

# THE OVERVIEW EFFECT

FOOD SYSTEM INNOVATION THROUGH  
REDESIGN, RECONNECT AND REVALUE

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## 1. THE OVERVIEW EFFECT

Why is it that some astronauts, when they return from their space mission, get involved in sustainability? Why are they suddenly so motivated to share their experiences and insights with large audiences, or work in education and research with students on sustainability, renewable energy and climate adaptation and mitigation strategies?

Is it because they have seen our planet Earth as small and all alone in that immensely large black space? Is it because they have seen how thin our atmosphere is, how fragile our planet really is? How everything is interconnected? How national boundaries vanish, how conflicts that divide people become less important? Or is it because they have suddenly realised the urgency of protecting our planet; the one we depend on for a healthy living environment, air, water and food - for life itself?

***The overview effect: a cognitive shift in awareness that results from the experience of viewing Earth from space resulting in a more sustainable behavior.***



Whatever the reason behind the astronauts 'awakening', the phenomenon is called the overview effect: a cognitive shift in awareness that results from the experience of viewing Earth from space, affecting the perceptions of the world and the future, resulting in a difference in attitude towards more sustainability.<sup>1</sup>

There have been symposia about it. And Frank White's book: *The Overview Effect*. If you want to experience the overview effect for yourself, you can visit the Columbus Earth Theatre in Kerkrade, the Netherlands.

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1 Based on book 'The Overview Effect: Space exploration and human evolution' by Frank White

The notion of an ‘overview effect’ made me wonder: could there also be an ‘overview effect’ for our food system? Could seeing how agriculture and food are connected, and how they are linked to other systems like energy, transport, materials, and how these in turn are connected to health, food security, the environment, to various social and economic values, could insight and awareness of all these interconnections result in behavioural change towards greater sustainability? Could we organise or evoke an ‘Agri-food Overview Effect’? And would people be somehow ‘struck’ by this overview effect, resulting in diagnosing solutions and collective actions for global sustainability challenges like the Sustainable Development Goals?<sup>2</sup>

My explorations into the concept of an overview effect for the food system resulted in a number of complete yet complex schedules and visuals of food systems, showing how everything is interconnected. However, if I’m being honest, these schedules did not really inspire me or spur me into action.

So, I opted for a different route, one which, during the past year has become a quest for leadership and reconnections. Today, I will attempt to use the results of my quest to provide an overview on the future of our food systems: The Agri-food Overview Effect.

So first, allow me to zoom in a little...

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2 <https://sustainabledevelopment.un.org/>

## 2. PRODUCTION PARADIGM AND THE POSITION OF THE NETHERLANDS

“This tiny country feeds the world” states the title of an article in the National Geographic of September 2017. The subheader expands on this thought with “the Netherlands has become an agricultural giant by showing what the future of farming could look like”. And indeed, the Netherlands as second exporter<sup>3</sup> worldwide of agricultural products<sup>4</sup> has an excellent international reputation. Why is that?



*Screenshot from online article “This tiny country feeds the world”, National Geographic.*

### Cooperation

Important reasons behind this success include our long history of cooperation in the Dutch agricultural sector through which we developed efficient and effective supply and value chains. We have a 120-year history of farmers’ cooperation, and a similar history in cooperative agricultural banking. This cooperation is not restricted to the agricultural sector, it also includes the ‘triple helix’ (private sector, educational and research institutions and government) or the ‘Dutch Diamond’ including NGOs.

### Knowledge and Innovation

Another reason is the high level of knowledge and innovation in the Netherlands. Across the board, in the plant breeding sector, greenhouse systems, high-tech farming and

3 <https://www.cbs.nl/nl-nl/nieuws/2016/23/nederland-tweede-landbouwexporteur-ter-wereld> (checked 15 Feb 2018)

4 <https://www.cbs.nl/nl-nl/nieuws/2018/03/nederlandse-landbouwexport-op-recordhoogte> (checked 15 Feb 2018)



processing systems. This innovation is supported by excellent educational and research institutions that range from vocational training to world-leading applied and academic undergraduate and post graduate programmes.

The next 'wave' of innovation is often characterised as the *fourth industrial revolution*<sup>5</sup>: the implementation of physical, digital and biological technologies such as robotics, blockchain, nano- and biotechnologies, sensor technologies, geodata applications, the internet of things, 3D printing and autonomous vehicles. Although some of these technologies are still at the pioneer stage, and business opportunities need to be further explored, smart production initiatives and resource efficiencies in agriculture and food are expected.



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### Industrial food system

With this cooperation, innovation, technologies, we have successfully built up a highly productive industrial farming system focussed on productivity. The result is an abundance of safe foods in our (Western) supermarkets, for relatively low prices. The success story of the twentieth century.

Internationally, the first Green Revolution in the 1960s has played an important role in establishing intensive agricultural production methods based on high-yielding crop varieties with the addition of fertilisers and chemical pesticides, and higher cropping intensity, for example. Since the second world war, global yields have been increasing steadily with agricultural production almost tripling from 1950-2000.<sup>6</sup> This Green Revolution averted global food shortages and brought more food security for many. However, this trend of intensification and further specialisation on just a few crops or

5 for example see book *The Fourth Industrial Revolution*, by Karl Schwab, 2017

6 *Agricultural development in the world periphery, A global economic history approach*, Eds. Pinilla, V. Willebald, H, 2018 ISBN 978-3-319-66020-2 (ebook)

products has in many areas also resulted in degradation of soils, loss of biodiversity, high dependence on external inputs such as chemicals and fossil fuels, unsustainable use of natural resource, increased inequalities among farmers<sup>7</sup>, and unhealthy consumption patterns based on increasingly processed foods.

The capital-intensive farm production systems, dominant in the Netherlands, often are a single-use infrastructures resulting in farmers being locked into one commodity and production method. And a disconnection of farmers from the actual food products that are produced from their raw materials, and from the consumers it is produced for.

