

# TOWARDS A FOOD POLICY

Gerard de Vries, Josta de Hoog, Bart Stellinga & Huub Dijkstra

WRR



## *Towards a Food Policy*

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The Netherlands Scientific Council for Government Policy  
Buitenhof 34  
PO Box 20004  
2500 EA The Hague, The Netherlands  
Phone +31 (0)70 356 46 00  
E-mail [info@wrr.nl](mailto:info@wrr.nl)  
Website [www.wrr.nl](http://www.wrr.nl)

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*Gerard de Vries, Josta de Hoog, Bart Stellinga & Huub Dijkstra*

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# CONTENTS

<b>Summary</b>	7
<b>Preface</b>	17
<b>1 Introduction</b>	19
1.1 International trends	20
1.2 Policy	20
1.3 Structure of the report	21
<b>2 Key trends in the global food supply system</b>	23
2.1 Introduction	23
2.2 Industrialisation of primary production	23
2.3 Globalisation of the food supply system	24
2.4 Increased role of non-agricultural players	27
2.5 Changing dietary patterns	30
2.6 Countermovements	32
2.7 Conclusions	36
<b>3 Problems in the global food supply system</b>	37
3.1 Introduction	37
3.2 Ecological sustainability	37
3.3 Public health	44
3.4 Robustness	47
3.5 Conclusions	49
<b>4 The Dutch hub</b>	53
4.1 Introduction	53
4.2 A food country	53
4.3 Vulnerabilities of the Dutch food system	63
4.4 Conclusions	72
<b>5 Food chains, the food system and the food net</b>	75
5.1 Introduction	75
5.2 Food chains	75
5.3 The food system	81
5.4 The food net	83
5.5 Conclusions	89
<b>6 Promoting societal interests within the food net</b>	95
6.1 Introduction	95

6.2	The role of businesses	96
6.3	The role of citizens/consumers	103
6.4	The role of governments	107
6.5	Conclusions	110
<b>7</b>	<b>Main characteristics of Dutch policy</b>	<b>113</b>
7.1	Introduction	113
7.2	Characteristics of current policy	114
7.3	Ecological sustainability	116
7.4	Public health	121
7.5	Robustness	126
7.6	Conclusions	128
<b>8</b>	<b>Conclusions and recommendations</b>	<b>131</b>
8.1	Introduction	131
8.2	Changing context and challenges	131
8.3	Governance challenge	133
8.4	From an agricultural policy towards a food policy	134
8.5	Towards a resilient food net	141
8.6	The road ahead	145
	<b>References</b>	<b>147</b>
	<b>Appendix: list of interviewees</b>	<b>163</b>

## SUMMARY

### INTRODUCTION

The Netherlands has a prominent position in the world of agrifood. The Dutch agrifood sector is held in high regard internationally for its efficient production of foodstuffs. The Netherlands is the world's second-largest exporter of agrifood products (including substantial transit trade). It is home to major international agrifood companies and to several internationally renowned agrifood research institutes. Contributing ten percent of GDP, the sector is a major factor in the Dutch economy. For Dutch citizens, food is available in abundance and – at historically low prices – is more affordable than ever.

At the same time, food has increasingly become the subject of public concern. Industrial-scale livestock farming, animal welfare, intellectual property rights, environmental issues and the use of antibiotics have become subjects of – often quite heated – public debates. Food-safety scares have attracted wide media attention. Simultaneously, there is an abundance of initiatives to stimulate local food chains like farmers' markets and city vegetable gardens, and to experiment with new types of farming practices (e.g. roof-top farming). As food touches on many divergent values, as well as on public and private interests, it is hardly surprising that food is firmly in the public eye.

Government policy has contributed significantly to attaining the prominent and favourable position enjoyed by the Netherlands. For a long time Dutch national policy was primarily aimed at increasing agricultural productivity, both for export and domestic consumption. When agriculture became one of the first domains of its common market policy, the EU adopted a similar stance. In subsequent decades additional efforts were undertaken – at both national and EU level – to address new policy challenges such as environmental issues, animal welfare and rural affairs. However, the traditional focus remained.

