city and the 'banlieues', its large suburbs where poverty and socio-economic disadvantages prevail. French president Macron won in the cities but Marine Le Pen from the right-wing populist Front National won in the rural areas.

Finally, also in the Netherlands the boundaries between the city and its surrounding area are becoming increasingly visible. Figure 3 shows that the situation is not yet as extreme as in France and England, but the populist voice does sound louder in the rural areas in the South and East of the country.

Rabobank is eminently well positioned to connect the cities and their surrounding country. The bank is active in both the cities as well as the local communities in the villages and rural areas. A theme in which the bank traditionally is well-positioned, is food. The food agenda connects the city with its many consumers and the surrounding area with its agricultural producers. A regional food agenda not only helps to improve social cohesion between the city and its surrounding area, but also facilitates the transition to a less CO2-emitting, more circular food chain. By actively linking the food agenda to the energy transition, smart mobility solutions and health gains, Rabobank can help to grow a better world, together.

Figure 3: Populist voters live in the southern and eastern rural part of the Netherlands, not in the 4 largest cities (March 2017). Source: Josse de Voogd

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GREEN, COLOURFUL CITIES

The following is an excerpt from a speech held on October 30, 2018 after a visit to Tirana, Albania. The speech covered art, city-green an public-private financing. The excerpt is dedicated to city-green.

Art, public space and city green are testimony to the way a city is faring; to the way a city is run. I am trying to draw lessons and inspiration from a comparison on these points in a number of cities. To my agreeable surprise such lessons were taught to me by the changes in Tirana, Albania.

In the Townhall of Siena, the Palazzo Pubblico, a world famous fresco of Ambrogio Lorenzetti pictures the contrast between good and bad governance. Fruits of good governance: beautiful houses, well-dressed noblemen on horseback, dancing ladies, trade, education, construction, ateliers, sale of agricultural produce. There is peace and harmony. And also the surrounding country-side benefits. Noblemen and farmers with their livestock come and go. The fresco shows villas and castles, good harvests, good infrastructure; one travels freely without fear.

Which country, I thought in front of the fresco, would not opt for good governance. For a long time it was Albania. “The Balcans produce more history than they can consume”, Churchill once said. For a long time Albania turned its back to the world and isolated itself with barbed wire. After communism in the early 90-ties it slowly got up, precariously eying the economic abyss. But the tide now is turning and Albania is catching up. The former Mayor of Tirana, Edi Rama, presently Prime Minister, has given this process a boost. He’s an artist (also sportsman) and a romantic at that. For him art is free, without rules. No art without freedom. It shapes ideas and beauty; consoles and inspires. It is moving almost, to see how the soft qualities of art have helped changing a city. Edi Rama started to conquer his depressed and grey town with colour. He compares his use of colour with “lipstick” or a “summer-dress”. But for him this has always been more a political action than an action of art. Tearing down 5000 illegal buildings he created public space, planted 50.000 trees. “Beauty was giving people a feeling of being protected”; “beauty acts as a guardsman, people stop throwing litter on the streets”. And it worked: where the city-scape improved, the city got safer and livelier.

Bryant Park, New York, provides another example of successful management of city-green. Where the park had fallen out of grace and was unsafe, a private Bryant Park Corporation of adjacent inhabitants and companies succeeded in turning the tide. It did away with enclosures, set rules how to deal with homeless people (tolerance, but order) and introduced active rotation in the silent parts of the park. The city still pays for the park’s upkeep but is pleased with the success of the public-private formula. Ten conditions, it was learnt, determine successful city-green: Safe, clean, consent of the neighbourhood, toilets, seats, light, plants for all seasons, programming, outlay, management. Neglect of these conditions, or of more than a few, lead the park to disfunction. Public green in principle benefits from involvement of both citizens and city government. New York’s Central Park offers another example. Where in the 80-ties the park registered 1000 serious crimes (rape, murder) a year, today only 60 so called light crimes, half of which “comfort-related”.

Cities are not just super-large villages. The difference is that cities are “full of strangers” (where in a village people know on another). Cities need space where “familiar strangers ”feel at home and meet. Cities are about people. Former Chief City-planner for New York, Amanda Burden on cities of the future: “it has to be green, has to be environmentally friendly, has to deal with mobility and integration”. Her approach is basically the same as Edi Rama, who created small parks in Tirana. New York creates the High Line and is greening the riverfront of Manhattan and Brooklyn. Governors Island, Battery Park, Brooklyn Bridge Park, all instant successes from the day of their opening and cherished by their neighbourhood and visitors. Financed, I note, with public private funding, much as the fly-over in Taiwan of Winy Maas’ MDRDV (also architect of a/o Markthal and Floriade ’22, ed.).
Everyone is fond of parks, I dare to submit. The places where, a universal pleasure, “people watch people doing the same thing”. Parks connect; young and old, rich and poor, bridge social class and station. They belong to the most appreciated forms of public space. They also make money! Real estate adjacent to a park notes a 15% higher value than similar buildings “next door”.

Creating a successful park is simple and complex at the same time. The biggest city-park of the 20th century, the Amsterdamse Bos (935 ha) was designed by a team combining the skills of sociology, biology, city-panning and architecture. It is well-planned, well-designed, well-managed.Without these prerequisites parks are accident-prone. We’re all familiar with the precarious task of city-services to please users, visitors and neighbours at the same time.

New York and Tirana show how to improve. I am convinced that a combination of the public and government and of public and private financing can make public spaces and parks grow and florish! Next decennia are calculated to see an amount of over 100 billion € coming available for philanthropy. Its disbursement requires an agenda. And parks undoubtedly should share in it. Did not Andrew Carnegie write: ‘No more useful or more beautiful monuments can be left by any man than a park for the city in which he was born”

Colour and green are vital for any city and their importance will only grow. So will our attention to “green”. Green is good, green is healthy. Parks therefore are good and: People love parks.

Wim Pijbes

Directeur
Stichting Droom en Daad

PERSONALIZED MEAL BOXES

against food waste

The European Commission has made the transition to a circular economy a priority and the Dutch government has stated that the economy should be circular by 2050. Momentarily only 9,1% of the global economy is fully circular. This means that around 91% of the materials we use are lost after use. The urgency of the circular transition is the greatest in cities. Worldwide, 54% of the population lives in cities, and that proportion is growing year on year. The United Nations Environment Programme (Unep) has calculated that 75% of natural resources are consumed in cities. The food sector is looking at how to become more circular and one of its focus areas is reducing food waste.

Numbers about food waste are showing the size and scope of the problem. Developments in technology which contribute to precision farming or cold chain solutions help to decrease food waste with farmers and food manufacturers. But trends in food and developments in technology can also reduce food waste on the consumer side.

Technological solutions, such as apps that help consumers buy food that is otherwise thrown away. Or electronic chips in food packaging that can indicate if fish or meat is still fresh and can be used. This offers a better and more scientific alternative to the expiration date. But another less obvious innovation in the food sector can also help combat food waste: mealboxes. And specifically, personalized mealboxes.

The demand for meal boxes has grown considerably in recent years. It is convenient for consumers, there is no need to think about the evening meal, and the shopping process is also less intensive, but you end up with a healthy meal. When combined with personalized dietary advice and taste preferences the mealboxes can add even more value.

Already several companies offer personalized dietary advice with help of DNA sequencing. Habit, a start-up that has teamed up with research partner TNO, is an example of such a company. Habit links DNA data to the data from a Fitbit device, which monitors exercise, sleep patterns and weight increases and decreases of users via smart patches and apps. The link to Habit will provide consumers with dietary advice that fits their lifestyle. Consumers working with Habit are given a list of ingredients and recipes. In addition, the company is working on a plan for meal boxes.

Meal boxes can help tackle the challenge of food waste in one of two ways. Firstly, by providing exactly the right of amount of ingredients needed. Research by the American meal box supplier Blue Apron showed that this can reduce food waste by 62%. Secondly, the demand for food will become predictable thanks to the boxes, so that at the end of the chain farmers know exactly what they can sell. This can reduce overproduction, and by halving the food waste the CO2 emissions can be reduced considerably.

ABN AMRO estimates that mealboxes could decrease food waste in households by 50%, this would not only save 2,100 kton of CO2 emissions in the Netherlands alone, but it would also save 11% of money spent on wasted ingredients. Which means an average household could save € 360 per year and reduce CO2 emissions the equivalent of a roadtrip from Amsterdam to Moscow.

ABN·AMRO

https://insights.abnamro.nl/en/

APPLIED SCIENCE

It takes people to feed the world

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Climate change, the scarcity of water and other resources and immense variations in local conditions make feeding the world's population a complex challenge. A challenge that demands answers in the form of solutions, and above all the involvement of people.

At Aeres University of Applied Sciences, we focus on educating and training a wide range of professionals capable of finding such solutions from multiple perspectives. Our aim is to generate competence and skills in the green sector; our motto is: 'Talent for Growth'.

Education, research and knowledge transfer

With deep roots in the innovative Dutch agricultural sector and an extensive international network, Aeres examines all aspects of food-related issues. Many practical studies are performed under the guidance and coaching of lecturers, widely recognised as experts in their specific fields. Aeres transfers the insights obtained through international educational programmes, cooperation with other knowledge institutes and specific development projects.

Feeding urban areas and efficiency of resource usage

In response to the challenge of feeding the ever-growing urban population Aeres has developed programmes relating to Urban Food Production. The dwindling availability of water and other resources calls for efficient and sustainable land use for plant-based and animal-based production. It is another vital focal point of our research and education.

Aeres is a pioneer in facilitating e-learning and seeks to develop new forms of knowledge transfer that utilise the latest technology.

The power of partnerships

Aeres generates added-value expertise thanks to its many partnerships with public authorities and government agencies, universities and the business sector. These alliances have occasionally resulted in specific expertise centres; the internationally renowned Poultry Expertise Centre is an example.

FEEDING (AND GREENING)

Megacities is what we stand for

The current food system is in need of revision as our earth is facing gradual exhaustion.

As a university of applied sciences, our ambition is to turn this tide. We want our students to be able to see themselves later in the mirror and know that they had a positive impact and contributed to the development towards a sustainable food system.

Sustainability, healthy and creativity are the profiling themes for Inholland; in the Domain Agri, Food & Life Sciences we develop specific knowledge on food, life and health in megacities. Our institutes are located in the heart of the Randstad, between the food-producing and processing companies, the logistic hubs and the many consumers. A wide array of knowledge and expertise is available to conduct practical research together with the companies mentioned, organizations, government and knowledge institutes.

Inholland believes that cross overs between disciplines generate innovation. For disruptive innovation is necessary to be able to feed the world's citizens in 2050, to ensure a healthy living environment and availability of sufficient resources to live and consume without destroying the earth. Inholland stands for practical research with impact and preparing young people for professions that really matter.

inholland
hogeschool

www.inholland.nl/opleidingen
/interessegebieden/
agri-food-and-life-sciences/

HEALTHY EATING,

through our great local brands

Healthy eating

Through our great local brands, Ahold Delhaize is committed to promoting healthier eating. Not only because meeting our customers' rapidly evolving needs for healthy fare is great for business. But because few things can be more important to the lives of our customers and communities than their good health.

What's happening

Increasing global awareness of the links between health and nutrition is driving a seismic shift in shopping patterns. Also demand for healthier products is growing - and growing fast. An example of this trend is the large-scale migration of consumers from full sugar sodas to alternative beverages such as no-calorie sparkling waters.

Across the globe and in our own markets, healthier eating for a growing number of customers means natural ingredients and more organic choices. At the same time, just as the world makes inroads into combating global hunger, we are overshooting in the other direction. The proportion of people struggling with being overweight now surpasses those who are underweight.

The good news is that this can be reduced by changing everyday behaviors such as eating better, moving more and avoiding smoking and substance abuse.

Our goal

In 2015 we set an ambitious target: healthy food sales to make up 45% of our own-brand total by 2020.

By the end of 2017 and three years ahead of schedule, healthy food sales surpassed 46% and we have now increased our target to 50% across all Ahold Delhaize brands by 2020.

Healthy eating is fast becoming the new normal for the general shopping public. To both respond to and drive this trend, more and more of our own brand products meet criteria for healthy sales.

Our approach

In the U.S. we use Guiding Stars to indicate the nutritional quality of our products, while in Europe and Indonesia we use Choices International.

Ahold Delhaize brands also join with community organizations, NGOs and other businesses to work towards United Nations Sustainable Development Goals 2 (Zero Hunger) and 3 (Good Health and Well-being).

What gets measured gets done

Ahold Delhaize is the only supermarket group that tracks sales of healthy products across all its brands.

For more information on what our great local brands are doing please visit our website.

Ahold Delhaize

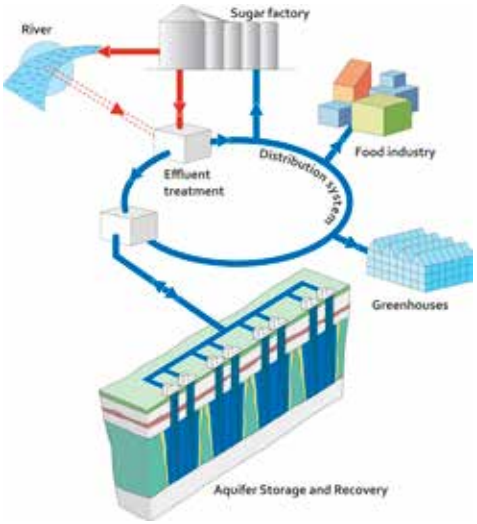
http://healthy-eating.aholddelhaize.com

ALLIED WATERS – SALUTIONS

Securing water for food

Allied Waters focuses on implementing game-changing innovations in the urban water cycle that are "driving the circular economy". Innovative solutions to water scarcity, turning residuals into resources, new energy/water concepts based on green hydrogen and new bacterial proteins are a flavour of the topics covered under the Allied Waters umbrella.

We collaborate in Collabs, public-private partnerships including research centers, commercial-enterprises and end-users. Allied Waters reinvests any profit into research and development in order to generate new innovative solutions.



Continuous availability of high-quality water is essential for modern agriculture. Yet, freshwater availability is under increasing pressure worldwide. Securing fresh water for drinking water, industries, and agriculture requires innovative thinking in water resource management and use of nature-based solutions. We are dedicated to implementing these solutions to help you meet your water demand.

Allied Waters - SALutions capitalizes upon 65 years of water storage and treatment experience that has successfully secured water supply in urban coastal regions in The Netherlands, adding new features to secure water availability in various environments and at various scales.

Rainwater harvesting and aquifer storage

Glasparel+ is a 90 hectares ultra-modern greenhouse horticultural area in Waddinxveen, the Netherlands. The water demand is fully met by rainwater from the greenhouse roofs and 26 hectares of surrounding industrial zones. The very effective storage in deep sand layers in the underground (Aquifer Storage and Recovery: ASR) using groundwater wells is chosen to cover for seasonal variations and prolonged droughts while keeping the spatial footprint limited. The water facility consists of small aboveground reservoirs connected to three ASR well fields that store large volumes of rainwater. Altogether up to 600 000 m3 of excess rainwater can be stored per year. A fully automated installation allows for the injection of the rainwater via the ten ASR wells and the supply of the recovered water to the greenhouses when demanded.

Growing tomatoes on reuse water from sugar beets

At the Nieuw Prinsenland greenhouse cluster in Dinteloord, the Netherlands, effluent from the neighboring sugar factory is converted into large volumes of high-quality irrigation water. Aquifer Storage and Recovery (ASR) is applied to balance the availability of this reuse water in Autumn and Winter with the demand for additional irrigation water by the local farmers in Spring and Summer. The system provides local farmers with an extra 300.000 m3 of freshwater, in addition to the rainwater that is already harvested and stored in aboveground reservoirs. This additional freshwater is stored underground using eight ASR wells. The sugar factory, farmers and the ASR system are connected by a 5 km distribution loop, guaranteeing an automated maximum supply of 200 m3 of fresh irrigation water per hour during dry spells. Consequently, farmers enjoy a year-round supply of sufficient high-quality irrigation water.

Securing water at a Singapore vertical farm

Urban Farming Partners and HSL Singapore are developing an urban farm to produce vegetables for the local market. The Urban Farming Partners consortium has expertise in various aspects of indoor growing concepts, from growing and logistics to marketing and urban planning. Allied Waters - SALutions has joined the Urban Farming Partners consortium, bringing in expertise on rain-water harvesting, water reuse, and aquifer storage and recovery to balance water demand and supply.

Allied Waters, driving the circular economy.

ALLIED WATERS®

Driving the Circular Economy

www.alliedwaters.com

EFFICIENT SOLUTIONS

for professionals in the food industry

How can APH Group contribute to “feed tomorrow’s cities”?

It supplies knowledge, dedication and technology to both ends of the food chain.

APH Group can deliver the complete infrastructure for vegetable distribution centres. From cold storage to retail packaging it delivers and services the machinery, equipment and installations. Together with partners like construction companies and engineering firms, we can deliver turn-key solutions to the tail end of the food chain.

And early in the food chain, APH Group is present as well. Its knowledge centres “Field Equipment and Irrigation” are at work, demonstrating machinery and equipment to cultivate, plant, irrigate and harvest potatoes and vegetables. Efficient and sustainable production methods are essential in growing our food. And also in this field APH Group tries to find the most efficient solutions for its customers!

Background and track record count when it comes to partnership. With experience in Central- and Eastern-Europe, Asia, Africa and Latin-America, APH Group brings in a wide array of best practices learnt. Its agricultural Dutch background and word-wide outlook makes the group a solid and dedicated partner to setup large scale farming operations and professional distribution centres.

For as the demand for safe food in the world increases rapidly, very rapidly, the food chain will have to develop accordingly. With its 4 knowledge centres Field equipment, Irrigation, In-store Solutions, and Engineering it updates its professional partners.