The harsh truth is that our global food system poses one of the greatest sustainability challenges of the twenty-first century, for people, health and the environment. Increasingly is stated: *our food system is broken*. Here are some of the harsh facts:

### 3. SOME HARSH FACTS

#### Malnutrition now affects one in three people worldwide

- The FAO reports that, since 2015-2016, the number of chronically undernourished people in the world has increased by 38 million, to 815 million people. This is due mainly to the greater number of conflicts, often exacerbated by climate-related shocks such as droughts.<sup>8</sup>
- More than 2 billion people lack vital micronutrients such as iron, zinc, vitamin A, which is affecting their health and life expectancy. For example, in low- and middle-income countries, over half of the young women and adolescent girls are not meeting their micronutrient needs.<sup>9</sup>
- Multiple forms of malnutrition coexist, with countries simultaneously experiencing high rates of child undernutrition and adult obesity.<sup>10</sup>
- Malnutrition in all its forms affects one in three people worldwide.<sup>11</sup> Today, 159 million children are stunted in their growth, 50 million are wasted and more than two billion people are overweight or obese.<sup>12</sup>

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7 Freebairn, DK. Did the Green Revolution concentrate incomes? A quantitative study of research reports. World Development 23, 265–279 (1995)

8 FAO state of food insecurity in the world, 2017. <http://www.fao.org/3/a-I7695e.pdf>

9 Global Panel on Agriculture and Food Systems for Nutrition. 2016. Food systems and diets: Facing the challenges of the 21st century. London, UK. <http://glopan.org/sites/default/files/ForesightReport.pdf>

10 Food and Agriculture Organization of the United Nations (FAO) et al (2017). The State of Food Security and Nutrition in the World 2017. Building resilience for peace and food security. Rome. <http://www.fao.org/3/a-I7695e.pdf>

11 International Food Policy Research Institute (IFPRI) (2016). Global Nutrition Report 2016: From Promise to Impact: Ending Malnutrition by 2030. Washington, D.C. <http://www.ifpri.org/publication/global-nutrition-report-2016-promise-impact-ending-malnutrition-2030>

12 Global Panel on Agriculture and Food Systems for Nutrition. 2016. Food systems and diets: Facing the



- Diets have deteriorated globally, leading to an increase in non-communicable diseases, particularly type II diabetes, coronary heart disease and some cancers. Six of the top 11 risk factors driving the global burden of disease are related to diet.<sup>13</sup>
- In the Netherlands, 14% of all children and almost half of the adult population are overweight and 13.9% of the adults are obese.<sup>14</sup>

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### **Food systems are a major driver of environmental impacts**

- Globally, food systems are estimated to be responsible for 60% of terrestrial biodiversity loss, around 24% of greenhouse gas emissions, 33% of degraded soils, full exploitation or overexploitation of around 91% of commercial fish populations, and overexploitation of 20% of the world's freshwater aquifers.<sup>15/16</sup> WWF's Living Planet index, measuring biodiversity abundance levels based on 14,152 monitored populations of 3,706 vertebrate species, shows a persistent downward trend.<sup>17</sup>
- Humanity has transgressed three planetary boundaries: for climate change, rate of biodiversity loss, and changes to the global nitrogen cycle, as was estimated already in 2009 by Rockström et al.<sup>18</sup>

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challenges of the 21st century. London, UK.

13 Global Panel on Agriculture and Food Systems for Nutrition. 2016. Food systems and diets: Facing the challenges of the 21st century. London, UK.

14 <https://opendata.cbs.nl/statline/#/CBS/nl/dataset/83021NED/table?ts=1522312658353> (checked 12 Feb 2018)

15 UNEP (2016) Food Systems and Natural Resources. A Report of the Working Group on Food Systems of the International Resource Panel. Westhoek, H, Ingram J., Van Berkum, S., Özay, L., and Hajer M. ISBN: 978-92-807-3560-4, 2016

16 European Environmental Agency, 2017. Food in a green light. A systems approach to sustainable food. ISBN: 978-92-9213-879-0

17 WWF. 2016. Living Planet Report 2016. Risk and resilience in a new era. ISBN 978-2-940529-40-7

18 Rockström, J., Steffen, et al, 2009. Planetary boundaries: exploring the safe operating space for humanity. Ecology and Society, 14(2). [http://pdxscholar.library.pdx.edu/iss\\_pub/64/](http://pdxscholar.library.pdx.edu/iss_pub/64/)



**Over 75% of all farmers globally are caught in a poverty trap, with massive migration from rural areas to cities.**

- The FAO estimates that since the early 1900s some 75% of plant genetic diversity has been lost as local indigenous varieties were replaced by high-yielding, genetically uniform varieties. In human history, about 7,000 plant species have been cultivated for consumption, but now, only 150 edible plant species are used. And just three food crops – rice, maize and wheat – provide nearly two-thirds of global dietary energy intake.<sup>19</sup> A similar process of genetic erosion is seen in production animals as a few highly productive breeds that have been selected for their ability to convert feed to meat or milk, are disseminated worldwide, displacing local varieties.<sup>20</sup>
- Globally, around 30% of all food produced is either lost or wasted.<sup>21</sup>
- Livestock is the world's largest user of land resources, with grazing land and crop-land dedicated to the production of feed representing almost 80% of all agricultural land (1,5 billion hectares worldwide).<sup>22</sup>

19 Jones, AD, Ejeta, F. A new global agenda for nutrition and health: the importance of agriculture and the food systems. Bulletin of the World Health Organization, 2015; 95(228-229), <https://www.who.int/bulletin/volumes/94/3/15-164509/en/>

20 Mason, P, Lang, T. Sustainable diets, how ecological nutrition can transform consumption and the food system. 2017.p.140. ISBN 978-0-415-74470-6

21 Gustavsson, J., Cederberg, C., & Sonesson, U. 2011. Global food losses and food waste: extent, causes, and prevention. [www.fao.org/docrep/014/mb060e/mb060e.pdf](http://www.fao.org/docrep/014/mb060e/mb060e.pdf)

22 Food and Agriculture Organization of the United Nations, [www.fao.org/animal-production/en/](http://www.fao.org/animal-production/en/) (accessed Nov 2018)