While these policies were being pursued – and in fact partly because of them – both the food supply system and food consumption patterns changed significantly. The issues that induce public concern often exceed the local, national and even EU level. The WRR report *Towards a Food Policy* assesses the consequences of the international developments for the Netherlands. Based on its analysis, the WRR advises the Dutch government to develop a comprehensive food policy.

### GLOBAL CHALLENGES

There is a growing awareness that the global food system faces important challenges. The uneven distribution of food remains a major concern. The world is confronted simultaneously with undernourishment and with the effects of an

overabundance of food. With the expected growth of the world population and changes in diets related to increasing urbanisation, both problems will become more acute. Reports published in the past decade by leading research and international advisory organisations, governments and the industry attest to the fact that the global food supply system is facing three major challenges: (1) ecological sustainability; (2) public health; and (3) robustness.

*Ecological sustainability:* Food production is closely intertwined with the environment and has an important ecological impact. The global food supply system imposes demands on natural resources (arable land, water and fossil fuel, used both for energy and fertilisers) and on raw materials. It also contributes to environmental degradation, greenhouse gas emissions and loss of biodiversity. The ecological impact will rebound onto the food supply system. To feed the growing world population, the production of food will have to increase. However, agricultural productivity is threatened by soil degradation, by diminishing stocks of fresh water, by a potential scarcity of raw materials, by the effects of climate change, and by the decline in biodiversity. Between now and 2050, the challenge will be to roughly double food production using about half the resource base of land, water and minerals.

*Public health:* The public health challenge relates both to risks within and around production facilities, and to unhealthy diets. The use of antibiotics in industrial-scale livestock farming has substantially increased the risk of multi-resistant bacteria. The development and spread of zoonoses (diseases transmitted from animals to humans) remain an important concern. Recent decades have seen significant changes in diets (growing consumption of animal products and processed foods and declining consumption of vegetables). Current diets contribute to rising levels of overweight, obesity and diet-related diseases.

*Robustness:* Robustness pertains to the capacity of the food supply system to cope with shocks and – under a variety of scenarios – to adapt to gradual change. There are various reasons to expect a more volatile environment in the near future. Geopolitical developments (partly in anticipation of the expected scarcity of natural resources) and more extreme weather conditions are two major factors. Increasing concentration of companies and a decreasing variety of crop species, livestock breeds and ecological systems used for food production pose risks to the robustness of the food supply system.

#### **FOOD NET**

These global challenges arise within a food system that has changed remarkably over the past decades. Four developments have been of particular significance. Firstly, both agriculture and fishery have become industrialised and operate on ever-larger scales. Secondly, the food supply system has become more globalised.

Trade and foreign direct investment have expanded, while production chains have become longer and more international. Thirdly, the power of non-agricultural players has increased significantly. Producers of seed, fertilisers and animal feed, the food processing industry, traders and supermarkets have all become more powerful relative to agricultural producers. There has also been a strong concentration in these sectors, with major markets being dominated by only a small number of companies. Fourthly, there have been significant changes in consumption patterns, with increasing consumption of meat and other animal products, as well as of processed food.

In recent decades, the route from farm to fork has become much longer and more complex. What has developed over time is a dynamic and complex combination of flows of materials that are processed and combined into food products. The report refers to this network of material flows as the ‘food net’. The food net transcends national borders and hence jurisdictions, and it involves a large number of interdependent actors. No single player has a complete overview; none has the capacity to determine the functioning of the network as a whole. However, the food net does comprise hubs that have a major influence on what goes on elsewhere within the net. Seed companies and procurement organisations of supermarkets are examples of such hubs. Both vertical integration and industry standards introduced by cooperating businesses have led to increasing standardisation of products and processes that substantially affect the power relations within the food net. Increasingly, market competition is no longer between individual firms, but between chains of firms.

The food net poses specific policy challenges. To address the issues at stake, it is not sufficient to focus on the places where they first manifest themselves, i.e. to conceive the ecological sustainability of food production primarily as an agricultural issue, and food-related public health problems as issues of consumer choices. To address the current and future challenges concerning ecological sustainability, public health, and the robustness of the food supply system, the complex interdependencies within the food net need to be taken into account.