By offering integral and innovative solutions is wants to help increase their efficiency. And here helps the group’s own belief in the maxim of Nobel-prize winner Albert Einstein and the APH Group version of it: E = MC2

A universal value, also applicable to the irrigation, potato and vegetable business: Efficiency for the clients by:

- Increased yields (Mass)
- Improvement of quality (Create quality)
- Decreased costs of usage (Cost of ownership)

That is how the APH Group feels it can contribute to

“Feeding of tomorrows cities”.

APH Group

www.aphgroup.com

DUTCH INTEGRATED GROWING

systems for any climate, any crop and any market

The world is changing

The world we are living is changing rapidly. Growing and aging world population, climate change, economic inequality and urbanization. By 2030, more than 5 billion people will live in cities and in 2050 more than 10 billion people will have to be fed. More food must therefore be grown on a smaller surface. Urbanization leads among other things to new food issues regarding sustainability and new opportunities; Feeding Mega Cities.

Sustainable goals

By developing new sustainable technologies for the production of safe and healthy food, AVAG members are helping to provide solutions to the challenges of tomorrow. As a result, the Dutch greenhouse technology sector ensures that production of crops can takes place anywhere in the world.

Collaboration in the genes

Within the AVAG Greenhouse Technology Center, Dutch companies collaborate on integrated growing systems, components and associated services. All our companies provide a comprehensive offering of knowledge and technology for high-quality greenhouses, cultivation systems, logistics, E-grow, energy efficiency and water efficiency.

Dutch Solutions

The scale and complexity of horticultural projects continues to increase all over the world, creating a rising demand for innovative tailor-made growing solutions. Dutch suppliers of greenhouse technology are capable of providing such solutions. This has resulted in a globally unique concentration of specialised companies in the Netherlands.

Quality & Innovation

Dutch integrated growing systems are suitable for any climate, any crop and any market thanks to:

- Knowledge of your market, climate and crop
- High quality standards via HortiQ (www.hortiq.nl)
- Continuous focus on further innovation via Hortivation (www.hortivation.nl)
- Collaboration with you and the best partners for each project
- Exchange of knowledge between companies, knowledge institutes and government bodies

HortiQ
GREENHOUSE TECHNOLOGY CERTIFICATION

HORTIVATION
TECHNICAL GREEN INNOVATION HOLLAND

www.avag.nl/en/

TASTY POTATO PRODUCTS

Every meal, every day, everywhere

With a history of more than 50 years, Aviko can claim to be well rooted in the European cuisine on processed potato products. In fact, Aviko is Europe's No 1 and has exports to more than 100 countries across the globe. The fine infrastructure within Europe and the port facilities in Rotterdam have facilitated our global market position.

The product portfolio entails French fries and more than 100 other fine frozen potato products.

Aviko takes a very serious approach to the current global challenges. A growing global community with approximately 10 billion mouths to feed in 2050, a growing number of demanding affluent people, more and more urbanization ... On top of this, we all have to deal with the fact that there is a growing scarcity of natural resources, i.e. energy and water supplies. Did you know that potatoes only use approximately as little as 10% of water during the growing season compared to rice? See graphic - Source: waterfootprint.org

Moreover, potatoes are a staple food full of natural nutrients like minerals and fibers needed for a healthy diet.

Aviko is determined to make sure that all people around the globe can get to know and enjoy potato products, in all continents, including people in Asia. It is with this in mind that Aviko has set up a factory producing french fries nearby Beijing. We want to be part of Asia's Golden Age.

Our mission:

Aviko brings pure enjoyment of tasty potato products to every meal, every day, everywhere.

Aviko®

Every day pure potato enjoyment

www.aviko.com


VISION
WORLDWIDE IN DAIRIES

An optimal functioning dairy sector, both in developed and developing countries, is vital to guarantee the quality of milk with high nutritional content to serve the world's growing population. The increasing demand for sustainability in combination with the growing world population, requires effective solutions. Bles Dairies is the partner in the dairy value chain from feed to factory gate, with a never-ending focus on improving your livestock. Whether it concerns management, genetics, innovative technics, advice, training, supply of dairy cattle… Bles Dairies provides solutions in all areas. Important in this is our vision: the cow is central to all our thoughts and actions.

The importance of Food Security and Food Safety and their need grow every day and everywhere, especially in emerging countries. Bles Dairies is able to help meeting these needs. Our core business is developing and improving individual dairies or the entire dairy sector, no matter in which country. Our ambition is to build up a strong and solid strategic partnership with our customer. This means a full-fledged service, organized with the help of our key account managers, to run dairy farms successfully, breed the best cows, supply more volume with better quality milk to the factory or to develop the dairy sector as a whole.

Bles Dairies is continuously aiming for the best service in knowledge transfer. Frequently our livestock or genetic customers are looking for advice or training and at the same time, our consultancy customers ask for know-how in genetics or livestock. Providing knowledge by our own professional consultancy department is key for the success and satisfaction of all.

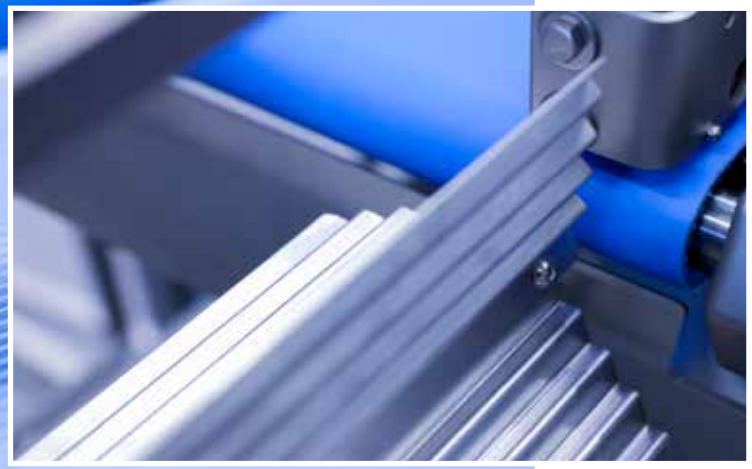
We believe in a holistic approach in the dairy farming sector, where all aspects of it are inextricably linked. As a strategic partner, with Bles Dairies as a whole, we meet our customer's needs. All with the cow in the middle, and around the cow anywhere in the world.

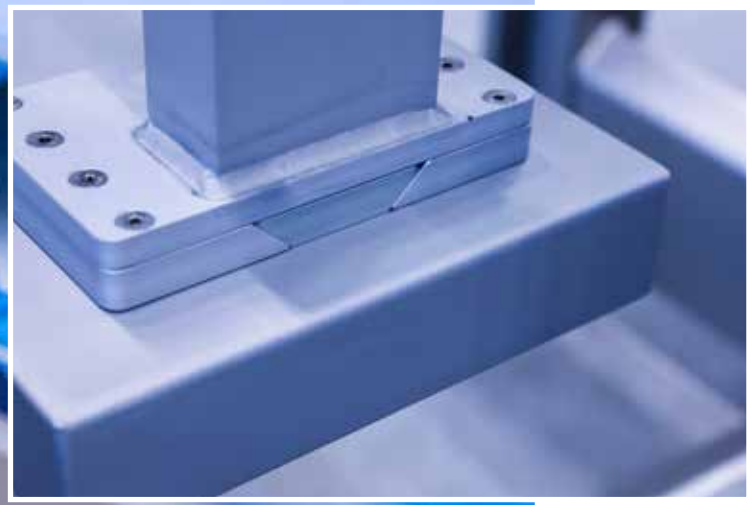
BLES DAIRIES

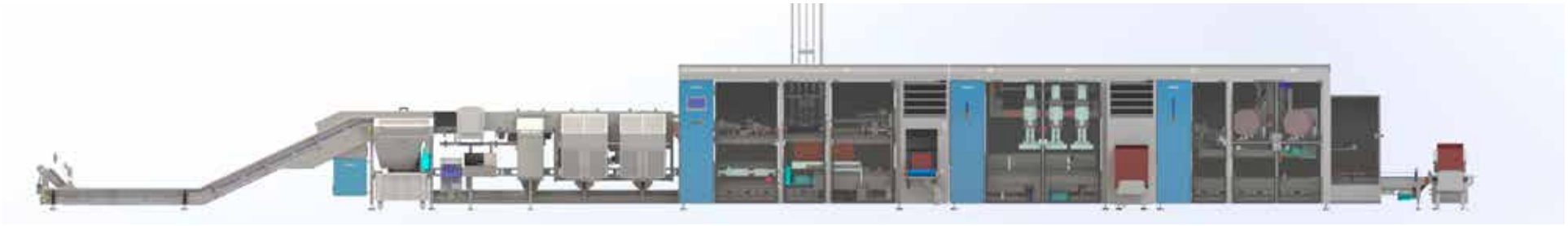
www.bles-dairies.nl

CREATING THE FUTURE:

The BluePrint difference







BluePrint Automation (BPA) is all about innovation. And they have been there from the very beginning. BPA was founded in 1980 in the Netherlands by Bob Prakken. Welcomed by customers from many different industries, his endeavor turned into a success. And ever since BPA has witnessed spectacular growth: in business and in commitment to people and the environment.

BPA designs, develops and manufactures case and tray packing solutions for flexible and other tough-to-handle packages such as doypacks, pillow bags and four-sided sealed bags. Built for around the clock operation, these solutions have a worldwide reputation for their quick change-over, flexibility, speed and comprehensible design. Integrated state of the art technologies includes gravity, pick and place, wrap around and vision-guided robotics.

Thousands of companies in over 30 countries worldwide have chosen BPA. And BPA is always nearby, with three full-service manufacturing facilities with the headquarters located in The Netherlands and six Sales & Support subsidiaries located across the globe. BPA is committed to their core values Flexibility, Innovation, and Partnership. The unity of these aspects helps us to make the BluePrint Difference. This is embodied in BPA's mission:

"We at BPA want to make a difference, a positive impact on our customers and the world we live in."

Leading topics of industry such as sustainability, circular capability of flexible packaging and recycling are continuously challenging the limits of what materials and processes can accomplish. As the world of packaging is rapidly evolving, BPA is growing and looking into the future. Rigid and prefixed solutions do not help to truly make a difference. BPA embraces flexibility in their solutions and attitudes.

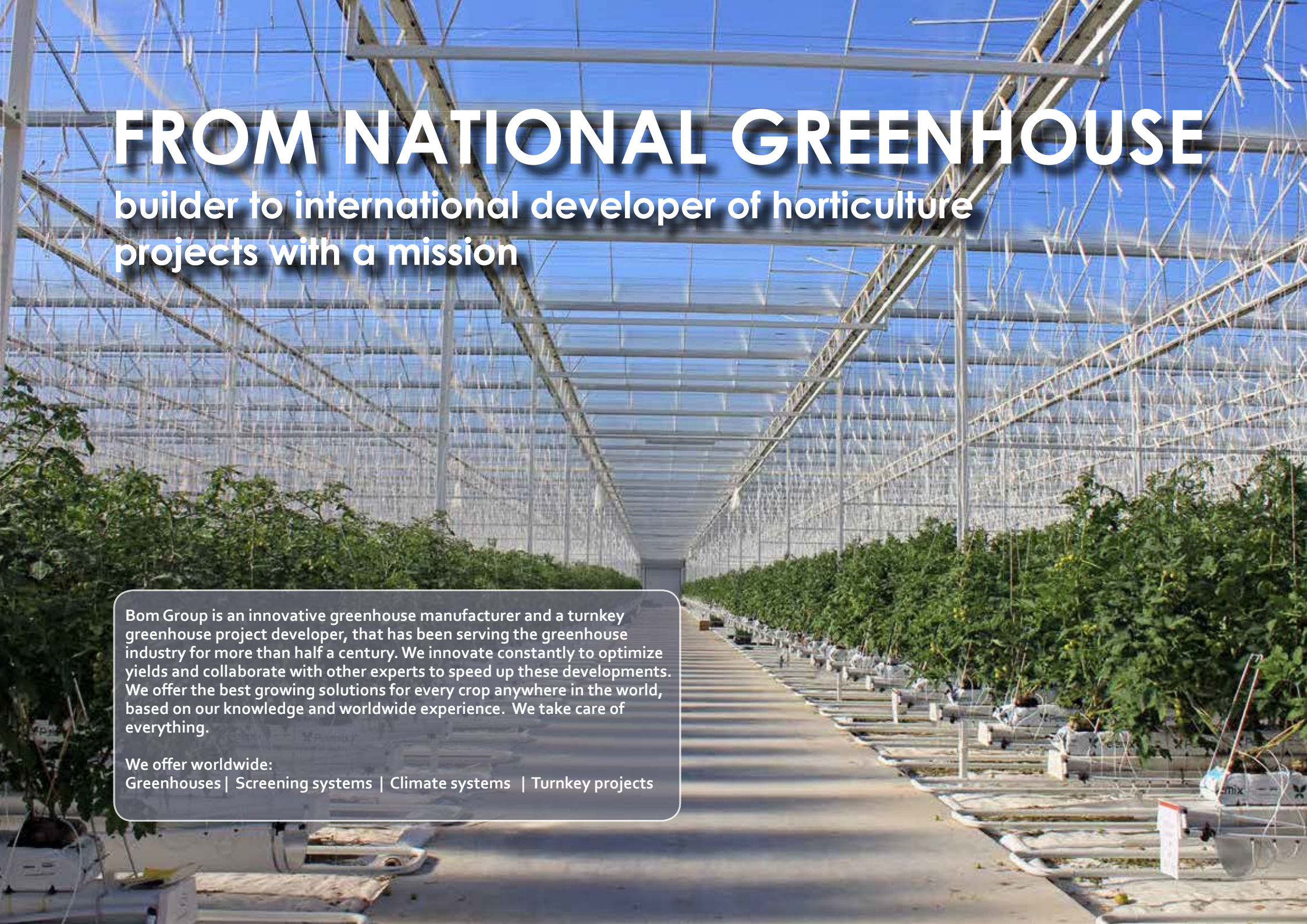
BPA has an important and lean building philosophy when it comes to sustainability and the factory of the future. BPA applies this lean building mentality into designing and building their machines. Most importantly by creating high-quality machines that last longer than average with high efficiency. The machines require little maintenance and are particularly made to therefore consume less chemicals and use less energy.

BPA makes their environmental footprint while creating more value for its customers. With innovation in their DNA, BPA is dedicated and will continue to bring new solutions to the market - supporting sustainable growth and creating a long-lasting value for their customers, that is better for the environment - and for business.

blueprint automation

bpa

www.blueprintautomation.com



FROM NATIONAL GREENHOUSE

builder to international developer of horticulture projects with a mission

Bom Group is an innovative greenhouse manufacturer and a turnkey greenhouse project developer, that has been serving the greenhouse industry for more than half a century. We innovate constantly to optimize yields and collaborate with other experts to speed up these developments. We offer the best growing solutions for every crop anywhere in the world, based on our knowledge and worldwide experience. We take care of everything.

We offer worldwide:
Greenhouses | Screening systems | Climate systems | Turnkey projects




Everyone is aware that the growing world population needs healthy and safe food, now and in the future. Not a simple task. Bom Group, a leading specialist in horticulture projects, uses its intensive knowledge, broad experience and specialized contacts to make a substantial contribution to this. Together with other horticulture specialists.

Sustainability and safety

About 50 years ago Bom Group started out as a very progressive greenhouse builder in the Netherlands, who regularly developed and applied groundbreaking technical innovations. Nowadays, large-scale turnkey projects abroad have the upper hand, with the innovations not only focusing more on technical elements, but also on sustainability and safety. For example, the (re) use of water has received a lot of attention at Bom Group in recent years, as a result of which a maximum of vegetables can be cultivated with minimal use of water.

Large-scale food production

Projects are becoming increasingly complex. Governments in all parts of the world realize that they have a social task: feeding the population.

They therefore decide to take the initiative for large-scale food production, such as a greenhouse complex of hundreds of hectares. Large-scale projects that can only be properly executed by bundling knowledge and expertise by horticulture specialists.

Collaboration

That is why BOM Group is also one of the initiators of Dutch Greenhouse Delta. This organization facilitates cooperation between specialized companies and relevant sectors, so that the major food issues of the future can be better attuned. Intensive collaboration and knowledge shared by independent horticulture specialists such as Bom Group. That is the future.

Bom Group

Greenhouses - Screening - Climate - Turnkey

www.bomgroup.nl

SAFE. SUSTAINABLE.

Always. Everywhere.

"Certhon wants to contribute to the global food solution, in other words: the possibility to produce healthy, fresh, high-quality products all over the world, 365 days a year."

Certhon is worldwide active as turnkey developer and technical installer of modern greenhouses and indoor farms. Its innovative focus enables Certhon to fully integrate all systems for year-round, efficient and optimal production of food, flowers and other indoor farming products, anywhere in the world.

Horticulture solutions

Worldwide demand is increasing for safe and healthy food. But it must also be sustainable and preferably locally produced. For an appropriate response to this and to developments like climate change, water scarcity and urbanization, technical solutions in horticulture are indispensable.

To remain a frontrunner in these market developments, Certhon is future driven and continuously investing in knowledge and research & development. Worldwide this effort has resulted in successful projects: greenhouses with fully automatic climate control, LED-lighting, greenhouses connected to third party heating sources, indoor farming projects for a wide range of research and multi-layer indoor farms for professional growing, to name a few.

Certhon Innovation Centre

In addition to the successful modern greenhouse and indoor farming projects that Certhon has realized, it is doing research in order to optimize the technology for daylight-free cultivation. To further deepen its knowledge of indoor farming techniques and plant growth, Certhon has developed its own research facility: *the Certhon Innovation Centre.*

It contains eight growth chambers on an area of 240 m^2, where research on various vegetables, soft fruit and herbs is carried out. The cultivation knowledge gained from this, helps Certhon's customers to grow their crops on the right footing, particularly in the first year. Furthermore this unique facility offers the possibility to show them system-options and allows trial projects to be carried out in order to obtain reference data.