## Food systems are not inclusive

- The majority of food is produced by smallholder farmers, yet over 75% of all farmers globally are caught in a poverty trap<sup>23</sup>, with massive migration from rural areas to cities.<sup>24</sup>
- A very small number of corporations control the vast majority of the world's food trade: four companies produce more than 58% of the world's seeds; four global firms account for 97% of poultry genetics research and development; another four produce more than 60% of the agrochemicals farmers use.<sup>25</sup>
- The high and rapidly increasing levels of concentration in the agri-food sector reinforce the industrial food and farming model, exacerbating its social and environmental fallout and aggravating existing power imbalances. Consolidation across the agri-food industry has made farmers ever more reliant on a few suppliers and buyers, putting pressure on their incomes and eroding their ability to choose what to produce, and how to produce it.<sup>26</sup>
- The food chains that supply consumers are growing longer, with global trade increasing the distance between production and consumption, as well as the diversity of foods available to consumers. Value and power in food systems is shifting towards the middle of these food chains, with agricultural produce becoming ingredients for processed products. Decisions by large agri-businesses, manufacturers and retailers are playing an increasingly major role, compared to the public sector, in the availability, affordability, safety and desirability of foods.<sup>27</sup>
- Business logic in the food value chain is based on quantity, standardisation and lowest price. Food prices do not account the 'true price' that includes (negative) environmental and social impacts.<sup>28</sup>

***None of these problems can be solved by one of the key strengths that led to our past success: productivity.***

23 NewForesight & Commonland, 2017, New horizons for the transitioning of our food system. Connecting ecosystems, value chains and consumers. <http://www.newforesight.com/wp-content/uploads/2017/01/New-Horizons-for-transitioning-our-food-system-Slide-presentation.pdf>

24 Newforesight analysis of world development indicators, 2017

25 <http://www.etcgroup.org/sites/www.etcgroup.org/files/CartelBeforeHorse11Sep2013.pdf>

26 25 IPES-Food, 2017, Too big to feed, Exploring the impacts of mega-mergers, consolidation and concentration of power in the agri-food sector

27 Global Panel on Agriculture and Food Systems for Nutrition. 2016. Food systems and diets: Facing the challenges of the 21st century. London, UK.

28 NewForesight & Commonland, 2017, New horizons for the transitioning of our food system. Connecting ecosystems, value chains and consumers. <http://www.newforesight.com/wp-content/uploads/2017/01/New-Horizons-for-transitioning-our-food-system-Slide-presentation.pdf>

## The global food system is in need of dramatic transformation

All these different challenges in food systems are deeply interconnected, mutually reinforcing, and subject to systemic dynamics. None of these problems can be solved by one of the key strengths that led to our past success: productivity. There is growing concern that the staggering longer term societal costs of our food production and consumption (such as health costs through unhealthy life styles, loss of biodiversity, reduced soil fertility, increases in food waste and losses) may soon exceed the short-term economic benefits.<sup>29</sup>

The increases in food production needed to feed a growing and wealthier human population cannot be achieved by simply extrapolating current trends in production and consumption. A continuation of the strategy of the expansion and intensification of agriculture, the industrial food and farming model, will undermine the very resource base on which the food system itself depends. The preservation of ecosystems and the future health and wellbeing of the human population are all centrally dependent on a structural transformation of the food system towards a sustainable and resilient state.<sup>30</sup> A new strategy is needed.

***A continuation of the strategy of the expansion and intensification of agriculture, the industrial food and farming model, will undermine the very resource base on which the food system itself depends.***

## Cooperation

The good news is, in the Netherlands, we can deploy our well-established strength of cooperation. We need all stakeholders in our sector to cooperate. Because we know from the work of for example Jared Diamond<sup>31</sup> that great civilisations in history failed for two main reasons: environmental problems (lack of resources) and *unwilling elites*. Fortunately, stakeholders from many sectors and regions (including IPES Food, EAT Forum Stockholm, the World Economic Forum with their program FReSH, and many more) have now recognised the need for a fundamental transformation of food systems. The momentum in the Netherlands for a system innovation in the agri-food sector, following the energy transition, is also building. And I believe the next sectoral transition is on its way: the clothing industry.

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29 Also see The hidden cost of UK food, Nov 2017, Sustainable Food Trust, <https://sustainablefoodtrust.org/articles/hidden-cost-uk-food>

30 WWF. 2016. Living Planet Report 2016. Risk and resilience in a new era. ISBN 978-2-940529-40-7

31 E.g. the book Collapse, How Societies Choose to Fail or Succeed, by Jared Diamond, 2005.

But how can we achieve a global food system that ensures food and nutrition security for a growing and urbanising world population, inclusively supports human livelihoods, and contributes to a healthy global ecosystem? How can we prioritize diversity in agricultural production and position agricultural growth as a way to improve diet quality, rather than merely delivering sufficient calories? How can we reverse the negative impacts of food systems on people, health, climate change, and the environment?



***We need all stakeholders in  
our sector to cooperate.***

## 4. TRANSFORMING OUR FOOD SYSTEMS: THREE GUIDING PRINCIPLES

In response to global challenges in agriculture and food, there are two predominant strategies:

- Sustainable intensification: targeted at increasing productivity, improving resource efficiency, *more with less*, smart farming technologies (see fourth industrial revolution technologies above), and making the existing food system more sustainable, i.e. 'less bad'.
- Transformation of food systems: based on an integral food systems approach, this strategy focusses on a system innovation that *redesigns* the food system from making it 'less bad' to making it 'net positive', starting at the desired impact level and working in cooperation with all system stakeholders.

### STRATEGIES FOR FUTURE FOOD PRODUCTION



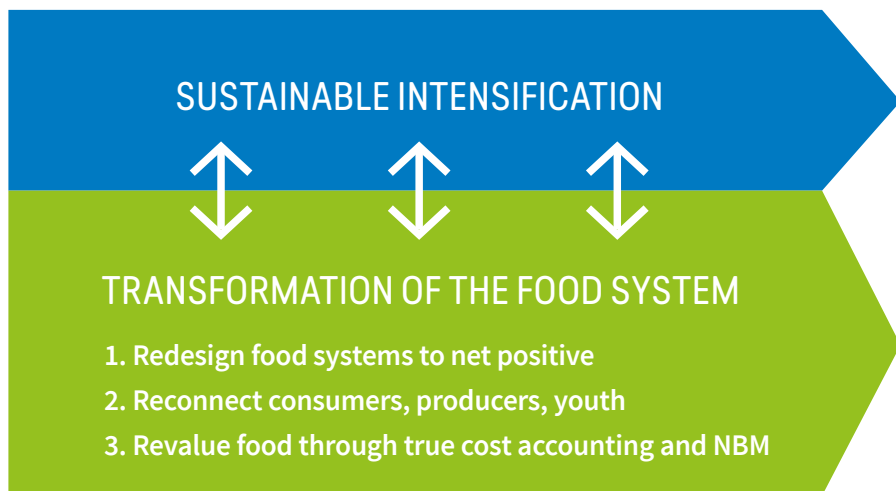
The first strategy is more or less a 'default'. It suits our historic productivity paradigm and the policy comfort zone, and it fits in with the reductionist way our education system works: based on specialisations rather than interdisciplinarity. Both strategies are needed; also in light of international challenges posed by yield gaps. Nevertheless, in this address, I argue for placing the full emphasis on developing a systems approach for the transformation of the food system.