#### **A REORIENTATION OF DUTCH POLICY**

The three challenges of ecological sustainability, public health and the robustness of the food system manifest themselves in a food net that transcends national borders and that is characterised by many interdependencies and interconnections. A magic bullet that targets the core of all problems is not available. What has functioned as such in the past – an increase in production – can no longer provide the whole answer. The ecological sustainability of this approach has been called into question, and it does not provide an answer to the challenges of public health and

robustness. The transition towards a food net that is more sustainable, healthier and more robust requires action by many different players. Businesses, NGOs, consumers and government will all have to play a role.

The Netherlands' prominent position in the world of food brings with it vulnerabilities, opportunities and responsibilities. The challenges outlined above also concern the Netherlands: it contributes to these global challenges as well bears their effects. The ecological footprint of Dutch production and consumption is substantial and to a large extent it lies abroad. The Netherlands is also confronted with more changeable weather conditions, degradation of soil, diminishing biodiversity and an expected scarcity of resources. As a major hub in the global food net it is not immune to the threats of zoonoses and multi-resistant bacteria. In the Netherlands, too, changing diets have led to an increase in overweight, obesity and diet-related diseases. The robustness of the food net is also a vital Dutch concern. Given the close intertwining of the Dutch agrifood sector with the global food supply system, proper functioning of the food net evidently affects the Netherlands directly.

Given its state-of-the-art knowledge in agrifood and its potential for innovation, the Netherlands may also be expected to contribute to a more sustainable and healthy global food net. Developing innovative food products and production methods that explicitly address the challenges could also generate additional export opportunities.

To address the global challenges facing the food net and their repercussions for the Netherlands, and given the growing complexities and uncertainties that policy-makers have to face, the WRR recommends two major shifts in policy orientation:

- From an agricultural policy towards a food policy;
- Focus on the resilience of the food net.

#### **TOWARDS A FOOD POLICY**

For many decades, the Dutch government has pursued a successful agricultural policy. However, the time has come for the development of a comprehensive food policy, i.e. a policy that addresses the global challenges and takes the new context of the food net into account. This does not mean that agriculture has become less important, it does mean that policies should be designed with a view not only to the role of agriculture, but also to the role of other players in the food net. A food policy means taking into account (1) the different values associated with food; (2) the interdependence of food production and consumption; and (3) the changing power relations in the food net.

***Different values***

Food touches on a wide range of values; economic interests, public health, sustainability, animal welfare, spatial planning, cultural identity and social issues all matter. A food policy will need to take this variety of values into account. Bringing about the necessary policy shift will require time, discussion and vigour. It should lead to a long-term orientation and to institutional anchoring of a wider range of values.

A national and EU food strategy that addresses the trade-offs and the choices that have to be made would provide a clear and reliable long-term perspective for the agrifood world and for society as a whole. It can build upon the growing awareness in both civil society and leading parts of the business world that the food system needs to become more sustainable, healthier and more resilient. This will undoubtedly mean that difficult choices have to be made. To mention just one: both ecology and public health will benefit from policies that promote a shift from animal products to plant products, while this would have an economic impact on parts of the agrifood sector.

A food policy that takes the variety of values into account needs to offer sufficient opportunities for voicing alternative views. Within the existing policy, the economic values of free trade and the business interests of the sector have often been dominant, leaving little room for other values. A comprehensive food policy requires better institutional anchoring of the values of ecological sustainability, public health and the resilience of the food supply system at all levels – national, EU and global. An example at the international level are the WTO regulations. Within the existing free trade policies, it can be difficult to assign more weight to ecological sustainability. Enhancing sustainability will often require adjustments to production processes. However, under current WTO regulations, governments can only impose requirements on products, not on processes. This issue should also be taken into account during the current negotiations on the Transatlantic Trade Investment Partnership.