CERTHON®

Greenhouse solutions

www.certhon.com

SUSTAINABILITY AND INNOVATION

Key to feeding cities

The Sustainable Development Goals (SDGs) of the United Nations are at the hearth of Corbion's strategy, and key to contribute to the challenge of Feeding Cities in the wake of urbanization and growing population.

Contributing to 'a better world' plays a leading role in our Creating Sustainable Growth strategy. Corbion believes in the potential of companies as agents of change. We selected SDG2 (Zero hunger) and SDG12 (Responsible production and consumption) as the ones where Corbion can create the most impact.

SDG2 or Zero hunger is about food security, improved nutrition, and sustainable agriculture. We contribute to this through our food ingredient solutions for shelf-life extension, food safety, and healthier food. We help keep food fresh and safe from production until consumption, which reduces food waste and helps make food more accessible and affordable for the worlds growing population.

Sustainable agriculture is relevant, too, because we rely on agriculture to produce our renewable raw materials. We aim to create a sustainable supply chain for our key agricultural raw materials, amongst other through RSPO certification, Bonsucro and Field to Market. The agrochemical solutions we provide also contribute to SDG2 and thus to feeding cities.

We are only scratching the surface of the potential of our new Algae Ingredients platform. Through targeted effort in R&D we are working on new applications, many food-related. An example is a protein based on algae. Algae protein has a remarkably better environmental footprint than animal protein.

Such novel food technologies in our view will be pivotal in being able to feed the cities of the world going forward. Therefore, the current sustainability efforts by many companies need to go hand in hand with a strong commitment to innovation.

GREEN TESTING GROUND

The Netherlands

Royal Cosun is a cooperative of some 9,000 Dutch sugar beet growers, which has been processing its members' sugar beet since 1899. We produce a wide range of ingredients and intermediate products from vegetable raw materials such as sugar beet, potatoes, chicory, fruit and vegetables for the international food industry.

Of all the business groups that make up ***Cosun***, ***Suiker Unie*** and ***Aviko*** are the most widely known. They have traditionally produced sugar and potato specialities respectively. ***Sensus*** produces inulin from chicory, a dietary fibre that reduces the sugar and fat content of foodstuffs. ***SVZ*** processes fruit and vegetables into concentrates and purees for the food industry. ***Duynie*** is a trader and distributor of animal feed and develops advanced applications based on residual flows and co-products from the food industry.
The Dutch agro sector performs above average in feeding people across the globe. Royal Cosun has for more than a hundred years been part of this remarkable phenomenon. Economy of scale and internationalization caused us to concentrate on Europe in the first place, but Cosun also operates in other parts of the world.

Food quality, reliability of supply and innovation have been the calling card of the Dutch agrofood sector for years. Sustainable production methods have been an additional feature. Sustainability in fact starts with farmers and growers; it applies through the chain up to the level of the consumer.

As a major cooperative, Cosun wants to take responsibility for the vital arable farming sector it is part of. We have become used to find food readily available, always and at a relatively low price. This certainty is being challenged by developments like the still growing world population, the rural migration to megacities, the impact of climate change. The increase of welfare diseases is the other side of the coin.

Seen from space, the Netherlands is a large city-state at the mouth of the river Rhine. A city-state in which fields, meadows and greenhouses are available to produce food. So much so that we also manage to feed many mouths outside the national borders. In many respects the Netherlands has become a testing ground for new concepts. For example, to shorten supply lines, close mineral cycles, produce more vegetable proteins, reuse waste and reduce energy consumption across the board. This ambition is one of substance and is pushing us to combine where ever possible knowledge, experience and ingenuity.

At Cosun, we conduct research on new 'green' raw materials, look for opportunities to extract more substances from the raw material that fit in "responsible foods" and in bio-based building blocks. We use data to generate more return with less input and we invest in making our production plants more energy-efficient.

Cosun can and wishes to contribute to developments of this kind, together with our members, business partners and knowledge institutions.

Together we grow.

ROYAL COSUN

www.cosun.com
www.annualreport-cosun.com

DAIRY CAMPUS

Our cows produce data

The Dutch dairy chain is facing a huge challenge; it must realise sustainable development, while simultaneously enhancing and expanding its position in an increasingly global market.

To meet this challenge, all parties in the milk and dairy chain joined forces and cooperate. Dairy Campus plays a key role in bringing together these parties and facilitating research, innovation and education. Our cows produce milk, but above all they produce data and therefore knowledge, that contributes to a sustainable future in which sufficient, healthy and safe milk is produced.

CO2 Footprint

The Dutch dairy chain targets a 20% reduction in greenhouse gasses by 2020. The Dairy Campus Innovation Fund project GreenFeed PoP (Proof of Principle) will contribute to the 'licence to produce' of the Dutch dairy chain. It provides information on the effect of different feed strategies under practical conditions and thus providing an action perspective for both farmer and dairy chain in reducing the CO2 footprint. It is one of the many projects at Dairy Campus that generates new information and drives innovation in the dairy chain.

DAIRY CAMPUS

Inspire to create

www.dairycampus.nl

GROWING GREEN CITIES OF THE FUTURE

EXPO 2022
FLORIADE
AMSTERDAM - ALMERE, NL

The earth has seven billion inhabitants, more than fifty percent of them live in cities. By 2050, this percentage will have increased to nearly seventy percent. With continuous and relentless urbanisation, we have no option but to look for new ways to keep our cities safe, healthy and attractive, to find a better balance between 'buildings' and 'green' and to find solutions for feeding the city.

As part of this, we have developed four sub-themes:

- Green - parks and green structures that make cities more attractive.
- Food - food production, food safety and food security solutions.
- Health - the effect of green structures on a healthy living environment, as well as on the physical and mental vitality of city inhabitants.
- Energy - sustainable energy solutions, as well as the effects of green spaces on the vitality of a city.

For six months we focus on cities of the future. We invite the world to join us and to contribute to our theme: Growing Green Cities. Floriade Expo 2022 promises to be an extraordinary event. Visitors will enjoy a unique and meaningful experience, as the expo will invite and challenge them to '**Explore. Touch. Change.**'.

FOR MORE INFORMATION ABOUT EXPO 2022 FLORIADE AMSTERDAM - ALMERE CONCERNING FEEDING THE CITY:
WWW.FLORIADE.COM

LIVESTOCK FARMING

De Heus is in a position to contribute to the progress of livestock farming

For over a hundred years, it has been our goal to help our customers move forward. They wish to increase the quality and production of animal protein related products and optimize the production process. Consequently, knowhow concerning animal feeds, livestock farming and farm management meets with a large demand. Here De Heus with its knowledge, experience and ‘on-the-farm’ sales approach can make a difference and can actively contribute to the further professionalisation of the local livestock farming sector.

Every farm is different and therefore requires its own, specific animal-feed concept.

De Heus understands the complexity of agricultural business. Many different factors are at play, all influencing each other: health, genetics, animal welfare, legislation, nutrition, microclimate, management, IT and plans for the short- and the long-term.

All these factors affect a farmer's results, which is why De Heus has tailor-made solutions on offer for all types of farms.

The support services of De Heus focus on:

- Providing accessible knowledge and experience about feed, animal husbandry and cattle farming
- Establishing the proper nutrient requirements and a feed strategy adapted to the local situation
- Keeping the animals and their offspring healthy
- Improving the productivity of the animals
- Increasing the production efficiency
- Improving the management processes on farms

de heus

www.de-heus.nl

REDUCING FOOD LOSS AND

waste as imperative to future-proof cities food systems

People help to shape the world by the food choices we make. Our food choices in turn help shape us. DSM is committed to supporting choices that help keep both people and the planet healthy: healthy diets for all within planetary boundaries.

Food loss and waste

Today no less than 1/3 of all food is lost or wasted during production or consumption. This wasted investment costs up to $940 billion per year and is responsible for about 8% of total global greenhouse gas emissions. It also causes ecosystem degradation and biodiversity loss. What is Food Loss & Waste exactly? The UN Food and Agriculture Organisation states that 'Food Loss' is "food that gets lost before it reaches the consumer" and 'Food Waste' is "food fit for human consumption but discarded or spoiled". Above all, it is a serious challenge for humanity. Governments, NGOs, food companies and consumers are becoming increasingly aware of the issue and are taking action to it. If we succeed in reducing food loss and waste, it means a multiple win: we help boost the amount of nutritious and valuable food available for consumption, and reduce pressure on resources and the environment at the same time.

Future-proofing food systems

DSM works hard to find solutions that help to provide the most nutritious, safe, and great-tasting ingredients for food and beverages, that are produced and distributed as sustainably as possible. Drawing on our scientific resources, we work together with partners to get the most out of the valuable inputs that go into food production processes; for example preserving the nutritional value of food and extending the food product shelf-life and optimal quality.

Sustainable cheese production

Dairy products like cheeses are an important and well-loved source of protein in peoples' diets. During production and processing, however, some cheese (and as a result the milk it was produced from) ends up going to waste. DSM's Pack-Age® is a high-tech membrane that allows cheese to ripen naturally, but without the risk of mold and yeast growth, resulting in a higher quality and value. And there is more, because Pack-Age® eliminates the crust removal process, less cheese is lost, less production time is needed and a higher yield is achieved with the use of less material. If all naturally-ripened Gouda and Parmesan cheeses were made with Pack-Age, 3.6 billion fewer liters of milk would be required and there would be about 200,000 tons less cheese wasted.

It's just one of the many examples of how DSM is working to future-proof food production, supporting healthy diets within planetary boundaries to create brighter lives for all.

DSM
BRIGHT SCIENCE. BRIGHTER LIVING.

www.dsm.com

World Potato Production 1991 - 2016

(1.000.000 tonnes)

Jaar	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009	2010	2011	2012	2013	2014	2015	2016
Developed	183.13	199.31	177.47	174.63	165.93	166.93	160.97	159.97	158.89	149.77	131.88	155.90	144.18	141.56	150.83	142.50	143.53
Developing	84.86	101.95	108.50	128.72	135.15	145.92	152.11	160.01	165.41	184.03	200.35	218.33	224.66	232.93	229.97	234.06	233.06
WORLD	267.99	301.26	285.97	303.35	301.08	312.85	313.08	319.98	325.30	334.14	332.51	374.48	369.07	374.72	380.97	376.81	376.83

THE DUTCH,

Potato Professionals

Potato, being the 3rd ranked food crop world-wide, is rapidly increasing its importance. Especially countries in Asia and Africa are adopting the potato as crop to grow and to feed the population. Being both a vegetable and staple, potato is a versatile ingredient in many cuisines and offers a high nutritious value. In addition, growing of the crop requires a relatively small amount of water and therefore it presents an excellent alternative to irrigated rice in arid regions.

During more than a century professional growers in The Netherlands have optimized the art of growing, crop protection, mechanization and storage of potatoes. Also a large number of new varieties were developed, with properties that suit the local conditions and needs of potato growers all over the world.

As the climate is very suitable for the production of healthy seed potatoes, The Netherlands has a share of 60% of the international trade of certified seed potatoes.

The Dutch Potato Organization represents the trading companies in seed and ware.

Dutch Potato Organisation

https://nao.nl/nl

THE SUSTAINABILITY

contribution of the dutch dairy sector

The Netherlands is well known for its dairy produce. Butter, cheese and milk are staples of our diet. Our dairy is not only sought after in The Netherlands, there is also great demand for Dutch dairy products abroad.

Population growth and scarcity of commodities pose a threat to global food security. Moreover the challenge has to be met of feeding a growing population with food that is healthy and sustainably produced. The dairy sector in the Netherlands can match the growing demand through ongoing responsible growth. The country is eminently suited to dairy production. Climate and soil are ideal for breeding cattle and growing grass. The strategic location within Europe offers excellent market opportunities.

Its high-quality products, knowledge and craftsmanship command a strong international position.

In many of the markets the Dutch dairy sector operates in, increasing importance is being attached to animal welfare and climate change. The sector is aware of its significance and has set goals for its further evolution: climate-neutral development, continuous improvement of animal health and welfare, preservation of outdoor grazing, biodiversity and the environment. Collaboration between scientists, farmers, private enterprise and the government has helped the Dutch dairy industry to its prominent place in innovation and knowledge development.

By exporting its knowhow and technology the sector wants to contribute to a more efficient and sustainable food production worldwide.

nzo

dutch dairy association

www.nzo.nl

DUTCH POULTRY CENTRE

Serving the poultry planet by the Dutch approach

The world's finest

The Netherlands has an excellent international reputation as a poultry country. Producing top quality poultry meat and eggs with guaranteed food safety, at a competitive cost price takes a great deal of expertise and knowledge. Dutch Poultry Centre is the network organization of almost 100 Dutch companies active in the poultry sector. They are our Preferred Partners, the world's finest innovators in their field of expertise within the poultry production chain: animal housing, breeding & hatchery, feed, feed ingredients & additives, healthcare, processing and meat & egg production.

Mission

Dutch Poultry Centre's mission is to share quality, knowledge and innovation of its Preferred Partners on a worldwide scale and contribute to create business opportunities for them. Our Preferred Partners cooperate and co-create for the benefit of innovations in the poultry industry. By joining forces and strengthening the reputation of the Dutch poultry sector, we try on a worldwide scale to be the portal for expertise where farmers and companies can find solutions for their businesses: from building a poultry meat- or egg production facility, building high-tech housing to designing state-of-the-art slaughterhouses.

Dutch Approach

In each segment of the production chain our Preferred Partners are showcasing the 'Dutch Approach'. This is an integrated approach towards the production chain in which every link has an effect on the others. Food safety is the first link of the chain. Animal health and wellbeing is another. Dutch companies have a strong international focus and able to match prevailing circumstances in local situations with the quality requirements of the international market. They know how to add value and further improve the international poultry production with a clear view on consumer needs in terms of product safety and taste.

DUTCH POULTRY CENTRE

www.dutchpoultrycentre.nl

SMALLHOLDER FARMERS FEED THE WORLD

East-West seed serves farmers with better seeds for better yield

East-West Seed helps to improve the income of farmers in tropical areas. We produce the seeds and provide the knowledge and technology that enable tropical vegetable farmers to increase their production and the quality of their crops. Vegetables generate higher value and profits than other crops. Therefore vegetable farming is attractive for farmers in urban areas, where land is scarce and expensive.

East-West Seed breeds tropical vegetable varieties that provide the highest yield and quality in tropical conditions. Resistance to plant diseases, insect plagues and adapted to the increasingly difficult production circumstances linked to climate change are key in our breeding programs. Our staff that deals with knowledge transfer share best practices with farmers that help them to improve their farming methods and production.

Our headquarters are located in Bangkok, Thailand, with subsidiaries in the Philippines, India, Indonesia, China, Guatemala, Tanzania, Vietnam, Myanmar and Cambodia.

The story of East-West Seed

After Dutch Seedsman Simon Groot reluctantly resigns from the family-owned seed company in the early 1980's, he decides to apply his knowledge of seed breeding to tropical vegetable breeding.

On an earlier business trip to Indonesia, he had seen that smallholder farmers there were hardly able to support their own families, let alone make a profit. Simon Groot used his experience to provide the knowledge, technology and good quality seeds which were lacking to produce high quality crops and create a profitable business.

In the 36 years that followed, East-West Seed has developed into a world-class vegetable seeds company. Simon Groot's seeds and his knowledge have helped millions of smallholder farmers in the tropics to develop profitable businesses, after years of poverty. They have become entrepreneurs and have contributed to the remarkable economic growth of Southeast Asian countries.

EAST-WEST SEED

www.eastwestseed.com

SEAMLESS, SAFE AND SUSTAINABLE

In dedicated supply chains

The (Dutch) Fresh Produce Centre

Fruit and vegetables contribute to a strong economy and are good for people and society. For they improve the collective health and sustainability of the society as well. Having enough fruit and vegetables in the diet can bring significant annual savings for society in terms of healthcare costs caused by for example overweight.

To help consumers to increase the daily intake of fruit and veg it is essential to assure a reliable availability of a wide selection of products to the diverse omni channels that provide food to the consumer. Fresh Produce Centre puts a lot of effort in setting up networks to this purpose: with the government, logistical and digital service providers, with organizations in fields like health care and education and with ngo's. The aim is to work together towards the joint objective to put the World Health Organization slogan into practice - *"making the healthy choice the easy choice"*.

For a small country, the Netherlands is "big" in the production and supply of fruit and vegetables from Dutch open ground, Dutch glasshouses or produced anywhere else in the world. Dutch trading companies in fruit and vegetables know how to source first-class produce from around the globe. Food safety always comes first and is constantly monitored. Additionally as a sector we seek to guarantee fair working conditions and to minimize the environmental impact of production and transport. By using new technologies, we aim to organize our supply chains efficiently and to make them more sustainable.

The Dutch fruit and vegetable sector meets a global need for healthy food for millions of people. Thanks to our expertise and innovation, we have seen strong growth in the production, import and export of fruit and vegetables in recent decades. The fruit and vegetable sector has become a key driver of the Dutch economy.

Total commercial sales of fruit and vegetables in the Netherlands are worth approximately € 18 billion, with members of Fresh Produce Centre accounting for around eighty percent of these sales. The 350-plus members affiliated to Fresh Produce Centre strive every day to guarantee the availability of healthy, sustainable food across a sales market centred mainly on Europe but also extending far beyond.

Fresh Produce Centre

www.freshproducecentre.com

NOURISHING BY NATURE

The world of tomorrow is a world of mega cities. Cities that can only thrive for the long term if sustainability is a focal point in its day-to-day management. That is the core for global dairy company FrieslandCampina too.