In my view, three important principles contribute to the transformation of food systems:

- **Redesign** food systems from 'less bad' to 'net positive'
- **Reconnect** consumers, producers, youth
- **Revalue** food through true cost accounting and new business models



## STRATEGIES FOR FUTURE FOOD PRODUCTION



### Redesign food systems to ‘net positive’

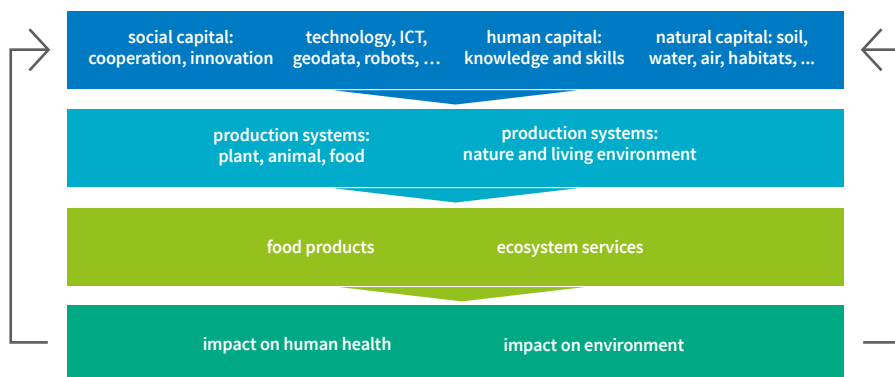
A food system can be defined as ‘all the elements (environment, people, inputs, processes, infrastructures, institutions etc.) and activities that relate to the production, processing, distribution, preparation and consumption of food, and the outputs of these activities, including socio-economic and environmental outcomes’.<sup>32</sup> Food systems refer not only to market transactions, but also to the web of institutional and regulatory frameworks that influence those systems.<sup>33</sup>

A very simple food system can be visualised as follows: Using the blue coloured stocks or ‘building blocks’, two types of production systems are developed: food production, consisting of crop production, animal production and food processing systems, and nature and living environment. These production systems create products: food products such as vegetables and grains, processed foods like bread and cheese. They also produce ecosystem services such as fresh air, biodiversity, nature and recreational facilities, etc. Both the production systems and the consumption of products have an impact on human health and on the environment.

32 HLPE, 2017, Nutrition and food systems. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome.

33 32 IPES Food, May 2015, The new science of sustainable food systems

## PRODUCTION, CONSUMPTION... WHO IS RESPONSIBLE FOR IMPACT?



It is clear that Western-style food systems are not sustainable in terms of their use of resources, the impact on ecosystems and effects on human health. Making the negative impacts ‘less bad’ e.g. through sustainable intensification, is important but not sufficient. We need to radically redesign consumption and production systems, *starting at the desired impact side*, in cooperation with all relevant system stakeholders.

A number of ‘sub’-transitions work on one or more aspects of redesigning food systems:

- A. From monocultures to more diversified cropping systems**, systems that connect the blocks agro-food production and nature & living environment (see food system on page 19), by shifting industrial agriculture to more diversified agroecological production systems. Regenerative agriculture, for example, that restores soil fertility, biodiversity, and the resilience to climate shocks like heavy rain or drought. In the report ‘From uniformity to diversity’, IPES Food states that “*A growing body of evidence shows that diversified agroecological systems deliver strong and stable yields by building healthy ecosystems where different plants and species interact in ways that improve soil fertility and water retention. They perform particularly well under environmental stress and deliver production increases in the places where additional food is most needed*”.<sup>34</sup> The momentum for more diversified cropping systems is building, e.g. in the Netherlands with many initiatives on nature-inclusive agriculture like food forests, and agriculture-inclusive nature like agroforestry.

34 33 IPES Food, 2016, From Uniformity to Diversity, A paradigm shift from industrial agriculture to diversified agroecological systems

Examples developed by some of our HAS students are ‘Den Food Bosch’<sup>35</sup>, an experimental agroecological perennial farming system near the city of Den Bosch supported by the regional Water Board. The Foundation ‘ReNature’<sup>36</sup>, also established by one of our international HAS students, works on restoring ecosystems through agroforestry, with projects in Indonesia, Brazil and South Africa. Interestingly, these initiatives attract many young people worldwide that want to contribute to these crucial transitions.

- B. From linear to circular production systems** that promote resource efficiency, reduce and re-use waste and losses, re-use and recycle resources, often across sectoral boundaries and disciplines. Several great initiatives exist that work on circularity. The Verspillingsfabriek (Waste factory) in Veghel is an example of how new food products can be produced from food waste streams. Another iconic example is the Floating Farm<sup>37</sup> in Rotterdam that feeds its cows up to 90% waste streams from the city, and it aims to produce dairy products for local markets in a floating vertical system in the city. Circularity may also contribute to the climate objectives, as set in the Paris agreement in 2015.
- C. From curative to more preventive health care**, related to food, lifestyle and (food) environment. This transition would reverse the aspect ‘impact on human health’ in the food system on page 19. Examples include Stichting Voeding Leeft<sup>38</sup> in the Netherlands, a foundation that runs programmes to reverse Diabetes type 2 through food and life style interventions. There are also interesting developments on more personalised food concepts. Internationally, the Global Alliance for Improved Nutrition (GAIN)<sup>39</sup> works in a food systems project on food and nutrition security, by establishing dietary goals first, linking these to food system actions and leveraging for sustainability.
- D. From current to sustainable diets:** healthy consumption patterns within ecological boundaries. By adopting an integrated approach, it would be possible to refer to the impact on both human health and the environment through sustainable diets. According to the UNEP, sustainable diets are *“those diets with low environmental impacts which contribute to food and nutrition security and to healthy living*