***Interdependence between consumption and production***

A *comprehensive* food policy should consider the production, processing, distribution and consumption of food as inextricably linked. This first of all requires a broadening of the available policy information. Information about agricultural production is available in abundance; by contrast, surprisingly little information is publicly available about food processing and consumption. Broadening the policy and taking into account the link between production and consumption necessitates a more comprehensive policy information base.

It also means that to address today's issues it is no longer sufficient to conceive ecological sustainability primarily as a problem for agriculture and food-related health problems purely as issues of consumer choice. Leverage points for effective policy are often located at places other than where problems arise. To improve ecological sustainability, policies should also be aimed at feed and seed production, at the processing and the consumption of food. With a view to improving public health, a broad spectrum of measures is desirable, including measures aimed at production, processing and retail.

### ***Changing power relations***

The power relations within the food supply system have changed. Where in the past agricultural organisations, national government and knowledge institutes jointly determined Dutch agricultural policy, today non-agricultural players (seed and feed companies, the food processing industry, traders and supermarkets), consumers, NGOs and international organisations also play an important role. Food policy will need to adapt to this changed reality and involve these prominent players in its food policy.

The changing power relations also affect the role of government. A transition towards an ecologically sustainable, healthy and resilient food net will require action and cooperation from both the business world and civil-society organisations. Government should encourage this and remove potential barriers. EU and national competition policy could hamper initiatives to enhance the ecological sustainability of food supply chains, the WRR therefore recommends that existing EU competition law be reviewed in this light. The societal dynamics that surround food can also be supported by the provision of adequate information. For example, public information on waste and residual flows of materials from agrifood companies would facilitate innovation, leading to a more circular system. Reducing the multitude of logos and claims on food products to a limited number of logos (e.g. one on health and one on ecological sustainability) would enable consumers to make better-informed choices.

## **TOWARDS A RESILIENT FOOD NET**

To address the challenges the food system faces, there are many concrete measures that could be taken now, at both national and EU level. However, policymakers should be aware that they also face uncertainties. Forecasts of future developments and issues are all based on models and estimates with limited projective power. Long-term geopolitical, market and technological developments are at best the subject of informed guesswork. The complexity of ecological systems adds to these uncertainties. Ecological systems that remain stable for a long time may suddenly start to behave differently after a 'tipping point' has been reached, with unpredictable consequences.

The world of food is heading towards a more volatile and in many respects more uncertain environment. The second main recommendation of the WRR is therefore to adopt policies that help to enhance the resilience of the food net. Resilience can be increased by (1) stimulating variety; (2) organising sustainable management of resources; and (3) developing learning capacity.

### ***Variety***

Resilience requires sufficient variety in the food net – a variety of players, but also of crop species, animal breeds and materials. Competition law is concerned with the variety of players. However, its focus is on consumer prices and market power, not on resilience. Due to standardisation, even in fully competitive markets uniformity may emerge at the level of material flows. To enhance variety in the food net, the government can intensify its innovation policy aimed at increasing the variety of crop species used for food production, and at developing alternative protein sources. Promoting variety will require support for business ‘challengers’, not only during the pilot phase, but also during the phase of upscaling production levels. Intellectual property legislation should also be perceived from the perspective of its effects on the resilience of the food net.

### ***Sustainable resources***

To cope with sudden, short-term shocks and to secure adequate long-term functioning, a resilient food net requires sustainable management of natural resources. There are many initiatives already in place, involving businesses, governments and NGOs. There is more to managing resources than choosing between government regulation and the invisible hand of the market. Successful examples involve various kinds of institutions for the sustainable management of ‘common pool resources’. Food policy should encourage and facilitate such initiatives. In addition, efficient use and recycling of raw materials – for example phosphates – are crucial. Sustainable management of resources also requires increased efforts to reduce waste and to re-use residual flows at the highest possible value.

### ***Learning capacity***

Resilience requires learning capacity and adaptability on the part of all players within the food net. Learning to deal with changing circumstances requires room for experimentation and selection based on results. It may require governments to allow temporary exemptions from established regulation. Enhancing learning capacity requires a permanent exchange of knowledge and experience between businesses, NGOs, consumers and government.