With food-security and safety first in line, it is important for people to start to consume a sustainable diet. A sustainable diet is a healthy diet, adequate in nutrients and energy, with a low environmental impact. Sustainably produced dairy products are part of a balanced healthy diet. Milk, by nature, contains essential nutrients, such as proteins, vitamins B2 and B12 and minerals such as calcium. A rural dairy sector around cities will contribute considerably to fill the gaps in the local food requirements.

It is FrieslandCampina's purpose to ***nourish by nature***, to provide better nutrition to the world and to secure a good living for its member-farmers for now and for generations to come. Every day millions of consumers around the world enjoy FrieslandCampina's innovative and tasty dairy products. We strive to fight malnutrition with our products but also with school milk programs and the Drink.Move.BeStrong campaign that encourages an active lifestyle amongst children in South-East Asia.

FrieslandCampina aims to limit the pressure on natural resources and the environment for the next generations.

Dutch dairy farming has a high standard with its high quality products, and with a low CO_2-equivalent emission per liter milk compared to the world average. And with the cooperative model which is often at its origin and aims to ensure a good living for the member-farmers involved. Through its Dairy Development Programme FrieslandCampina supports local dairy farmers (mainly small farmers) in Indonesia, Thailand, Vietnam, Malaysia, China, Nigeria and Pakistan in order to improve the quality of the milk, to increase the productivity per cow and to get access to the market.

By offering trustworthy and tasty dairy products FrieslandCampina wants to help safeguard food and nutrient security wherever the opportunity arises.

FrieslandCampina

nourishing by nature

www.frieslandcampina.com

TEAMING UP FOR ANIMAL

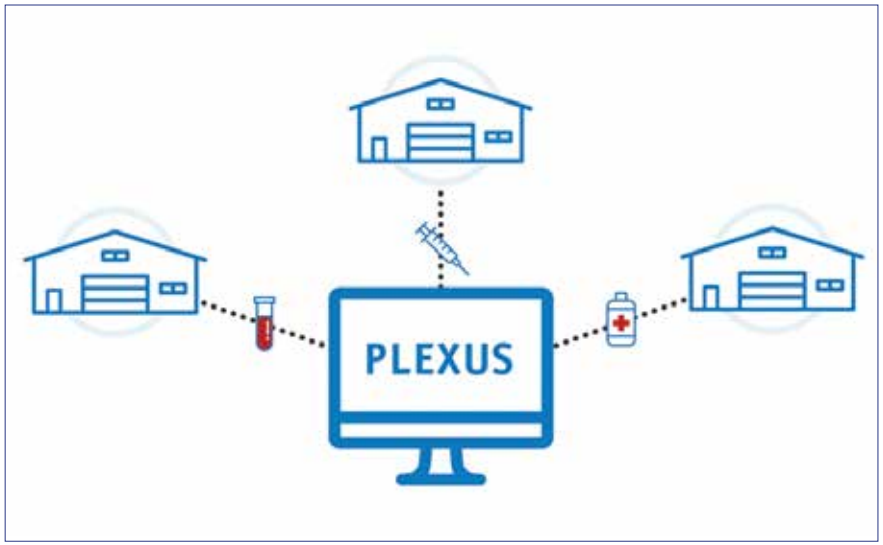
health, in the interest of animals, their owners and society at large

GD Animal Health

GD supports farm managers, veterinarians, industrial customers and governments. We combine animal health monitoring and prevention of livestock diseases with practical research projects, laboratory diagnostic services, animal health programmes, contract research and consultancy.

GD Academy provides training courses, lectures and keynotes related to animal diseases and the implementation of veterinary diagnostic lab-test methods and the ISO17025 QualitySystem.

GD is located in Deventer, the Netherlands and owns one of the largest veterinary laboratories in the world, in which annually over 4,8 million laboratory analyses are performed.

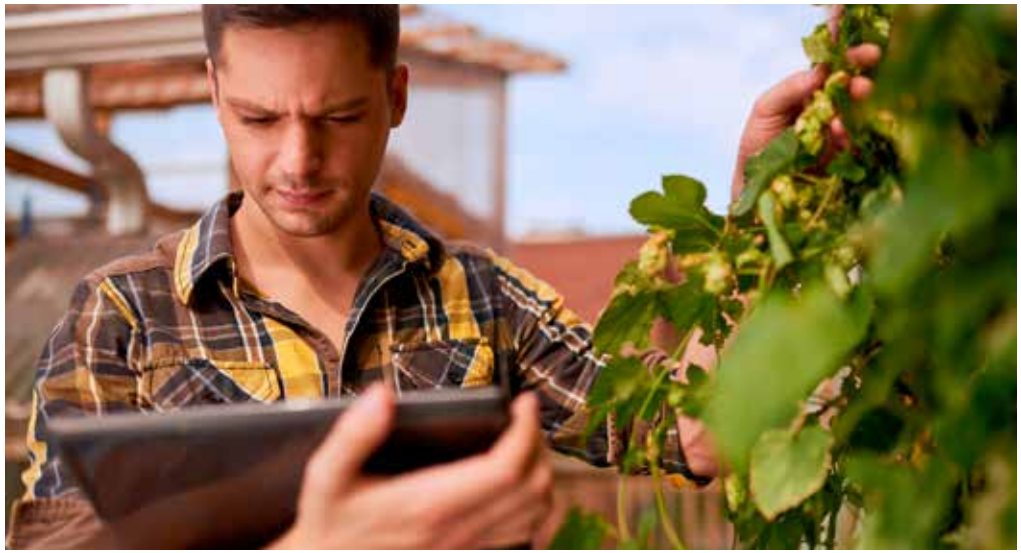


PLEXUS: profit from healthy livestock

International customers not only demand high quality meat and efficiency; they want a transparent production process and they pay a better price for antibiotic-free meat. With our software tool Plexus clients can easily register and stock a large variety of data in one central location to monitor animal health. From flock and farm information to antibiotic administration, from lab results to vaccination schemes. The system shows trends and correlations and gives advice how to optimize vaccination strategies and disease control to improve the health of your livestock and reduce the use of antibiotics.

www.gdanimalhealth.com

URBAN AGRICULTURE



Worldwide more and more people move to the cities. Continuously growing food demand and traffic congestion force cities to redesign their food supply chain, whilst also addressing other quality of life issues. Initiatives to grow crops in the city, gradually put all processes related to quality of life in the city under review. Crops nurseries and crops processing facilities require water and energy. Simultaneously, they may contaminate water and sometimes not use, but produce energy.

Inner-city logistics of water and energy requires examination. At GGNI we believe most benefit comes from simultaneous optimization of both.

Cleaning contaminated water yields materials to produce biogas and biogas production is accelerated when adding heat. This heat may come as excess heat from rooftop greenhouses.

Smart appliances combined with systems managing demand and energy trading options make it possible to produce the energy and clean water just in time and feed it back into the water and energy infrastructure of the future.

The Energy, Water and AgriFood & Technology sectors are inextricably linked and affect each other. The smartest solutions for Food, Water and Energy Security issues are found when these sectors are already jointly involved in the identification of the issue at hand.

Contact us on to inspire you to optimize.

GGNI

www.ggni.nl

TURN KEY COLD STORES

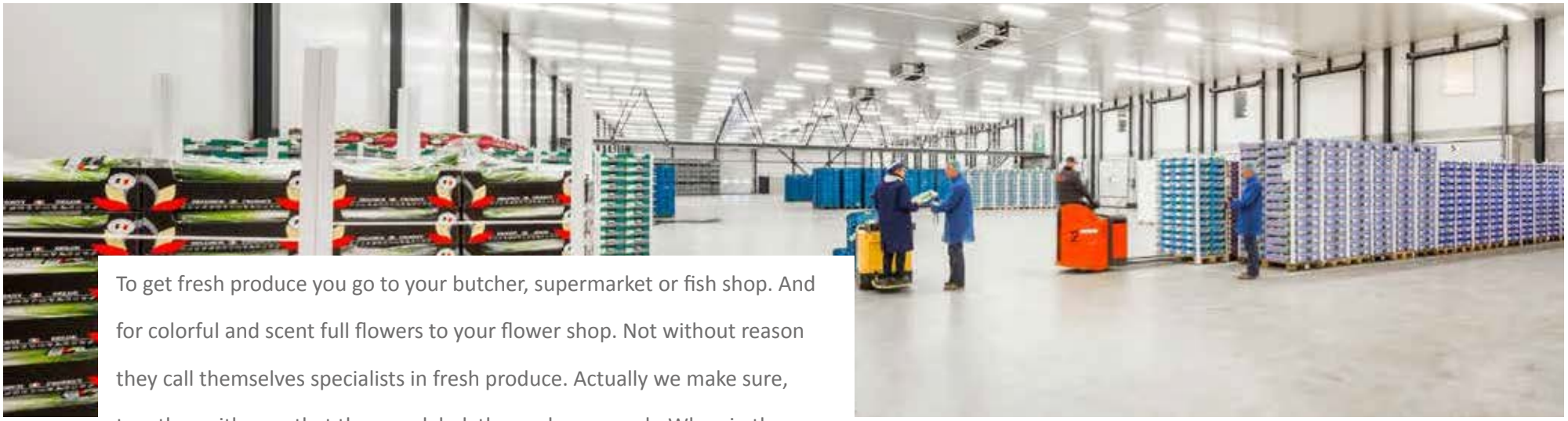
Worldwide

Our markets:

- Food industry: meat, fish, bakery, sweets
- Agriculture: vegetables, fruit and potatoes
- Flowers and flower bulbs
- Logistics: distribution storage at airports, sea harbors and road transport
- Laboratories

Our products:

- Cold stores
- CA/ULO cold stores
- Freezer stores and blast freezers
- Industrial Refrigeration solutions
- Doors
- Isolation panels
- PLC controls with application specific software



To get fresh produce you go to your butcher, supermarket or fish shop. And for colorful and scent full flowers to your flower shop. Not without reason they call themselves specialists in fresh produce. Actually we make sure, together with you, that they can label themselves as such. When in the morning the flowers, vegetables, fruits and potatoes come from the land, the fish has just been caught from the sea and the meat is being cut, our work starts. From that moment onwards we create the best available conditions to store and process fresh produce to keep it fresh a long time. In doing so, the produce is displayed in retail in optimum condition of freshness. With the best possible shelf life. And the consumer gets what he or she came for.

Geerlofs Refrigeration combines knowledge of fresh produce with engineering expertise. Our people have a vast experience in designing and building turnkey cold stores worldwide. Not to forget: 80 years of experience that builds a cold store or freezer cell for you.

GEERLOFS
part of the smeva refrigeration group

www.geerlofs.com

GROWING WITHOUT DAYLIGHT

The Dutch HAS University is proud of its facilities for plant production, especially its state-of-the-art water culture systems, HPS greenhouses, LED top and interlights and its LED equipped climate chambers for growing without daylight.

HAS shares its experience in horticulture and vertical farming with students and industrial partners and develops new knowledge with companies like Philips, Priva and Rijk Zwaan. In the BrightBox-Venlo we work in close cooperation with partners like Botany and Philips.

HAS University is a participant in international projects like Nethwork in Central America and Fresh Academy in Vietnam. Our ‘Growing without daylight’ course is available as an online course in English.

has hogeschool

www.hashogeschool.nl

APPLIED SCIENCE

A new kind of learning environment

Van Hall Larenstein uses the concept of the Living Lab to find solutions with which we can radically redesign metropolitan agricultural value chains and business models. This redesign demands collaboration and mutual learning of knowledge workers, entrepreneurs, social organizations and government.

The Living Lab is a new kind of learning environment and a promising instrument that can be used to bring about innovation in the agri-food sector. Living Labs, originally developed in ICT, create new and essential competences.

Van Hall Larenstein University of Applied Sciences has developed Living Labs in metropolitan areas in Pune India, Macedonia, Serbia and The Netherlands.

Hogeschool VHL University of Applied Sciences

www.vhluniversity.com

INNOVATION,

A company culture

Helping Societies In Transition

Our world is in transition. Faced with the challenges created by scarcity of resources, climate change, urban redevelopment, traffic management and more, there is a desperate need for new ways of thinking and new ideas.

Our innovation strategy and action programme focus our response. Through innovation, our projects are embedding smart solutions, pioneering technologies, resilience, flexibility and future functionality for businesses and communities.

Smart Solutions

Innovation is integral to our business. We recognise its importance in everything we do. We question, explore alternatives and we challenge ourselves and others. We create new approaches and apply ideas across disciplines for smarter outcomes.

Innovation helps our business thrive through renewing and adapting our products, services business models and processes. The resulting solutions are quicker to implement, safer, of higher quality, or more sustainable. They may require less resources or produce fewer emissions.

Strategic Agenda

We are recognized as a leader in innovation. To maintain this position, we have developed a strategic innovation agenda.

In building the best teams, we are developing a culture which supports innovation and maximizes co-creation.

Action Programme

To stimulate our innovation culture, we recognize and celebrate individual innovations, communicating them across our business. We highlight our innovations through examples and insight which we share with clients and partners. We regularly enter and win industry awards. These activities showcase what innovation means to Royal HaskoningDHV, what it is achieving and how it benefits society. We are creating a structure to develop our innovation pipeline. It includes an ideas bank and more collective involvement to increase momentum.

Innovation is a collaborative process, inspiring our colleagues and our associates. We work in partnership with clients, universities and knowledge institutions and are applying for grants and funding to extend our involvement in ground-breaking research.

Royal HaskoningDHV

Enhancing Society Together

www.royalhaskoningdhv.com

URBAN TECHNOLOGY

A growing population, tourism, and hospitality sector, and the trend of food being delivered on demand, any time anywhere impact the whole food supply chain and increases the pressure on cities' logistics system. As logistics challenges vary depending on spatial characteristics and type of food company, a location-sensitive understanding of the actors in the food supply chain, from farm to fork and beyond, is key to finding solutions.

At the *Urban Technology* Research Programme of the Amsterdam University of Applied Sciences we investigate food logistics flows spanning the city and region. Building upon an interactive food system map, we analyse last-mile logistics challenges at borough level, engaging all actors involved to create change.

Further down the chain, we work on a circular food system by researching logistics solutions for organic waste collection and de-centralized organic waste processing. The role the Port of Amsterdam plays in international food supply chains, such as cacao, soy and fertilizers, is also part of our research. Together with students, researchers and partners from industry and government, in these initiatives we work towards sustainable urban food systems for thriving cities.

Amsterdam University of Applied Sciences

www.hva.nl

FEEDING THE WORLD

Lentiz education group consists of 14 schools of which 6 are VET-schools and 8 general secondary schools. Our schools use internationalization as a vehicle to educate and prepare our students for their future jobs. All projects are related to present-day themes, which means that ‘Food’ and ‘ Food production’ are often the main topic.

One of our projects in particular is interesting to share: “Feeding The World”. This is an Erasmus sponsored project with 15 European VET-partner schools. Our goal is to insert more relevant and in-depth specialist knowledge into VET curricula. It will enhance the general level of knowledge and skills in the sector and thereby allow for more and more efficient & sustainable food production.

In this project, the partners aim to enhance the curriculum of the lectures involved by creating new, relevant and internationally oriented modules in the field of agriculture/food production and related businesses. These modules will contain specialist topics originating from the various partner countries and in this way help locally gained in-depth expertise get disseminated around Europe. In doing so, the project partners try to meet the need of skilled employees in the food producing and related sectors and hope to enhance production worldwide.

We organize exchanges of our students with the other international partners to stimulate their international mobility and enable them to acquire relevant international knowledge and experiences from the agricultural sector elsewhere in the world. Beforehand we organize a course for the teachers involved to enhance their didactical skills on how to handle an international classroom. This training just took place and we’re very much looking forward to the first exchanges which take place for the first time in March 2019.

Lentiz | education group

www.lentiz.nl

FEEDING & GREENING

Mega-cities with horticultural automation

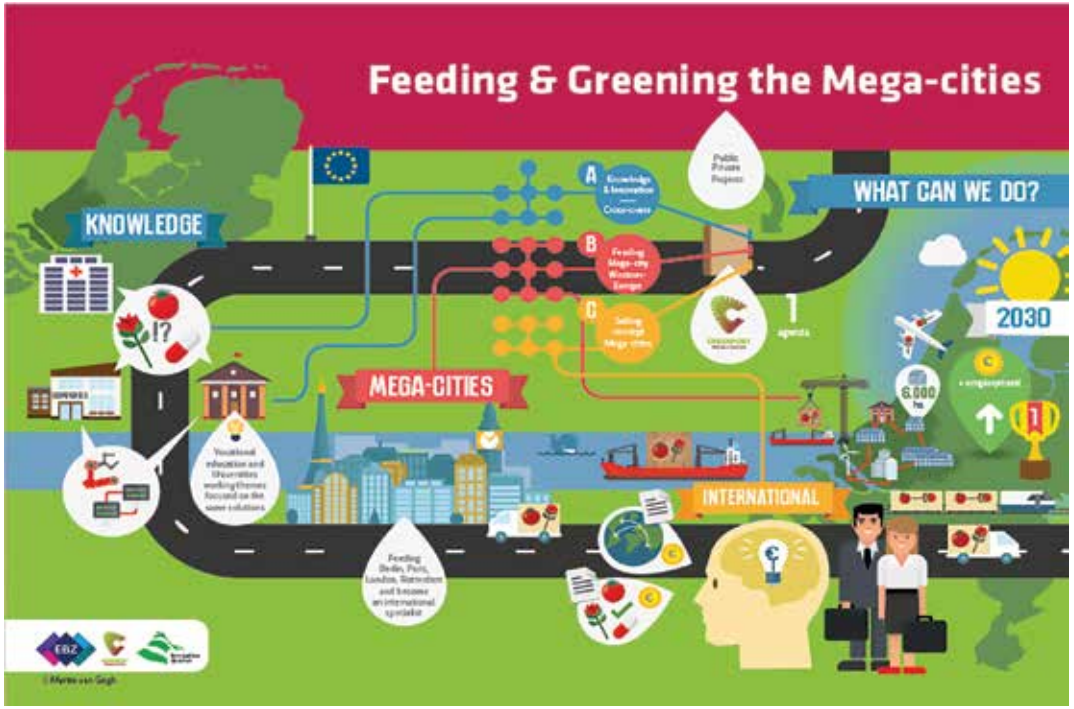
A bright, healthy and sustainable future lies ahead for the Dutch horticulture and its suppliers. However, this future doesn't come easy. It requires a strategy which contains 3 approaches that must be implemented at the same time:

1. Retain a world-leading position in the field of horticultural knowledge. Working on knowledge and innovation in the field of food, health, plant ingredients and technical systems are the first conditions to safeguard pre-eminence. Bioscience, cross overs, patents, food-safety. All these themes require a close cooperation and where boundaries of universities and graduate schools fade away we can all work together on the best solutions.