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35 <https://www.denfoodbosch.org/en>

36 <https://renaturefoundation.nl/>

37 <https://floatingfarm.nl/?lang=en>

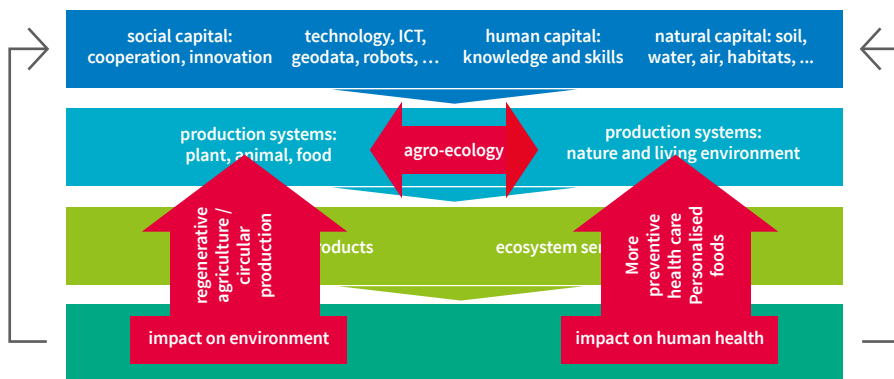
38 <https://voedingleeft.nl/>

39 <https://www.gainhealth.org/>

for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable, nutritionally adequate, safe and healthy, while optimizing natural and human resources”.<sup>40</sup> Sustainable diets usually consist of high amounts of fruits and vegetables and plant based proteins (*protein transition*).

Protein transition, in particular, also contributes to the climate targets in the Paris Agreement.<sup>41</sup> A growing number of scientific and non-scientific organisations promote a reduction of animal-based product consumption and an increase of plant-based products. For example, the Dutch Green Protein Alliance<sup>42</sup> strives for an animal - plant protein balance of 50:50 in 2025, and the Dutch Council for the Environment and Infrastructure promotes going to 40:60 in 2030.<sup>43</sup> It is clear that this target, if it is to be achieved, will have major implications for both animal production and consumption patterns.

## PRODUCTION, CONSUMPTION, ... WHO IS RESPONSIBLE FOR IMPACT?



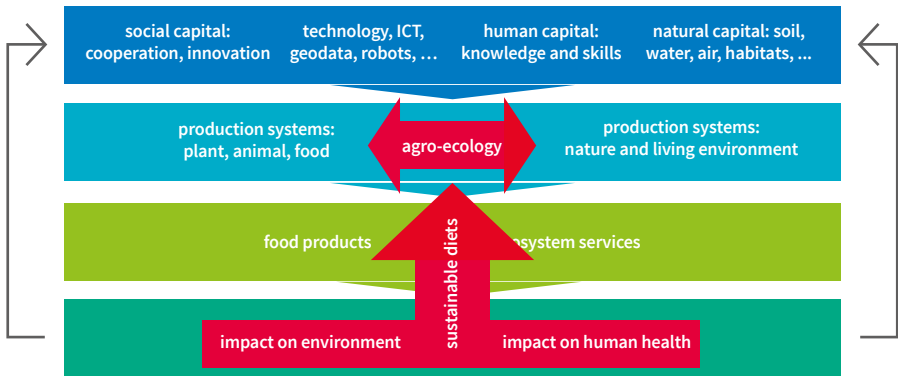
### Reconnect consumers, producers, youth

40 UNEP, Nellemann, C, MacDevette, M, et al. The environmental food crisis: the environment's role in averting future food crises. A UNEP rapid response assessment. Arendal, Norway: United Nations Environmental Programme/GRID-Arendal, 2009

41 [https://unfccc.int/sites/default/files/english\\_paris\\_agreement.pdf](https://unfccc.int/sites/default/files/english_paris_agreement.pdf), 2015

42 <http://greenproteinalliance.nl/>

43 <http://rli.nl/publicaties/2018/advies/duurzaam-en-gezond>



Food systems have evolved significantly in recent centuries, from predominantly local systems of exchange, into complex global networks of industrialised and non-industrialised production, consumption and trade<sup>44</sup>. The process of agriculture and food production occurs largely out of view of increasingly urbanised consumers, who often only see and buy food products in retail outlets. The result is that large groups of (urban) consumers are disconnected from where their food comes from and do not see the relationship between food and other values such as biodiversity, soil, climate and social inclusiveness. In fact, the deep reconnection of people to nature, for example through food, may well be one of the most important leverage points for the transformation to a sustainable and healthy food system.

This is why the many ‘short-chain’ initiatives like Herenboeren Boxtel<sup>45</sup>, and the various urban farming activities are valuable. Not just for their volume of production (food as goal) but also for the role they play in reconnecting consumers directly to producers and vice versa (food as means).

Internationally, there are programmes for reconnecting smallholder farmers to information, finance and insurance, and to markets. The ‘Geodata for agriculture and water’ programme<sup>46</sup>, for example, which is run by the Netherlands Space Office, works through various multi-stakeholder programmes on improving food security by using satellite data. Reconnecting youth to agriculture is a third aspect of reconnecting. According to a Rabobank study<sup>47</sup>, succession planning is one of the greatest challenges in agriculture,

44 European Environment Agency, 2017. Food in a green light. A systems approach to sustainable food.

45 <https://wilhelminapark.herenboeren.nl/>

46 <https://g4aw.spaceoffice.nl/en/>

47 Rabobank, 2014, The Future of Farming, the rise of the rural entrepreneur, isbn 9789090281902



## ***Making agriculture attractive to the future generations and creating viable business cases remains vital: who will feed the world in 2050?***

especially in low and middle-income countries. The average age of farmers borders on 60 years.<sup>48</sup> In Europe, only 5.6% of all farms are run by farmers younger than 35 while more than 31% of all EU farmers are older than 65.<sup>49</sup>

Making agriculture attractive to the future generations and creating viable business cases remains vital, also in view of the high youth unemployment in some parts of the world. Fourth-industrial-revolution technologies like geodata and the use of robots, drones and smart ICT's help boost the image of agriculture, as do high-tech production systems in cities (where the majority of (young) people want to live), such as vertical farming and aquaponics systems.