2. Feed mega-cities in Western Europe with the appropriate acreage and supply chains. Cities will play a crucial role in this development. Showing concretely how to feed a Mega-city in a responsible and sustainable way, sets a big example for the world. A top-logistical performance is a must, but quite in line with Dutch potential.

3. Propose the concept of feeding the mega-cities as a complete solution. Hundreds of mega-cities will arise in the coming years, wanting to produce their food locally. The blueprints are available. Just like New Orleans and New York are being protected against water, we can help to feed their size of cities. Dutch Horticulture will be able to play a key-role in this development and remain an international front runner.

What is it takes is more cooperation. Companies, authorities and research institutions must try much more to focus on growth, continuity and innovation.

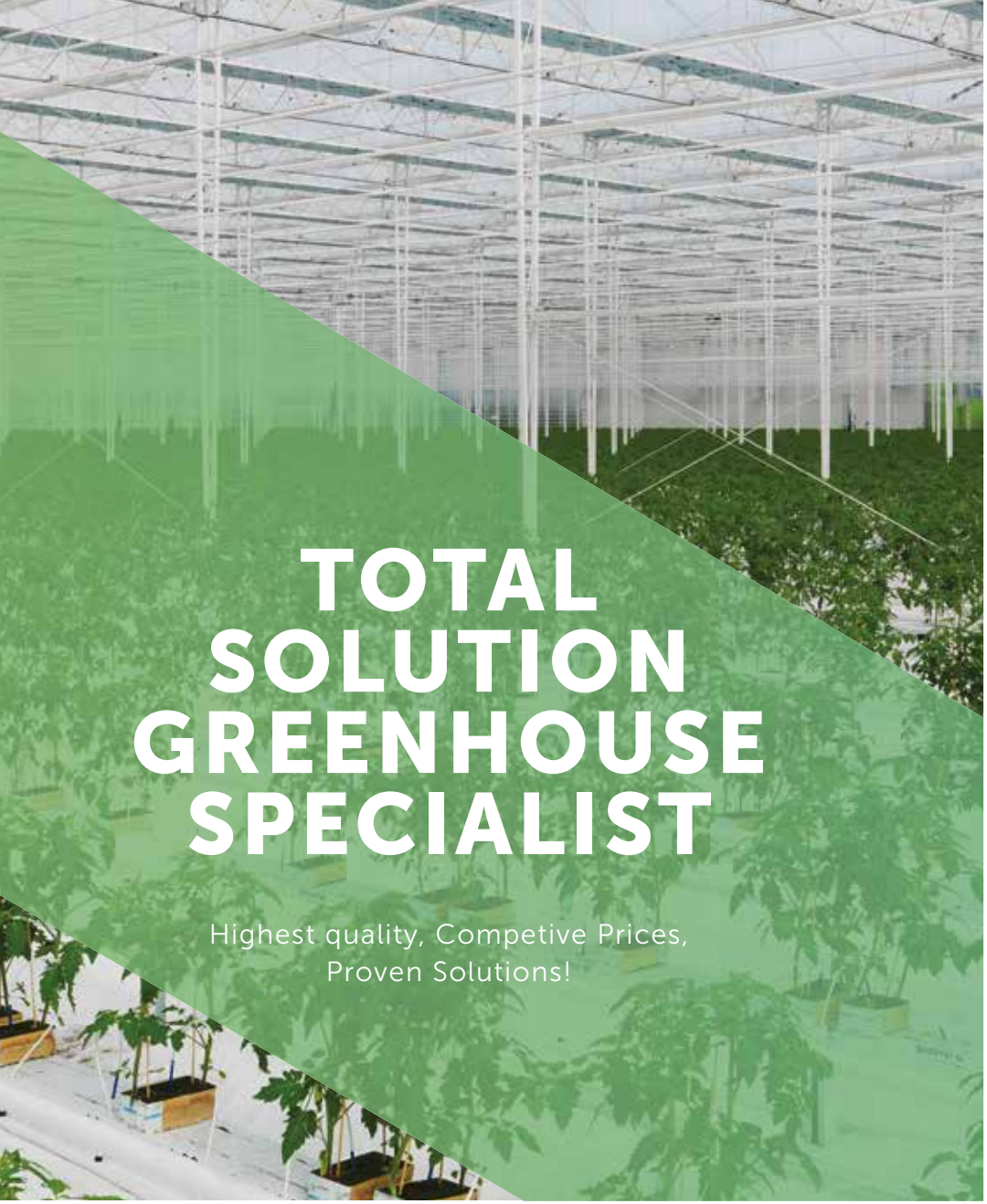


Hoogendoorn is a company aiming to combine these focus points; with the ambition to create sustainable and user-friendly automation solutions for every kind of horticultural business worldwide.

With the outlined approach Hoogendoorn tries to make significant steps forward towards a shared and prosperous future for all parties concerned.

hoogendoorn

www.hoogendoorn.nl



TOTAL SOLUTION GREENHOUSE SPECIALIST

Highest quality, Competive Prices,
Proven Solutions!

HORTI XS

THE DUTCH APPROACH

Today the world is facing a fast growing population which results in an increased need for safe food and a higher production per m2. At the same time the effects of climate change force us to use water, land and nutrients in a more sustainable way. Growing in green-houses "the Dutch approach" appears to be one of the first and major steps in the roadmap to a sustainable and circular production of food.

At Horti XS, our people have unrivaled experience and understanding of the needs of the global greenhouse technology industry. Our product development is driven by evolving market demand. Horti XS provides engineering and project management solutions to the greenhouse industry, over the full product life-cycle. The Company's main activities are the design, supply, installation, operation of turnkey greenhouse complexes.

Constructional engineering

Our Group employs approximately 20 engineers fulltime. The main disciplines of engineering are constructional engineering, engineering of heating systems, engineering of cooling systems, engineering of electrical systems and software engineering. Manufacturing takes place in China, Netherlands and Turkey.

Horti XS is a lean and customer-oriented firm with lots of experience in the field of development, construction and the complete realization of horticultural projects.

Horti XS has decades' worth of experience as a greenhouse builder and has developed into a leading provider for global horticulture. Horti XS sees the greenhouse as the backbone of a turnkey project and decides on the strategy, the layout, and the logistics of the project at the same time. The main principle in the high-tech greenhouse is always to increase yields and quality and reduce energy use to a minimum.

The Group is committed to conducting business in a sustainable way over the long-term by developing close relationships with local people, communities and businesses in host countries, and by safeguarding the natural environment.

Ambition of Horti XS

It is our goal and driving ambition to be the trusted partner of choice, delivering reliable, complete Turnkey greenhouse solutions that create value for Horti XS's clients, by sustainably and passionately applying the added value of the Company's technology and operating experience.

"Taking Greenhouse Engineering to the next level!"

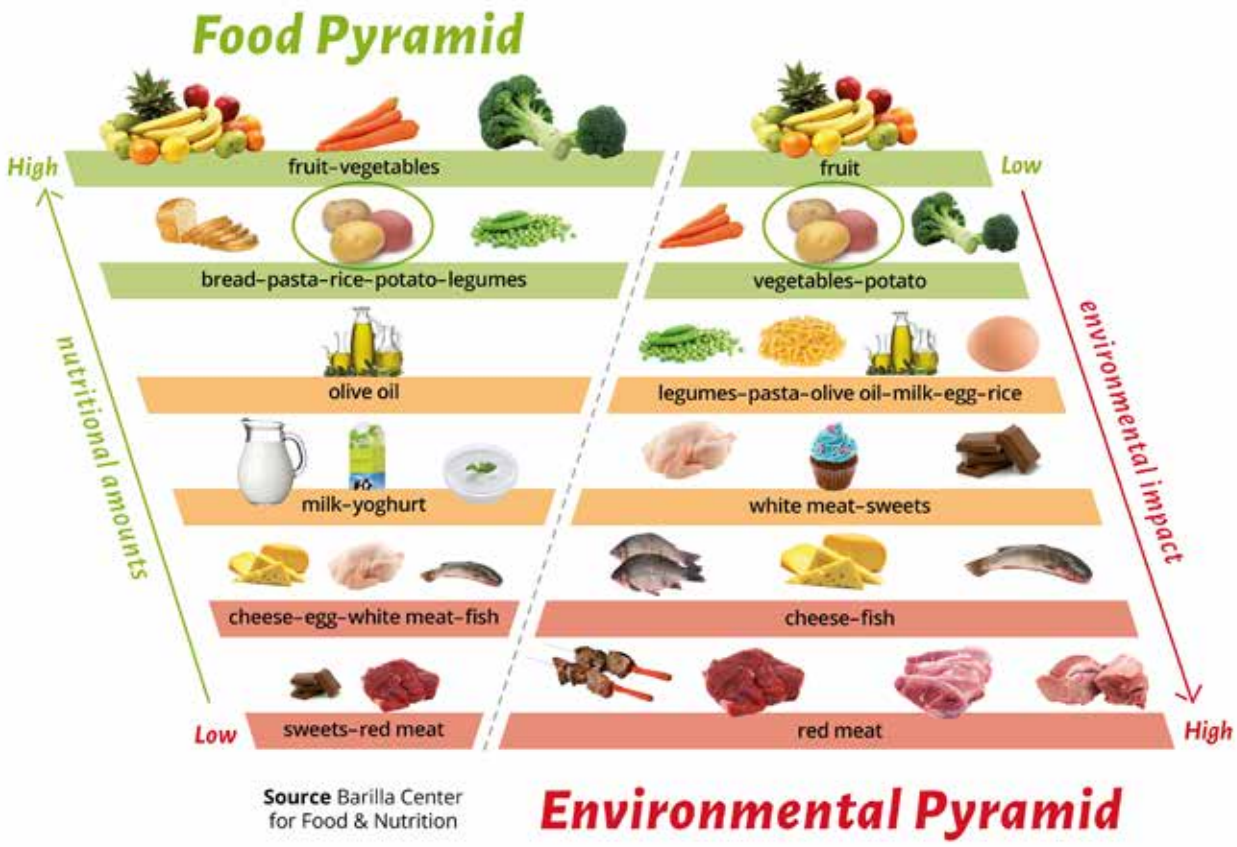
POTATOES ARE THE ANSWER

to the rising demand for food

To ensure food security in densely populated areas, fresh food that can be easily produced in the surroundings of cities is essential. Potatoes are not only the answer to that challenge, they are also highly nutritious! They are packed with vitamins, fibres and minerals, have a short crop cycle and require considerably less water than other staple foods. This vegetable is world food crop no. 4, but has the potential to surpass maize, wheat and rice.

Feeding the world

HZPC aims to contribute to the development of responsible food for a growing world population. This may sound like a noble aspiration for a commercial business, but to us it is absolutely realistic. We are convinced that our potatoes really can make a difference in the world. They already feed millions of people around the world every day. We strive to give everybody the chance to grow and consume them.



The best yield

Our varieties and seed potatoes contribute to worldwide food security. We deliver high quality seed potatoes and professional cultivation guidance to increase yields under different growth conditions around the world. The best yield starts with quality seeds. We continuously strive to develop efficient varieties, which are adapted to different usage, climates and growing conditions such as drought, heat and salinity. We focus on reducing the environmental impact of, for example, pesticides, by breeding for resistances.

Building chains

As a global leading company in seed potatoes, we are experienced in setting up local value chain platforms, delivering consistent potatoes year round. We are a reliable and ambitious leading player in the world of potatoes that wants to inspire the entire potato value chain. We believe in sharing knowledge, and growing and developing together.

Innovative concepts

Apart from the potato providing essential nutrients, we also meet the urban demand for variation by developing healthy and convenient potato products for modern consumers. Try our healthier French Fries (Fries4All®) and ready-to-eat freshly cooled potato strips (Woksi®) as a substitution for noodles, rice and pasta.

HZPC

Growing with our potatoes

HZPC is the innovative global market leader in potato breeding, seed potato trade and product concept development. For more information, please visit

www.hzpc.com


WE KNOW ...

The Dutch are known for their efficient farming and extremely high yields and this knowledge is key for upcoming economies in highly populated areas.

Kiremko has always strived to cooperate with local potato processors and potato farmers to improve crops that come from the land and ensure a good quality processing potato. Kiremko and its strategic partners do not only provide knowledge on the potato process. We make and install state-of-the-art lines for potato processing to produce high quality products like French fries, potato flakes, potato chips, hash browns and many more popular potato related products.

Kiremko believes that it is very important to work with both local and national governments and potato processors to get clear what their need is for knowledge and equipment. Combined, knowledge about the potato process and having the best processing equipment, will ensure that growing cities will have enough high quality food to support their growth.

Cooperation between Kiremko and its strategic partners ensures that the best equipment for food processing is available worldwide. Operating around the world, Kiremko potato processing factory lines (and knowledge) have been installed in Europe, Russia, the Middle East, India, China, Japan, Australia, South America and the USA.

Kiremko

Food Processing Equipment

www.kiremko.com


PARTNERS WITH NATURE

In order to feed the projected 9 billion people by 2050, farmers will need to produce more food with less input while maintaining and protecting natural resources. This is where biological and sustainable crop protection solutions can play a vital role.

For a number of years already our company prides itself with its quality reputation in greenhouse horticulture, where it provides the micro-animal husbandry that pollinates and combats invasive disease.

Koppert's most recent innovations focus on increased overall plant wellbeing in open field agriculture as well as protected agriculture. We have researched ways to increase the availability of beneficial microorganisms that have become scarce in many soils as a result of over-fertilization and intensive agriculture. Our microbial solutions increase crop resilience, improve access to nutrients, and result in improving soil quality. Farmers who have applied them realize higher yields and better quality crops. Following the initial years of research and testing, we entered into the market of large-scale agriculture.

Sustainable and ecologically responsible agriculture has a direct impact on all our lives and the planet. Koppert Biological Systems aims to make cultivation healthier, safer and more productive now and in the future.

As our cities grow on some of the world's most fertile areas, so the agricultural land in those regions shrinks. Koppert Biological Systems is dedicated to maximizing the yield of the remaining agricultural areal, and contribute to a healthy planet that can provide for present and future generations.

KOPPERT

BIOLOGICAL SYSTEMS

www.koppert.com

LIVEABLE CITIES

The liveability of our cities in the world is under pressure. We have a clear vision on how to (re)develop our cities based on inclusive and innovative concepts for robust and complete city centres and neighbourhoods, accessibility and sustainable mobility, a diverse and resilient local economy, vibrant public spaces and affordability.

Critical Needs

Improving the individual systems that make up a city will increase the liveability of the city overall. Water, energy, food and (affordable) housing need to be secured to sustain the next generations into our megacities of the future. Stable economies, strong leadership, cohesive and engaged communities, employment opportunities, healthy environment and qualitative and accessible education is required to create resilient liveable and loveable cities.

Innovation

KuiperCompagnons provide services for the development of innovative and integrated spatial (re)development visions, strategies and designs. We focus on the large cities around the world where the urbanisation will put the most stress on the liveability of these societies. Our strength is to find solutions within these complex urban environments. In recent years we have been focusing on urban agriculture as an emerging topic.

Urban Agriculture

The current urbanization rate will further transform fertile agricultural delta land into city scape, making food security an increased issue for most cities and therefore the quest for new and sustainable ways of producing food increases. We are member of Urban Farming Partners. A consortium with experts covering the total food chain. We are currently working on solutions to re-integrate food production within city limits in cooperation with several metropolises around the world like Singapore.

Singapore

Urban farming is a high potential solution, especially in densely built areas like Singapore. The city is dominated by skyscrapers, but has little to no available agricultural land. As a result, up to 90 percent of its food is imported. However, skyscrapers do not only take up space, they also provide space. Millions of square meters in, on top of and underneath buildings can serve as the fertile ground for so called urban farms. Supplying the local food market, urban farms can make Singapore less dependent of import and create a promising new business market, that investors, urban farmers and retailers will benefit from. The first very promising initiatives have already been taken.

KUIPER COMPAGNONS

www.kuiper.nl

BRIGHT FARMING

Farming innovators

As farming innovators, Lely is committed to the sustainability of tomorrow's food systems. By 2050, there will be more than nine billion people in the world. Eighty percent of them will live in cities at a distance, sometimes remote, from where their food is produced. Plus, it's not just the global population that's growing, so are its levels of prosperity. The increasing prosperity raises the demand for high-quality protein, such as dairy. We have therefore to find ways to increase our food production, even by up to 70% by 2050. Feeding the world in a sustainable way is one of the greatest challenges of the near future.

Lely aims to support these efforts with its solutions for automation in dairy farming. Since the founding of our family-owned company in 1948, we've been striving to improve the life of farmers. In doing so, we've changed many traditional practices. Among our innovations are the ground-driven wheel rake (invented in the 1940s), the power harrow (1960s), the robotic milking system (1992), and the automated feeding system (2013). Our solutions streamline farm work. They help dairy farmers run their businesses in a more sustainable and enjoyable way.

Data

Along with efficiency and automation, we're increasing the capacity for data-collection . Data are crucial for the reliability of future global dairy supply. We are now linking all aspects of dairy farming.

We connect input (feed) with the output (milk) through automated systems of feeding and milking.

Automation and data collection will enable dairy farmers to take the next step in farm management: a dairy business with 200 to 300 cows being run with no external workforce! Operating with increased productivity and leaving enough time for the farmer to enjoy a healthy work/life balance. And also the cows, with less human intervention, will enjoy more freedom.

Global and Local

Recently we introduced an on-farm dairy processer as well. This involves smart processing technologies to ensure the best food safety and traceability. But they will also enable the development of dairy products that are in tune with local markets. These technologies are in a way an expression of ideals, of sustainability, local production, and collaborative consumption.

They will give urban agriculture the chance to pervade and find foothold in our metropolitan life.

More Innovations and Investments

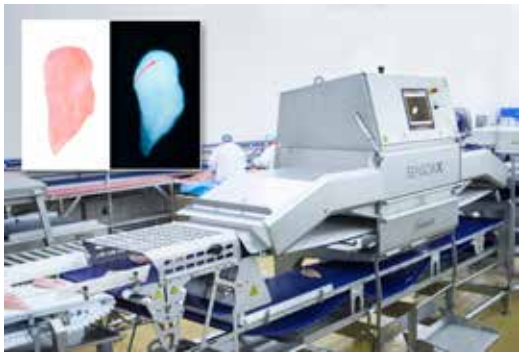
Together we need to strive for a world which promotes innovation and investment in the future of agriculture. Lely will do its part to help providing the world with nutritious, safe, and valuable milk and the related food that dairy farmers can produce.

LELY

www.lely.com

MATCHING POULTY PROCESSING

To urban growth



As global demand for animal protein rises, innovative new ways to satisfy it will be needed. Marel Poultry is a global leader in the technology of processing poultry and is ready for the challenge. It is, however, not just about increasing volumes. Food safety and sustainability are becoming key issues in a rapidly urbanizing world. Only when equipment fully meets the most stringent requirements for performance, food safety and sustainability, will it become of interest to every single country across the globe.

Performance

By 2050 some 70% of the world's population will live in cities. Chicken meat, processed in a high speed, high tech, high quality environment, will be one of the main sources of protein rich food. In this context, the focus of Marel Poultry on increasing hourly production throughputs makes complete sense, as top performance food processes will be needed to respond to the expected massive increase in demand for protein rich, affordable and healthy food.

Food safety

The knowledge that even the smallest contamination issue in a local food chain can have a much wider, even global impact, has made hot topics of food hygiene and food safety.

A key Marel Poultry priority is the supply of solutions, which ensure a hygienic process and which help processors deliver the safest possible food. In this respect state-of-the-art techniques for tracking and tracing - each and every product through each step of the process - are of invaluable aid. By translating global expertise into locally customized solutions, Marel Poultry is able to conform fully to all local regulations on hygiene, animal well-being or halal stunning and makes wholesome poultry meat available to city dwellers wherever they happen to be.

Sustainability

Sustainability is on the tip of everyone's tongue. The need to produce sustainably opens up huge possibilities for advanced, innovative processing. The solutions on offer from Marel Poultry lift processing efficiency to new levels, adding maximum value to all parts of the chicken such as breast, legs, wings, giblets and more. The result is perfect carcass balance with no useful resource wasted.

marel
POULTRY

marel.com/poultry

EXPERT KNOWLEDGE ON

feeding and greening (mega) cities

Netherlands Agro, Food & Technology Centers (NAFTC's) offer specialized knowledge on local markets and are dedicated to representing their members. NAFTC offices use a unique Co-Creation program and Land Development Software tool, which play a central role in many of its large-scale projects.

The Netherlands is the World's largest and most innovative exporter of Agri-Food technology, systems and equipment as well as a large contributor to World Food Security as leading source of healthy, safe agri-food products.

The strength of the NAFTC organization is based on its local offices with specialized knowledge of the local market, a joint commitment to the representation of its members, Holland branding, as well as on their integrated approach, working in close cooperation with other Dutch initiatives and the Agriculture Department of the Netherlands Embassies in their respective country of operation.

This position is further enhanced by NAFTC's unique Co-Creation programs involving the 'triple helix': entrepreneurs, knowledge institutes and government.

Its Co-Creation programs are based on:

Planning

Application of NAFTC's own innovative software for master planning regional development areas, using available resources efficiently and effectively to get to the highest possible nutrition yield per sqm.

People

Rural Development Network & Training Centres, focusing on development with knowledge transfer & training on the job, learning by doing.

Prosperity

Stimulating individual entrepreneurship for all parties involved in the value chains.

Results can be seen for example in Egypt, where NAFTC Africa with involvement of its members and being granted a Land Development Project, developed a unique, flexible Master Planning software tool, which today also plays a central role in new large-scale NAFTC projects in other regions of the world.

The NAFTC Africa and Middle East offices focus exclusively on the Middle East and Africa. NAFTC cooperates with the "Metropolitan Food Security", "Three4Life" and "FANEC" organizations. It aims to combine its Agro, Food & Technology expertise with that of the Water and Energy sectors. Together consortia like these are able to mobilize highly valued expert knowledge on Feeding and Greening (mega) Cities, hand in hand with their rural surroundings.

NAFTC Africa

Netherlands Agro, Food & Technology Centre

www.naftc-africa.com

CIRCULARITY; NO TIME TO LOSE!

The transition from a linear to circular economy

The transition from a linear to a circular economy is not only a necessity, but opportunity at the same time to help improving the environmental footprint and help securing a license to operate especially in area's facing water scarcity. Unlimited consumption and disposal of increasingly scarce resources like water, nutrients, organic matter and energy are the unfortunate consequence of today's non-circular standards and practices.

The impact of these recent developments on Planet Earth are asking for an immediate system-change. Our Nijhuis Industries team and partners do realize that there is no time to lose to help society implementing the transition of our water, nutrient and carbon economy into circular solutions securing clean water, sanitation, safe food and a healthy and resilient living environment for 9 billion people in the world.

Sustainable Water Use & Resource Recovery

(Waste)water treatment should no longer be focused on safe disposal only, but also on resource recovery. The use of, for example, animal manure should reduce the use of non-organic fertilizers. In the near future circularity maybe one of the only answers to the increasing needs of our growing population in a changing world that is trying to cope with climate change. That is why we, Nijhuis Industries, help our valued customers to meet their sustainability requirements, which are increasingly demanding. And at the same time lower their environmental footprint, combine productivity and energy efficiency and reduce life cycle cost. Together we meet today's challenges as well as those of the future. Move towards a CIRCULAR economy in a 'fluid' world and develop the most and best economical business case to create PROFIT and reduce, reuse and recover water and other resources.

nijhuis INDUSTRIES

www.nijhuisindustries.com

OUR MISSION
‘FEEDING THE FUTURE’

Today about four babies are born every second and by 2050, the world will have ten billion mouths to feed. With incomes rising as economies develop and people moving from rural to urban areas, the consumption of meat, fish, milk and eggs will increase. It is estimated that global food production needs to nearly double to meet this growing demand.

Yet we also live in a world with limited natural resources. The challenge is not merely to double food production, we also need to halve the pressure on the planet. It is simple: we need to produce more with less.

As a global animal nutrition and aqua feed producer, Nutreco is in the unique position to contribute towards more sustainable and efficient animal protein production. Our innovation agenda is focused on early life nutrition, nutrition related to healthy life and precision nutrition. With eleven research centers worldwide and over 100 global research partnerships, innovation is at the very core of our mission 'Feeding the Future'.

To further validate the effectiveness of our global products Nutreco has established validation centers to collaborate with leading universities, leading opinion leaders and key customers in the respective regions and countries. The validation of products in regional markets is important in accelerating the transfer of best practices from one market to another.

In the 1990s, 3.5 kilos of wild fish was needed to produce 1 kilo of farmed salmon. Our nutritional solutions have enabled salmon farmers to become net protein suppliers today. With our products that support the intestinal health of animals, we help to reduce the need of antibiotics in livestock farming and contribute to the global fight against antimicrobial resistance. Our research into the early life development of young animals stands at the basis of finding new, sustainable ways of improving development and productivity.

Nutreco employs approximately 12,000 people in 35 countries. Our advanced feed solutions are at the origin of food for millions of consumers worldwide and include products, models and services that enable our customers to optimize both their profitability and sustainability. Our two divisions Skretting (aqua feed) and Trouw Nutrition (animal nutrition) have sales in over 90 countries.

nutreco

www.nutreco.com


CLIMATE CONTROL
Like no one else does
OMNIVENT
Omnivent Demo - Omnivent DaE
21.9 °C
91 %
10.9 °C
712 ppm
21.9 °C
77 %
20.9 °C
22.9 °C

Urbanisation, fast growing global population and growing of middle classes make the security of food and its constant availability more and more challenging and important on our planet. The challenge is not only increasing production of food but also reducing losses and waste and creating awareness in the food chain towards the demand.

Omnivent is the international specialist in custom made food storage solutions, with multiple production facilities and sales and support branches worldwide. Omnivent is working in more than 60 countries with a dedicated team of specialists, who understand the above-mentioned challenges and quality demands in the todays agricultural sector.

But nowadays high-tech storage solutions are not sufficient enough anymore: a high level of knowledge of the present supply chain, climate circumstances and technical possibilities is required to provide the suitable solution to the client in order to ensure optimal product quality for long term storage of the crop.

Consequently Omnivent's own R&D department introduced several years ago a new concept to control product quality. With this concept Omnivent is able to use alternative energy sources to reduce the carbon food print per ton stored product and to improve the user friendliness of the system.

The OmniCuro

The result is a high-end storage controller called "OmniCuro". The OmniCuro is equipped with a number of features to be ready for future developments: a.o. an Energy Management System (EMS), use of Solar panels and other alternative energy sources, weight loss measurement & control, high efficient fans with speed control through Modbus communication and a "*Wizard*". This feature, *never used before in the agricultural sector,* provides advice to the customer for the selection of program settings for his crop storage, based on a carefully selected questionnaire. The result is advice on the current status of crop, which is uploaded automatically after approval of the customer.

User friendliness is enhanced by simplifying the graphical interface on touch screen, PC, laptop or smartphone. The update of control software is done online, only acceptance of the customer is required to receive the latest features. Because of its online connectivity Omnivent can also deliver accurate technical and agronomic support.

Quality support systems

Not only the OmniCuro is helping to establish quality improvement. Also the well-known compact OmniBreeze air humidification system and the OmniRecup energy recuperation system for optimal air refreshment during the storage season are important performance improvers. Recent developments launched by Omnivent are the OmniFan ventilator with permanent magnet technology, a robust ventilator with high efficiency engines, and also the OmniScale for accurate weight loss measurement during the storage season.

The Omnivent approach with the view on the future connected with the Omnivent Staorge Academy (OSA) is providing the key for the right solution in agricultural storage support and custom made solutions.

OMNIVENT

SMARTER STORAGE

www.omnivent.com

PARTNERS WITH NATURE

PHOTOGRAPHY: BEN VULKERS

Reduce your carbon footprint and reclaim valuable resources

The availability of fresh water has become a major global challenge and a shortage of fresh water will threaten the world food supply. This, together with the reclaim of valuable resources, are the key business drivers for Paques. Using biotechnology to purify wastewater and gas is Paques' specialty.

Water sustainability has become a significant issue for companies dealing with fast moving consumer goods (FMCG). Many FMCG-companies publish information on their water usage and are committed to reducing their carbon and water footprints. Paques' technology, based on sustainable and natural processes, enables the company's clients to combine economic progress with environmental responsibility.

The food industry is incredibly varied, with many different types of effluent streams. In general, processing uses a lot of water and wastewater often contains organic products, with possibly fats, oils and grease. In addition, some wastewater "segments" contain high levels of nitrogen and phosphate, which imposes increased discharge costs. These characteristics make biological wastewater treatment a very interesting option for the industry.

Paques purification processes vary from end-of-pipe solutions to closed loop systems, using a combination of anaerobic treatment, aerobic treatment, filtration, ultra-filtration, reverse osmosis and UV radiation. With over six hundred case references in the food industry, Paques has ample proof of its solid experience in advising the food industry; advising on how to create renewable energy from wastewater, reduce discharge costs whilst complying with environmental regulations, recycle process water and non-process water (e.g. water for steam boilers) and reduce the intake of fresh water.

In the last fifty years, Paques has grown into a global player in the development of innovative biotechnologies; the company is continuously looking for new innovations to help companies in the food sector worldwide to reduce their footprint. With offices in many countries, and represented by licensed partners in others, local presence and the best service for clients is ensured.

PAQUES

Revitalizing Resources

www.paques.nl


FISH FOR LIFE.

Parlevliet & Van der Plas is a successful, top 20 of the world's largest seafood companies. Founded in 1949, this family owned concern with 7.700 employees is dedicated to provide millions of people worldwide with affordable high-protein food every day. We do this in a sustainable manner, preserving the capital in the sea by catching the interest only, and we strive to ensure that all fisheries in which our vessels operate are certified in accordance with a sustainability standard. As responsible stewards, we believe in balancing ecological, social and economic interests.

The size of our company enables us to be a supplier of seafood to all types of customers in terms of their purchasing power. Our canned tuna, shrimp products and cod can be found in supermarkets all over the world.

Our main markets for whole round, frozen at sea pelagic products like herring, mackerel, horse mackerel and blue whiting, are mainly in Africa (Western Africa and Central Africa) and the Middle East (predominantly Egypt) and Asia.

To illustrate, our Dutch herring, prepared in local style, is widely eaten in the cities in Burkina Faso, Ivory Coast and Nigeria. The same goes for our mackerel, which is smoked to a golden color, and enjoyed by Nigerians, Ghanaians and Ivoirians as an essential source of high-quality protein. As a healthy, affordable and easily transformable protein resource, pelagic fish is an extraordinary product that is enjoyed by people from all cultures and all religions worldwide.
Without doubt, the development of pelagic fish markets for human consumption purposes by our company is a major success story.

Thanks to innovation and decent stewardship, our fish and seafood products can further expand on their role as a healthy, affordable source of animal protein for a growing, increasingly urbanized world population.

PP

www.pp-group.eu

GOOD SEEDS

The key to feeding metropoles

The Netherlands sector for seeds and planting materials already plays an important part in feeding the cities around the globe and is perfectly positioned to continue to expand its role.

An essential key to feeding metropoles

Seeds and planting materials lie at the root of every food value chain. Seeds do not only determine to a large extent the success of farming systems; they determine transportability, processing and consumer qualities including taste and nutritional values. Seeds have to be optimally adapted to the various and continually changing supply systems that fe ed the city; be it intensive urban or peri-urban production of fresh produce, large scale production of grains, or production of regional specialties by smallholders.

The Netherlands: Global centre of adapted varieties and quality seeds

The Netherlands, being one of the densest populated countries in the world, has a history of over two centuries in producing and exporting seeds. This history, together with entrepreneurship and its knowledge infrastructure has made the Netherlands the global number one exporter of seeds and planting materials. Our top-position is attained particularly in vegetable seeds and seed potatoes, but also involves grass seeds and seeds and cuttings of a broad spectrum of ornamentals that are important for greening cities and colouring homes and gardens.

Combining global and local

The Netherlands breeders select plant varieties by matching the global scientific developments with the local needs of consumers and growers. They maintain stations in different countries, close to all major metropoles in the world. They thus take into account all the local needs and preferences and select the best seed production locations globally. Their base in the Netherlands provides the required scientific knowledge, as well as the seed quality control procedures to assure an excellent start of crop production. Their presence in many countries contributes to sharing knowledge and economic benefits. This effect logically is most noticeable in countries that protect breeder's rights, have favourable investment conditions, and apply effective regulatory mechanisms for the international movement of seeds.

As leading country in sector for seeds and planting materials, The Netherlands already plays an important role in feeding the cities around the globe. It is perfectly positioned to continue to expand this position.

Plantum

www.plantum.nl

PELAGIC FREEZER-TRAWLER ASSOCIATION

CATCH & CARE

Our oceans are home to a wealth of fish and shellfish, which make a vital contribution towards feeding a world population of 7 billion. The members of the PFA are family-run, vertically integrated fishing companies, based in several EU member states. They operate a combined fleet of 19 pelagic freezer-trawlers fishing solely for human consumption.

Our aim is to maintain a sustainable fishing industry, where the supply of frozen pelagic fish to people all over the world is in balance with the responsible harvesting of the fish stocks concerned. PFA members have therefore established a policy in which collaboration with scientists and the transfer of knowledge on sustainable fisheries play a central role. The Association is active in a large number of sectoral and international bodies, where fisheries science is developed for responsible management. Four of our fisheries bear the prestigious Marine Stewardship Council label for sustainable fisheries.

Our catch of pelagic species (herring, mackerel, blue whiting, horse mackerel and sardines) averages around 500,000 metric tons annually. Up to 90% is exported to markets outside the EU (predominantly Africa) where pelagic fish is often the only affordable animal protein. In this way the PFA members provide more than 5 million meals per day of healthy, omega-3 rich pelagic fish to consumers around the world.

PFA

www.pelagicfish.eu

RIDDER

Farmers and growers worldwide need to be able to adopt their own individual approach to efficient and sustainable controlled environment agriculture. This is the promise that Ridder, as an international family-owned company, fulfils by translating more than 65 years of Dutch agri-food expertise into adaptive technology and know-how that is tailored precisely to local needs and conditions.