### **Revalue food through true cost accounting and new business models**

Food systems cause considerable environmental and health externalities that impose costs on others. These extra costs are not paid for by the food businesses that cause them, nor are they included in the retail price of food. Instead they are passed on to society in various ways. In the UK, for example, a recent study reports that, in addition to the £120 billion spent annually on food by consumers, the UK food system generates

48 <http://www.un.org/en/ecosoc/integration/pdf/foodandagricultureorganization.pdf> (data of 2014)

49 [https://ec.europa.eu/agriculture/sites/agriculture/files/rural-area-economics/briefs/pdf/015\\_en.pdf](https://ec.europa.eu/agriculture/sites/agriculture/files/rural-area-economics/briefs/pdf/015_en.pdf)  
(EU data 2017)



further costs of £120 billion<sup>50</sup>, related to environmental pollution, biodiversity loss and health care costs.

True cost accounting methodology, as developed and/or implemented by a number of organisations, including The True Price<sup>51</sup> and Eosta<sup>52</sup>, could be a way to establish a business case that covers all externalised costs. Basically, it is a form of ‘next-level’ transparency. It is however essential that the true price helps farmers to cover the higher cost of more sustainable farming practices and farmers and value chain stakeholders in producing food in ways that are ‘net positive’ for the environment and human health.

True cost accounting may be a leverage point for food system innovation, together with developing new business models based on more values than just economic value. It is clear, however, that implementing true cost accounting may require European/international agreements. At this moment, it is important to invest in knowledge development, building best practices, and harmonisation of the methodology.



***Food systems cause considerable environmental and health externalities that impose costs on others.***

50 <http://sustainablefoodtrust.org/wp-content/uploads/2013/04/HCOF-Report-online-version-1.pdf>

51 <http://trueprice.org/>

52 <https://www.eosta.com>



## **A personal story about reconnecting to nature**

You may think - that sounds all good, keep going, many roads will lead to Rome. Many roads do indeed lead to Rome, as I experienced when I cycled there from my home town in the Netherlands last spring. Whilst cycling alone for several weeks through the beautiful European countryside, I found myself trying to establish a relationship with my bike. I took lots of pictures of it. We even shared a bedroom occasionally. But, in the end, it retained its authenticity: a clever piece of steel. So much for a relationship...

But something else, something magical occurred. My eyes re-opened to the beauty of small flowers along the roadside. To the beauty of snow-capped Alps. My ears re-opened to the song of birds in the fields and trees.

These magical moments also helped me through the tougher times. On one occasion, I had reached my emotional rock-bottom during a steep climb of one of the many mountains between here and Rome. I asked myself useless questions like why do you have to do this, what do you have to prove...? Then all of a sudden, a large group of bright blue dragonflies surrounded my head and accompanied me uphill. It was as if their incredible lightness and their wings lifted me all the way to the top of the mountain. Tears were running down my cheeks. How fragile we are. And how much power and energy nature provides...

## ***Tears were running down my cheeks. How fragile we are. And how much power and energy nature provides...***

Only then did it occur to me that there may be guiding principles in nature that we have neglected in our efforts to control it. In our genuine efforts to increase productivity, to feed the world, to establish businesses, to increase efficiency, we have lost our connection with nature. The very source of life on earth. The very basis of our food system. Maybe this was the moment I was 'struck by the overview effect'.

Nature's guiding principles, so simple and yet so powerful. Would it be possible to apply those guiding principles to our food systems? For example:

- Nature is diversified, locally adapted (monocultures → *diversified agroecological systems*)
- It uses solar energy via photosynthesis (→ *climate positive systems*)
- It produces zero waste (→ *circular systems*)
- It has firm ecological boundaries (→ *sustainable diets*)
- There is evolution (→ *continuous innovation*)

When I returned, we started a research programme to validate nature's guiding principles and establish a framework for sustainable food systems based on those principles.

## 5. A FOOD SYSTEMS APPROACH NEEDED

A recent manure fraud in the Dutch province of North Brabant, and registration flaws with calves and phosphate quota in the Dutch dairy sector are, I believe, symptoms of an agricultural sector that has for too long been rewarded only for quantity, efficiency and lowest cost, instead of nutritional quality of food, growth of biodiversity, and the maintenance of beautiful and diverse landscapes, whilst producing the most vital of all products: *our daily bread*.

Our current food system, with its guiding principles of productivity, cost-price reduction through upscaling, high dependence on external inputs like pesticides, fertilisers and antibiotics, and a business logic of infinite linear growth with unlimited resources and externalised costs, needs to be transformed far beyond incremental technical or social innovations.



***Our current food system is going to be transformed far beyond incremental technical or social innovations.***

Food systems have many complex dimensions, relationships and levels of scale. For example, intervening on one dimension, e.g. reducing greenhouse gas emissions, may result in unwanted impact elsewhere in the system, e.g. affecting employment or investment. In fact, interventions to tackle one isolated problem in a system may actually worsen it when the context and interrelations in that system are not considered. An example from my own time at the FAO IPM programme in Asia, was when chemical pesticides were applied to eradicate an insect pest in rice, it actually resulted in heavy outbreaks of

another pest insect, the brown plant hopper, due to elimination of its natural enemies by those pesticides.

Moreover, food systems are connected to energy, materials, mobility systems that, in turn, shape the context within which the food system operates. The tendency is often to address the problems as individual issues and overlook the interrelations that shaped these systems.

The challenge, therefore, is to develop a *systems approach* that would address food production, consumption and value chains in an integrated way and that includes all other shaping institutions such as policy and legislation institutes, research and education, financial institutions (banks, investors, insurance) and NGOs. A food systems approach looks at the linear and non-linear relationships between the different aspects of the system and makes the feedback loops, lock-ins and tensions between the different components and flows of food systems visible.

One of the most influential pioneers in system dynamics and identifying places to intervene in the system is Donella Meadows. She was also principle author of the famous *The Limits to Growth* (1972). In our professorship Future Food Systems, we use and apply her concept leverage points for food system analysis and identifying places to intervene in the system.

Based on Meadows, the 'iceberg model' for systems thinking is very useful to identify effective system-based intervention strategies. For example, when the iceberg model is applied to the topic of food waste, it becomes clear that food waste is not the problem, it is a symptom (event) of an unsustainable system, caused by underlying patterns of behavior, systemic structures and mental models (paradigms).