Visit our website www.ridder.com and find out how we can help you grow!

Helping you grow
your way ridder.com

AGRICULTURE INTELLIGENCE

Waterwatch Cooperative helps to feed our growing cities in a way that benefits both people and the planet. We address the need of farmers and others in the agricultural value chain to enable them to make well informed decisions by supplying dedicated- and local information services. These services are based on advanced AI technology and wide variety of resources a/o earth observation data. With better and timely information, farmers can:

- Produce a much better harvest
- Increase yields and income
- Reduce risk of crop diseases
- Reduce the use of pesticides and fertilizers
- Make the best possible use of water

Worldwide an increasing number of farmers discover the power of data analytics. Our ambition is to connect all farmers (approx. 570 million) including the small holder farmer to our information services and to support them every day in making well informed decisions to realize a sustainable improvement of yield.

WATERWATCH COOPERATIVE

www.waterwatchcooperative.com

> WE HAVE AN IMPORTANT MISSION TO FULFILL

Many people are looking for a better life in the city; a career, more varied food, health and mobility. Every day, 200,000 people around the world move to a big city. Today there are already over 30 large metropolises; from Tokyo with 35 million inhabitants, to Manila with more than 20 million inhabitants. In 2030, 60% of all people on earth will live in metropolises. There will even be super cities with more than 50 million inhabitants.

Where so many people live and work in close proximity, there are many mouths to feed and more and more food will need to be produced. That's quite a challenge! Many times, the countryside is pushed away, to make room for the construction of houses and other buildings. Cities are beginning to realize that they can't continue to sacrifice the land around the city, because this land is needed to produce food. That is why the 'green belt' – the land close to a city that is or at least should be used for food production, will have to be integrated into metropolitan developments.

Cities are the biggest drivers of radical innovations

Because of all these developments, cities are becoming the biggest drivers of sustainability and radical innovations. With this, we mean: technological breakthroughs that create sustainable solutions. Local authorities will increasingly support the use of their cities as a testing ground for new technology. And with a clear goal: to solve the major problems they have with living, working, air quality, sewage, water, energy, lack of green, mobility and safe and healthy food. The cities' inhabitants are becoming more demanding and critical. Quality of life is becoming more important than economic growth!

And that forces us to handle our natural resources in a smarter way, so that we don't exhaust Mother Earth.

Efficient energy and water flows, sustainable food production, green and clean neighborhoods and decentralized, short supply chains, will all transform these cities into sustainable living environments.

Meiny Prins, CEO of Priva: *"On to a new world where cities will have the power and will become the promoters of the creation of a green, healthy and circular society."*

Indoor Growing

Growing plants indoors, in a fully controlled and clean environment is a good example of a sustainable and radical innovation that responds to this movement. To create a professional indoor farm, thinking through every detail is crucial. Priva has invested in horticulture and building automation for many years and is collaborating with several key players in this field. Thanks to our extensive knowledge and experience, we can create the perfect circumstances for growing plants in an indoor facility. Because at Priva, we believe that growing indoors without the influence of daylight and external climate conditions will play a fundamental role in feeding the cities of tomorrow.

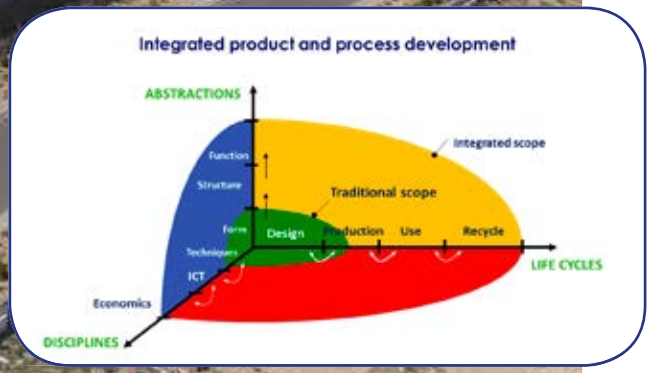
CREATING
A CLIMATE
FOR GROWTH

PRIVA

www.priva.com
www.sustainableurbandelta.com

SYSTEMS AND TECHNOLOGY

which contribute in ‘feeding the world’



QuaTerNes' activities aim to stimulate efficient integration of agriculture, food, water and relevant energy aspects and policies to answer World Food Challenges. We focus in this respect on system and technology innovations that result in less usage of water, energy and chemicals. In that way, we expect to contribute significantly to world food security and food safety.

We focus on realizing sustainable development and efficient integration in the value chain of the world's main food crops such as potatoes, fruit and vegetables. These crops are a significant source of ingredients, essential elements and vegetables proteins, that provide the basis for healthy, sustainable products.

Our companies and international partners combine their capabilities and expert knowledge on a global scale in all segments of the Agro, Food &Technology sector. They supply products, user friendly systems and software, as well as investment, advisory and management services for different climatic and agricultural environments.

In this way, we assist companies, governments and farmers to develop modern investment projects In the field of Agro, Food & Technology with higher production efficiency, increased yields, limited losses, higher nutritional value per sq.m. and the lowest cost of the final product. All with a consumer centered approach.

Our references range from breeding and industrial, large scale vegetative multiplication (**ProphyTIS**) to master planning and realization of added value facilities and agri-food parks (**Hak&Partners**, **Q Solution**).

QuaTerNes

www.quaternes.nl • www.prophytis.com
www.hak-partners.nl • www.q-solution.nl

GROWING A BETTER WORLD TOGETHER:

From farms to future-proof dining

Figure 1

Rabobank wants to contribute to the global food security solutions. From innovative finance models and start-up festivals in the USA to smallholder cooperatives in Africa; from soil improvement projects in Brazil to big data and cold chains in Asia, from partnerships with UNEP, WWF and FAO to consortia of Dutch horticulture companies: these are just a few of the tools Rabobank can commit to as global leading F&A bank. Supported by the Food & Agri expertise we've built in the past decennia on a worldwide scale (see figure 1). However, at 'home' we can also make a difference in food patterns:

Brasserie 2050

This year we developed a new concept in cooperation with the Dutch Lowlands Festival and The Food Line-Up catering company: a future proof restaurant called Brasserie 2050. Because in 2050 the world population will probably be 10 billion people. That will have a huge impact on consumption, and therefore on food production.

On the menu we served classic dishes such as steak tartare, ravioli, boeuf bourguignon and crème brûlée. But every dish had a surprise in terms of its ingredients and the story it told about food issues. The steak tartare was called 'meat me halfway', and was half as big as usual. We don't advocate completely removing meat from our diet, but eating less and better-quality meat. Also we served hyperlocal salads with ingredients of the land right next to the Lowlands site. The other ingredients come from the wider region. By eating more local products, less transportation is needed, and we can therefore reduce CO_2 emissions.

Shorter food chains in and to the city

With this formula we built a bridge between big corporate clients and small local entrepreneurs. We offer talented young chefs a prominent stage - like Lowlands. Because our specialists excel in a type of cookery or particular dish, we see them using their expertise to make sustainable choices more quickly. They choose to buy directly from the farmer or producer. That makes the chain shorter and more transparent.

By setting a new standard, we hope to inspire other companies to work sustainably - not only catering companies, but also other food retail and related businesses.

We can only Feed Tomorrow's Cities in close cooperation with others and this example shows how you start **Growing a Better World Together** in your own country!

Rabobank

www.rabobank.com

PLANT-BASED PROTEIN FOOD

Schouten Europe started in 1990 as the first Dutch company to develop meat substitutes based on plant-based proteins from soy, wheat and pea. Nowadays Schouten is one of the key-players in the worldwide market of meat substitutes with a range of more than 40 products that are delivered in more than 40 countries.

We work with European retailers; brand manufacturers of snacks, salads and meals; global fast food chains and all sorts of other parties within the industrial, intermediate, and institutional market. Our intensive cooperation with specialized production sites enables us to work quickly and efficiently.

Our products are manufactured at our own specialized production locations.

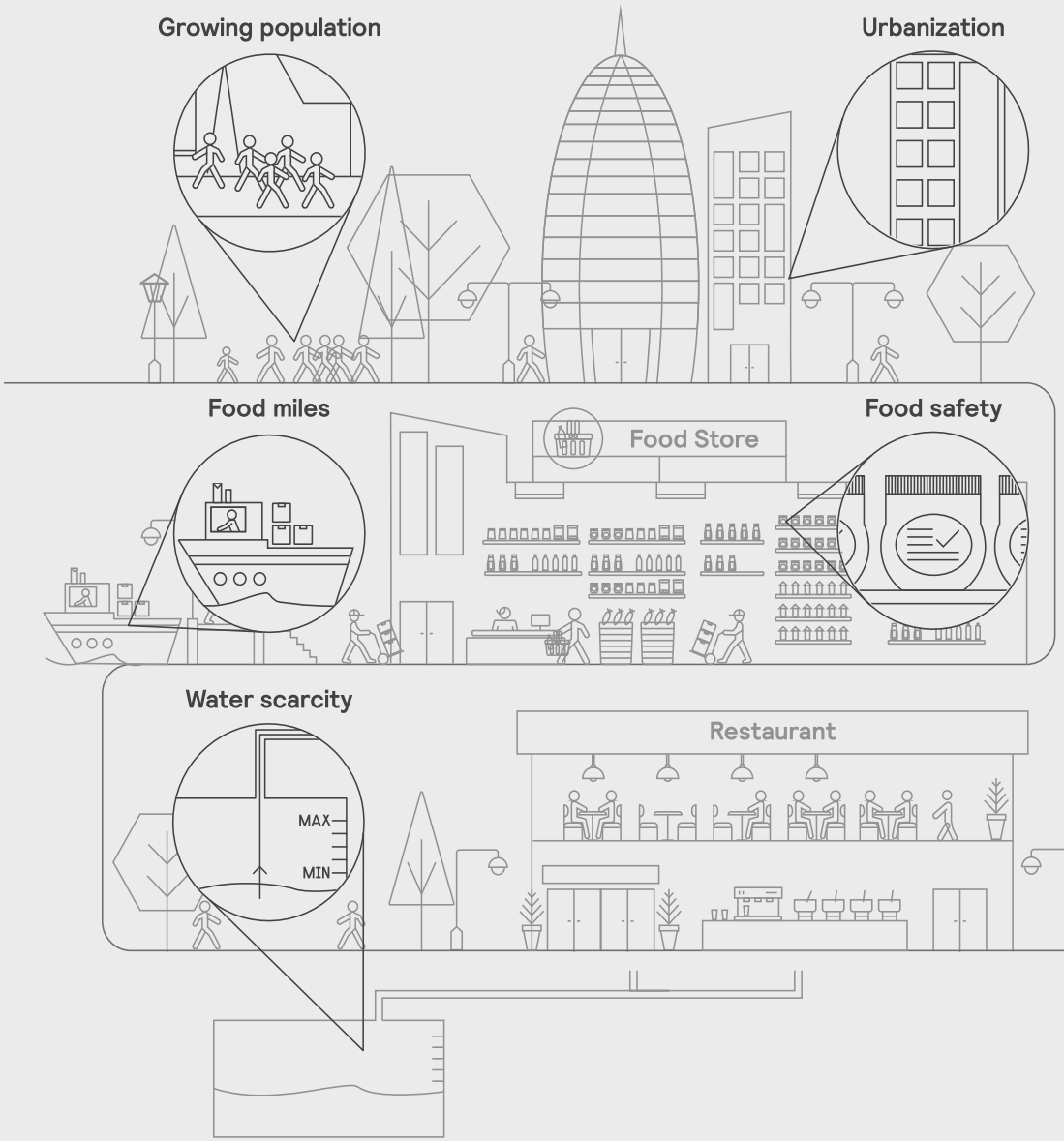
The products can be delivered both fresh and frozen. Sale under your own brand (private label) or under our brand GoodBite is possible.

In recent years, the plant-based foods market has seen strong growth. Alternative proteins and flexitarian diets were named key food trends in 2017 and 2018 by numerous industry commentators including Rabobank, Forbes, Mintel, Innova Market Insights and MarketWatch.

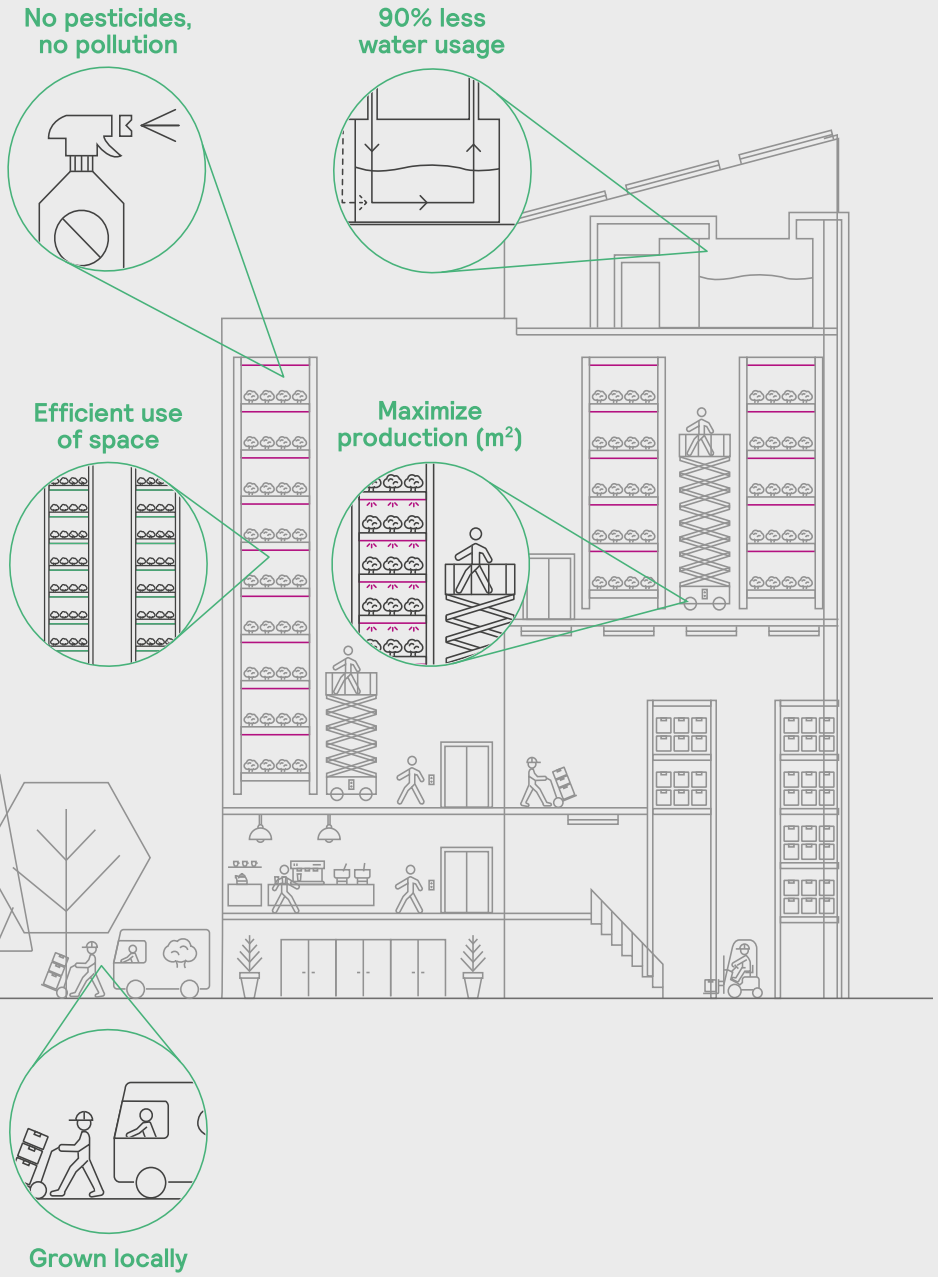
Annual global sales of plant-based meat alternatives have grown on average 8% a year since 2010. Currently, growth is about twice the rate of processed meat, with annual sales of about $2 billion. Industry estimates project that the sector globally will expand at a compound annual growth rate (CAGR) of 8.29% between 2017 and 2021, with the plant-based meat market reaching $5.2 billion by 2020. Longer term, it could make up a third of the market by 2050.

Schouten Europe can provide added value for any company looking for plant-based protein food. Good products, reliable deliveries, and professional support in the area of quality, marketing and product development are a matter of course.

Global challenges



City Farming benefits



VERTICAL FARMING REVOLUTION

50% more efficient.
90% less water.
100% pesticide free.

Vertical farming is a reply to the environmental problem that exists today in horticulture – how to guarantee fresh food to urban environments in a way that's efficient and sustainable. Also known as city farming, vertical farming is all about growing the best foods possible indoors to meet the needs of an increasingly urbanized world. Food is produced close to where people live, with minimal impact on the environment. In a city farm, we can use our knowledge to provide plants with the perfect conditions to grow indoors in a multilayer system.

Making horticulture more sustainable

Tomato cultivation with LED lighting has been booming since the introduction of interlighting (lighting in between the crops) in 2009. Greenhouses across the globe are shifting to energy-efficient LED lighting, making it possible to predict their harvest more precisely and increase their yield, as well as the quality of their produce. It even makes them less dependent on the weather conditions, as growers can light their crop in winter or on cloudy days in summer.

So what's the next step?

Beyond traditional farming

Since 2014, city farming has meant we have become completely independent of the weather and climate change. The innovative farming technology means that plants can now be grown in closed indoor environments without sunlight. The process is ideal for propagating young plants, cultivating full head crops and growing healthier, pesticide-free crops. It maximizes production by using LED to light multiple layers of crops, achieving a higher yield with a smaller footprint.