*Illustration of the Iceberg model for systems thinking*

(by Tim Paul; <https://blog.methodkit.com/the-iceberg-of-how-889e87fb5394>)



Such a systems approach, that includes and engages the range of actors and food chain activities, has the potential to reach across scientific disciplines, improves understanding of why the food system functions the way it does, what structures, behaviors, paradigms are keeping the positive and negative impacts in place. Based on a systems approach, effective interventions for transformation of the food system beyond a sectoral approach can be identified.<sup>53</sup>

According to the International Panel of Expert on Food Systems, the domain of sustainable food systems is a new science.<sup>54</sup>

## 6. A NEW TRANSDISCIPLINARY SCIENCE WITH NEW METRICS AND NEW COALITIONS

Food system innovation, the transformation of the food system into a net positive, sustainable state requires a combination of incremental (for example through sustainable intensification) and more radical changes of the structure of the food system, and especially in the underlying values and paradigms. This may sound simple but there are many different views on what a sustainable food system actually is, where to intervene for more sustainable outcomes, and who should do what.

Foresight studies and methodologies help to systematically explore desired and positive food futures with groups of stakeholders, for example based on nature's guiding principles, and reverse our strategies and actions accordingly.

This is also the domain of transition science.<sup>55</sup> Transitions have processes of destabilisation, chaos, break-down and phase-out. Other initiatives, 'the niches', are in the phase of experimentation or acceleration. If successful, these niches follow an S-curve. The patterns of breakdown and emergence can be seen at the level of systems, sectors, organisations and persons.<sup>56</sup>

***It is important to realise there will also be habits that will have to be drastically reduced. For example meat consumption.***

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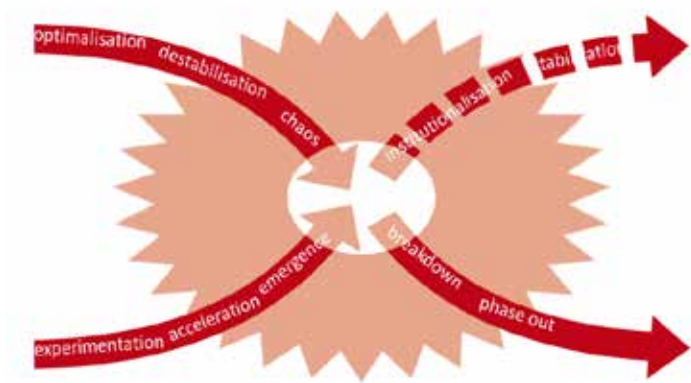
53 Paragraph based on European Environmental Agency, 2017. Food in a green light. A systems approach to sustainable food. ISBN: 978-92-9213-879-0, and IPES Food, May 2015, The new science of sustainable food systems

54 IPES Food, May 2015, The new science of sustainable food systems

55 See for example the Dutch Research Institute for Transitions, linked to the Erasmus University Rotterdam, <https://drift.eur.nl/>

56 Loorbach, 2012, To transition, governance panarchy in the new transformation. Inaugural lecture, Erasmus University Rotterdam.





*X-curve of transitions: patterns of breakdown and emergence.<sup>57</sup>  
Visible at the level of systems, sectors, organisations and persons.*

Many of the examples I gave earlier are niche initiatives that are in the stage of experimentation or acceleration. If the domain of sustainable food systems is indeed a new science, it also it in its early stages of development, the first part of the S-curve, and I believe it is accelerating fast.

It is important to realise that there will also be practices, habits, businesses that will have to be drastically reduced or even phased out. This could affect for example meat consumption, use of virgin materials, single-use plastics. It would be good to also systematically explore how to deal with the elements that need to be phased out.

## New metrics

As our understanding of the complexity and interactions in food systems grows, the ‘deeper’ layers of how food systems are structured and organised need to be reconsidered. The goal of the food system, the rules of the system<sup>58</sup>, and the metrics by which we measure success. Simplistic metrics like tonnes per hectare that only focus on productivity are not sufficient anymore to evaluate impacts of food systems and monitoring of its improvements. New metrics are required.

<sup>57</sup> Loorbach, 2012, To transition, governance panarchy in the new transformation. Inaugural lecture, Erasmus University Rotterdam.

<sup>58</sup> Also see Simons, L, 2014, Changing the food game, Market Transformation Strategies for Sustainable Agriculture, ISBN 9781783532308

For example, in their book sustainable diets, Mason and Lang suggest using people nourished per hectare a key indicator. Using land for growing food exclusively for direct human consumption (rather than for animal feed) could, in principle, increase available food calories by as much as 70%, feeding an additional 4 billion people. This is more than the projected 2-3 billion people projected in populations growth estimates.<sup>59</sup>

## New coalitions

To accelerate the transformation and achieve impact at scale, there is a need to form coalitions of committed frontrunners and organise experimental space for innovation and entrepreneurship, to accelerate and upscale initiative that work on making food systems ‘net positive’ in terms of human health, or socio-economic and environmental outcomes, reconnecting people to food (and nature) and revaluing food.

There is a Dutch coalition doing just that: the Transition Coalition Food.<sup>60</sup> Consisting of over 150 individuals and organisations, this coalition is working to accelerate specific initiatives that help transform the food system through the 3 principles of **redesign** (e.g. regenerative agriculture, preventive health care), **reconnect** (e.g. short supply chains) and **revalue** (e.g. true cost accounting).



*Some of the partners in the Dutch Transition Coalition Food*

59 Mason, P, Lang, T, 2017, Sustainable Diets. How ecological nutrition can transform consumption and the food system. p.45. ISBN 978-0-415-74470-6

60 [www.transitiecoalitievoedsel.nl](http://www.transitiecoalitievoedsel.nl)

However, a systems approach works not just from the perspective of niches that will break through to the regime. Some niches are successful because they are small and locally organised. Food system transformation also requires ‘regime’ parties to actively engage in the transformation.

Transforming our food systems is not just a challenge, it offers significant business opportunities. Front running organizations that are able to cooperate with other system stakeholders, and get this transformation right, may be rewarded with faster growth and value creation, and will be an attractive employer for future professionals.<sup>61</sup>

## **7. TOWARDS A ROADMAP TO FOOD SYSTEM TRANSFORMATION**

From the overview of all the aspects of our current, ‘broken’ food system, and the inspiration that niche initiatives and foresight studies provide, it should be possible to develop a vision on future food systems that encompasses the various perspectives and priorities of participants. A shared vision within an organisation, a local or national government, or a broader coalition like the Transition Coalition Food. Based on that shared vision, system-based transition paths and/or intervention strategies linked to leverage points can be defined for specific future goals, preferably connected to parties or organisations already working on those goals. Systematic monitoring should be part of this food systems work, as well as collective learning on what works and what the role of the various stakeholders is.

Obviously, there are many questions about the future. Will there still be farmers if we have robots, sensors, and fully automatic production units? Is cellular agriculture with cultured meat and dairy products disrupting conventional animal production? Do we still have retail when we have Amazon and Alibaba for home delivery of goods and foods? Etcetera.

Futures thinking, being able to explore alternative, sustainable futures, is an important competence in education, that encourages creativity and offers direction and ownership. A great demo was made for us by our colleagues from GEODAN, a 3D virtual reality demo called “Growing Future Food Systems”. You will experience walking in the city of ‘s-Hertogenbosch when nature’s guiding principles are implemented. It will look completely different from today...

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61 NewForesight & Commonland, 2017, New horizons for the transitioning of our food system. Connecting ecosystems, value chains and consumers. <http://www.newforesight.com/wp-content/uploads/2017/01/New-Horizons-for-transitioning-our-food-system-Slide-presentation.pdf>

## Focus of Professorship Future Food Systems

In cooperation with the Transition Coalition Food, and many others, the team of professorship Future Food Systems will work on food system innovation and foresight studies, specifically looking into developing a food systems approach to understand the structure and behaviours of food systems at various levels of scale, working on leverage points and intervention strategies, and the inspirational leadership necessary to accelerate transformation of our food system to a healthy, sustainable, inclusive and resilient state.

## 8. NOBLESSE OBLIGE

If this tiny country, the Netherlands, wants to keep its significant international position, we must take a full-speed approach to adopting the strategy of structurally transforming our food system.

There is not one single food system. There are maybe thousands of subsystems, for example urban food systems to feed the cities, regional food systems providing local foods, national food systems and, if we take personalised food seriously, we may even have 7,5 billion individual food systems today, increasing to 9,7 billion in 2050.



Despite all the narratives, myths, cults and fake news in our sector, we know enough to act. We have awesome examples of entrepreneurs and organisations that show that transforming our food system can be done at various levels of scale. New technologies will help us. Science will contribute to the knowledge base needed to make that transformation to redesign, reconnect and revalue our food systems.

Our strong history of cooperative entrepreneurship will be the key for the multi- and interdisciplinary cooperation that is required. Fontys and HAS Universities of Applied Sciences recently experienced this in our Masterclass Future Food Systems, a joint honours programme to explore foresight and food systems together with students, lecturers and professionals from our working field. It was not only great fun, it was also very complementary to combine agriculture and food with creative design and develop 7 Future Food Systems which were presented by the Masterclass teams today.

And I would like to add intergenerational cooperation to the mix. Because the future generations: the Millennials, Generation X, Y or Z, are already connected through the social networks. These young professionals are engaged with societal challenges and want to make a meaningful contribution. They want to be part of the solution. We try our best at HAS University of Applied Sciences to give them an overview effect, because a wise man once said: *“it is not the strongest of species, nor the most intelligent that survives. It is the one most adaptable to change.”*<sup>62</sup>

***Determine your position in this field. Make sure you are connected to yourself – as I did on my cycle trip to Rome – to others and to nature.***

**Food systems are not about systems, they are about people.**

No-one can redesign the global food system alone. There are no quick fixes. It is not just technology. Farmers have only part of the solution. All players in the food system are needed. Social and organisational innovation will be key. And, if I can make one recommendation to all of you: determine your position in this field. Make sure you are connected to yourself – as I did on my cycle trip to Rome – and to others. And more than anything else, reconnect to nature. Because in the end, it is relationships that make us happy. And it is these relationships that will enable all of us to gain the overview effect we so desperately need.

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62 60 Attributed to Charles Darwin (1809-1882)

## 9. DEDICATION

I would like to dedicate this address to all pioneers and astronauts who are working on transforming our food system. Many of you are here today.

To all the participants in the Masterclass Future Food Systems for your engagement, intelligence and inspiration. I am so proud of you all! And to the organisers of the Masterclass: Linda Hofman, Kitty Jenniskens, Jos Wesselink, Nina van den Heuvel, Lotte van Oosterhout, and Christianne Heselmans, and Marjo Baeten and Howard Giddings. It was awesome working with you!

To all entrepreneurs who are reversing old business logic and are working from a systems approach with new business models based on true value.

To all scientists who are strengthening the knowledge base to leverage the transformation we need.

To government officials who understand that experimental space is needed for this transformation and budgets at least equal to those of the energy transition.

To the new generations of professionals: follow your dreams and be part of the solution.

To all consumers who cut down on food waste, eat more plant-based diets, appreciate the true value of food and respect and praise those who provide the basis for our food: farmers.

To Stichting Beheer NIB, for your continuing support of our applied research work and Masterclasses.

To my colleagues from Education who understand that the agriculture and food business is no longer just about production or products; it is about impact, and your inspirational leadership.






I would also like to dedicate this inaugural address to some of the inspirational women in my family: to my grandmother, Elsje Levert - Van der Mijll Dekker, who lived and worked establishing the basis of the strong Dutch international position in the old colonial times. She would have been 110 today. To my mother, Marre, and mother-in-law, Leonie, for showing me how to keep going when mountains appear on the road of your life.

And, most of all, to our four daughters, who are just at the start of their lives and, in one way or another, will carry further our family flag of international cooperation and sustainable development: the flag that I have inherited from my family. Through nature and nurture, in due course, it will be passed to you with great honour and pride.

I wish you all the overview effect.

It is a matter of civilisation.

Thank you.

A woman with short blonde hair, wearing a black blazer over a yellow top, stands at a wooden podium with a microphone. Behind her is a large screen displaying four panels: a colorful bird, a modern building interior, a green field, and a close-up of a flower. The podium has a sign that reads 'Provincie Noord-Brabant'.

***I wish you all the  
overview effect!***





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