"We recognize the value of working with long-established manufacturers and suppliers in horticulture to generate growth for our customers as never before…" Udo van Slooten, Business Leader Horticulture at Signify.

Brighter Lives Better World

We are changing the traditional horticulture industry by joining forces with specialist players in this market and by working together towards new solutions. Signify is the world leader in lighting for professionals and consumers, as well as lighting for the Internet of Things. We unlock the extraordinary potential of light for brighter lives and a better world. With our extensive lighting know-how and plant expertise, we offer growers and vertical farmers the best advice on successful growing with LED, along with the most reliable techniques and LED products for growing in greenhouses and indoors.

Influence the cultivation processes

At the GrowWise Research Center, our plant specialists study the conditions needed to optimize plant growth. This includes the effect that different lighting, climate, nutrition, irrigation, sensors and data collection can have on plant health and quality. It enables us to develop growth recipes for vertical farmers that will produce specific characteristics and create healthier plants with higher yields. Besides our own research, we work together with researchers and commercial greenhouses, customers and partners to find solutions that produce more food and better crops. All by making use of LED.

Signify

www.signify.com

ORGANIC FOOD INGREDIENTS

for healthy and sustainable diets

Tradin Organic strives to be the global front runner in organic food ingredients. We offer a full-service portfolio based on our unique sourcing projects and sustainability initiatives. We have our own processing facilities and distribution capabilities, which help us to deliver quality organic food ingredients worldwide. With a strong focus on creating a positive impact for people and the environment, we work closely with the communities of our global sourcing projects to ensure fair work practices and traceability of our products at all stages of the supply chain.

Our efficient distribution helps us deliver our products to customers in the EU, US and around the world. We offer just-in-time deliveries and mixed, consolidated orders, helping our customers to maintain low inventory levels and a stable supply of organic ingredients

Studies increasingly show that consumers want their food to be healthier and more sustainable. Our wide range of organic food ingredients caters perfectly to this trend. For example, our range of organic plant-based proteins offer great options for the growing segment of consumers that seek to replace meat in their diets. We also supply a variety of organic sweeteners, offering alternatives to replace refined sugars. With crops farmed using organic practices that minimize the impact on the environment, our ingredients have better environmental footprints than the conventional (non-organic) alternatives.

Tradin's sustainability goals exist at all stages of the supply chain. For example, our organic mango farmers in Burkina Faso grow their mangoes without the use of harmful pesticides or sprays, primarily for the exportation of fresh fruit. As this is a production that typically sees a lot of fruit go to waste due to strict standards on the size, color and shape of the fruit, we took action. At our drying facility, we turn these rejected mangoes into organic dried mango - a sweet and healthy snack!

Similarly, in our certified organic cocoa project in Sierra Leone, we invested in trainings and registration for cocoa farmers to help them regain access to the world market after the Ebola crisis. These farmers receive an organic premium for their crop before the beans are shipped to our cocoa processing facility in the Netherlands, Crown of Holland.

TRADIN™
Organic
Global Organic Ingredients

www.tradinorganic.com

Transforming Global Food Systems

Globally, over 815 million people in the world today, one in nine, are under-nourished. In developing countries, the proportion of children suffering stunted growth can rise to one in three. Poor nutrition causes nearly half of deaths among children under five; 3.1 million children each year.

This is an unacceptable situation.

The United Nations Sustainable Development Goals (SDGs) include the objective of achieving a **Zero Hunger World** by 2030 (SDG#2). It is therefore vital to ensure global food security. Sustainable agriculture has the potential to help address food security, whilst at the time having relevance for other SDGs, including **Responsible Consumption & Production** (SDG#12), in particular through reducing food loss and food waste.

As Unilever, we are addressing food loss and food waste across our value chain, through innovation and collaboration. At the same time we acknowledge there is a long way to go before we achieve he desired impact in a global context. Therefore Unilever is actively working with partners towards this wider systemic change.

Transforming Global Food Systems

Why is so important to transform the entire global food system?

- Agriculture is the single largest employer in the world, providing livelihoods for 40 per cent of today's global population.
- The world needs to increase food production by 60% to feed a population that could reach 9 billion people by 2050.
- 500 Million small farms worldwide, most still rainfed, provide up to 80 per cent of food consumed in a large part of the developing world.

Unilever is a progressive business; in our view these issues present a humanitarian- as well as commercial imperative at the same time, because we depend on a supply of sustainably sourced, nutritious ingredients, many of which come from farms and forests.

Therefore, we believe global food systems have to change, to better serve farmers and their communities, the planet, and the people who buy our brands. As Unilever, we believe collaboration is the biggest driver to transform the global food system.

By working with organisations, such as **The World Economic Forum's New Vision for Agriculture**, we are building public awareness and advocating food system reform, as we want the issue of food & agriculture to be high on the political- and business agenda.

We co-founded the **Business Commission for Sustainable Development** (BCSD). Its 'SDG Prize in Food and Agriculture'-report concluded that achieving food security could create 80 million jobs and unlock 14 major business opportunities worth $2.3 trillion annually by 2030.

To help unlock this potential, we support the **World Business Council for Sustainable Development** (WBCSD) and the **EAT Partnership**, a global initiative seeking to accelerate the transformation towards a healthy and sustainable global food system, bringing together science, business, government and civil society to form science-based targets for the food system - and develop scalable business solutions.

Unilever is one of the founding members of the **Food and Land Use Coalition** (FOLU), aiming to define, co-ordinate and accelerate the transformation of foods and land use systems.
The overall objective is to achieve sustainable nutrition for all, whilst at the same time addressing climate change.

Food systems need to protect and ultimately regenerate natural resources, become a carbon sink rather than a carbon contributor, feed 9 billion people in a healthier, less wasteful way, and provide a more prosperous and resilient lifestyle for farmers.

For Unilever, food & nutrition security continues to be of the highest priority.

Unilever

unilever.com/sustainable-living/

DUTCH QUALITY VEAL

The Dutch veal sector started in the 1960s. With the growing demand for dairy products, the number of dairy cows in the Netherlands grew enormously. A cow needs to have a calf every year to continue producing milk. In no time at all, there was a surplus of calves that were not needed to replace the dairy herd (bull calves and surplus heifers). It was the start of calf-raising not necessarily for dairy farming but for the benefit of veal production instead. The Dutch veal industry has now grown into a sector of world stature. This sector employs more than 10,000 people and veal production alone is worth at least €2.1 billion at consumer level.

One of the major players in the field is the VanDrie Group. It is the global market leader in veal, calf skins and calf feed. With more than 25 companies and an annual turnover of approximately € 1,97 billion, the VanDrie Group is the largest private agribusiness group in the Netherlands. It exports its high-quality products to more than 60 countries around the world. The VanDrie Group is an integrated producer that covers the entire production chain: calf husbandry, processing of raw dairy products, calf feed and young animal nutrition, calf slaughter, calf skins, marketing and promotion.

Feeding tomorrow's cities? The VanDrie Group is partner in the trustworthy supply of young animal nutrition and highly nutritious and safe meat, an innovative and reliable producer. Continuous investment in innovative product development, quality assurance and marketing are the prerequisites for successful progress, both in the present and in the future. Sustainability is key in this. The VanDrie Group thinks in circular terms and makes use of waste flows. It is part of the group's policy.

The company capitalizes on waste flows and by-products from other sectors in various ways. The VanDrie Group buys calves from the dairy farming sector that are not suitable for replacing the dairy herd. It processes whey (a by-product from the cheese industry) into calf feed. And is using waste products from grain processing and oil seeds as feed. The VanDrie Group also tries to make total use of the calf. Not one single part of a calf is regarded as waste. Creating value from everything is the policy target.

The Dutch controlled quality veal of the VanDrie Group meets therefore all the requirements to address food needs worldwide. Throughout the production chain, food safety, animal welfare and environmental management are assured by Safety Guard, the VanDrie Group's unique full-service quality system. Safety Guard is based on ISO 22000 and incorporates IFS and BRC.

VanDrie Group

CONTROLLED QUALITY VEAL

www.vandriegroup.com

Think ahead with poultry people

One of the world's biggest challenges is how to feed the growing population while decreasing the use of natural resources in order to reduce the impact on the planet. At Vencomatic Group, we are on a mission to make poultry husbandry sustainable. We seek to balance the operation of a successful business with the lowest possible environmental impact, all while achieving the highest animal welfare levels.

Innovations and improvements have continuously taken place in the entire chain of the poultry sector. A commercially produced egg travels a long journey from the very first moment it is being laid until it reaches its final destination. On this journey it is confronted with numerous influences and sources of potential contamination. Vencomatic Group focuses on perfection for every detail of this journey, calling it the "Egg way". Their poultry and technical specialists evaluate and optimize every little step to protect the eggs from damage or contamination. Vencomatic Group strongly believes that optimizing the Egg way is the only option for poultry producers to maximize their profit

Extensive research shows that carrying an egg from the nest to the hatchery or the retailer can be managed perfectly if you have the insight in every single move the egg experiences along its journey. Being successful in modern poultry production demands not only a high level of management but also perfectly adapted equipment. At Vencomatic Group we not only know that each single system must be designed to maintain the egg in perfect condition, but we are also conscious that systems must interconnect. Their precise interconnection is vital for a successful chain of production.

Vencomatic Group

Agro Supply – Prinzen – Vencomatic

www.vencomaticgroup.com

FACTORY AUTOMATION

In Agro & Food

Viscon Group specializes in mechanizing & automating production processes in Agro & Food all over the world. We provide equipment in Fresh Produce, Horticulture, Poultry & Warehousing. Viscon is all about making life easier for our customers through innovation, quality products, expertise and reliability. We specialize in standout layouts and delivering turnkey in all our sectors, including all required tracking & tracing software for optimal food safety.

Viscon Fresh Produce is your partner in the delicate and intricate handling of greenhouse grown vegetables. Viscon delivers solutions to meet your needs ranging from the arrival from the green-house, up to packed, and palletized product, and everything in between.

Viscon Group also supplies all solutions required for the production of young plants, in the company Visser Horti Systems.

Visser Horti Systems has designed and manufactured machines and complete production lines for both large and small horticultural nurseries since 1967.

Viscon specializes in storage facilities for your product as well, in our company Viscon Logistics. Our automated systems take care of the entire product flow inside the building: ranging from the infeed of the sorted goods up to the outfeed of the order and everything in between. Storage systems are available for pallets, crates and boxes. We can also work with temperature-controlled products. Built in temperature zones even allow mixed storage of ambient, cooled and frozen products. The integrated software sorts and mixes every possible order on demand.

Viscon Hatchery Automation is dedicated to improve our customers profitability by providing cost effective, hygienic and reliable hatchery automation. Viscon is your partner in 1 day old chick production at high level automation.

Please contact us for any factory automation project in Agro & Food!

VISCON GROUP

www.viscongroup.eu

FISHING FOR FOOD

From Dutch Fisherman to Global Market Player

Seas and oceans cover around 70% of the earth's surface. W. van der Zwan & Zn. focuses on responsible fishing and the sustainable production of marine proteins in order to meet the growing demand for affordable proteins.

Our state-of-the-art fishing vessels catch quoted fish mostly in European waters, targeting pelagic species like Mackerel, Herring, Horse Mackerel and Blue Whiting, as well as demersal species like Sole, Plaice, Turbot and Brill. The fish is caught in a sustainable way, and sorted, packed, and frozen directly on board. We offer healthy, affordable and high-quality fish-products for sale to over 1 million consumers every day, mostly in Africa and Asia. Fish is healthy because it contains plenty of vitamins, proteins, and omega 3 fatty acids.

After landing, we store the fish in our own coldstores in The Netherlands, from where we export our fish world-wide. The largest populaton growth is expected to be in Africa. We own coldstore and distribution companies in Ghana and Nigeria, close to large cities such as Accra and Lagos. In Africa, our fish is often the most affordable source of proteins in the daily menu. Of course tracking and tracing is fully transparent, whereby the quantity is always accounted for and whereby the quality is guaranteed, from catch to delivery.

W. van der Zwan & Zn. uses selective fishing techniques, based on net innovations and acoustic research, contributing to a reduction of by-catch and a reduced carbon footprint of pelagic fish species. The carbon footprint of, for example Mackerel and Herring, is the lowest of all animal proteins produced. Unlike cows, pigs and chickens, fish caught in the wild do not have to be fed and do not use up scarce freshwater recources.

wvanderzwan.nl

SMART FARMING

Southern Agricultural and Horticultural Organisation (ZLTO)

ZLTO represents the interests of entrepreneurs working in green areas. Together with our members, over 14.000 farmers, we work to produce healthy food, flowers and plants in an innovative and sustainable way.

ZLTO has been founded at the end of the 19th century as a social movement to promote the social and economic emancipation of small farmers. The organization started with the mobilisation of the farmers at grassroot village level. The pioneers or innovators at that time understood the meaning of two basic principles for a successful farmers organisation: high trust and shared profit.

Farmers today face many more challenges. For example: food has to healthy, its quality flawless, with a small footprint, no nuisance for neighbours, transparent and cheap and contributing to the 17 MDG's (Millennium Development Goals).

ZLTO believes that farmers can and will have to play an important role in the major challenges society faces nowadays: our climate, food safety & health and rural development. Farmers have solutions and can contribute solutions to the challenges. Farmers produce sustainable energy, water management, contribute to biodiversity, recreation, education, our landscapes and innovation.

ZLTO believes in cooperative innovative farming for the future; farming in two directions. The first one is 'smart farming' with the focus on new technology: precision farming, agro-biotech, green medicine etc. The challenge is more output with less input, transparency and societal responsibility. The second direction is 'social farming': farming in connection with society and environment. Social farming is about food, energy, water, care, nature, culture. It brings farming in the cities and citizens to the farms.

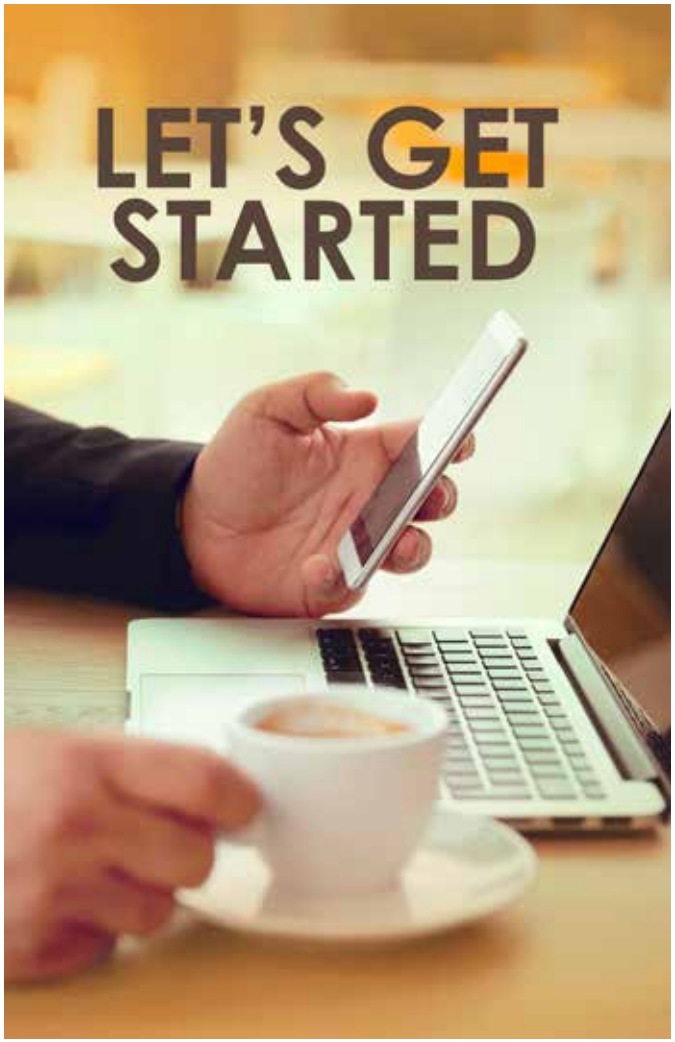
ZLTO always had a high degree of member-participation. Together with the members and the stakeholders in market and society ZLTO works at a sustainable future for farming and farmers households.

ZLTO

www.zlto.nl

SYNTHESIS:

CREATE MORE THAN THE SUM OF THE PARTS



Feeding tomorrow's cities is a a complex challenge. Numerous trends have an influence on production, processing, transport and marketing of daily food in the expanding urban regions. Addressing merely one of them will most likely have an unwanted adverse effect. If only attention is paid to – for example – food availability, what will become of quality, water and energy use, infrastructural complexities or equal access? Just to name a few.

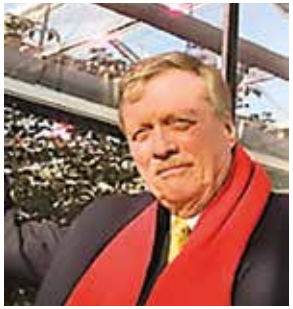
We need to take all those aspects into account if we want to improve the A&F system. The overview of the challenges presented in this publication is far from complete. But even this selection shows that we must have our antennae out for the developments that may have a positive impact. This in itself is already a thought-provoking assignment.

But just adding up parts is probably not enough. We are dealing with an A&F *system*.

So, the real challenge is to transform these essential parts into something that is more than just the sum of them. And also here the way forward is to start collaborations between stakeholders. To compare experiences, to have disciplines interact. Together they can create, innovate and try to provide answers and solutions that neither of them can do by themselves.

With this publication we hope to have helped, perhaps only modestly, to push in this direction. It will take many more efforts to get closer. Feeding tomorrow's cities is a cause that certainly deserves it.

Ate Oostra, editor



Ate Oostra,

Ret. Ambassador &
- Director General Agriculture

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Responses

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https://insights.abnamro.nl/en/

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