## **CONCLUSION**

For many decades, the Dutch government has pursued an implicit food policy that coincided with a successful agricultural and food safety policy. Over the course of time, other food policy goals were addressed by accompanying policies.

However, the world of food has changed and is facing substantial challenges that also concern the Netherlands. These factors call for a reorientation of policy.

The time has come for an explicit *food policy*.





## PREFACE

This publication is a translation of the report '*Naar een voedselbeleid*' published in 2014 by The Netherlands Scientific Council for Government Policy (WRR). In 2015 an English synopsis was published, this is a translation of the entire report. For this translation, the report has not been updated.

The report was written by a project group headed by Gerard de Vries, a member of the Council. Huub Dijkstra and Josta de Hoog were responsible for project coordination. Other members of the project group were Wendy Asbeek Brusse, Hannah Koutstaal and Bart Stellinga. Marijke Rem, Steven Schouten and Lukas Verburgt also joined the team for a shorter period.

This report is the product of an extensive process of consultation and analysis. In addition to studying the voluminous academic literature, the project team conducted more than a hundred interviews with individuals from the agri-food sector, academic experts, policymakers and representatives of various civil society organisations. We are very grateful to them. Their names are listed at the end of the report.

We would also like to thank those who were prepared to read and comment at length on an earlier version of this report: M.A.J.S. van Boekel, A. Gerbrandy, D. Kromhout, H.C. van Lamsweerde, G. Meester, P. Oosterveer, K. Poppe, R. Rabbinge, M.A. Reudink, J.C. Seidell, G. Spaargaren and P. Winsemius.



# 1 INTRODUCTION

The Netherlands has a prominent position in the world of agri-food. The Dutch agri-food sector is held in high regard internationally for its efficient production of foodstuffs. The Netherlands is the world's second-largest exporter of agri-food products (including substantial transit trade). It is home to major international agri-food companies and to several internationally renowned agri-food research institutes. The Dutch agri-food sector – which encompasses primary production (agriculture and fishery), the processing and food industries, suppliers, retail, distribution, and food service – accounts for an important share of the Netherlands' GDP and about ten percent of overall employment (Van Leeuwen et al. 2014: 48). For Dutch citizens, food is available in abundance and historically low prices have made it more affordable than ever.

At the same time, food has increasingly become the subject of public concern. Q-fever, salmonella-tainted salmon, horse meat sold as beef, regular meat sold as organic: recent years have seen numerous food-related incidents, some more serious than others. As a result, food is now firmly in the public eye. Issues such as intensive livestock farming, animal welfare and the nutritional value of food have become subjects of – sometimes quite heated – public debates. Numerous new initiatives for alternative ways of food production and distribution are under way. It is hardly surprising that disagreements – in some cases ideological ones – have arisen. Food touches on many different values and interests, both public and private. It evokes a variety of associations, quite often contradictory. Food meets a basic need; it is tied directly or indirectly to nature; it is a source of pleasure; it is symbolic of cultural heritage; it expresses identity; and it is a source of income. What the agri-food sector produces affects our lives, our environment, and our health.

The current interest in food shows certain similarities to the environmental concerns that arose in the 1970s and 1980s. Once again, the conventional answers are no longer considered to be satisfactory, new initiatives are cropping up everywhere, and the sector is worried about public support for its activities.

Dutch food production and consumption are closely intertwined with that of other countries. Food-related issues that arise in the Netherlands cannot be understood or appraised without also considering global trends and developments. The present report analyses these trends and their consequences for Dutch society and Dutch policy. Some of the issues raised in current discussions in the Netherlands – for example landscape management and animal welfare – are therefore dealt

with only in passing here, not because they are unimportant but because the purpose of this report is to address the repercussions of *global* trends for the Netherlands.

## 1.1 INTERNATIONAL TRENDS

Due to the food crises of 2007-2008 and 2010, the food supply system has returned to the top of the international political agenda. Reports published in recent years by international research and advisory organisations active in agriculture and food (FAO), international economic policy (World Bank, OECD) and development cooperation (Oxfam), as well as a number of (professional service) companies (Rabobank, ING, KPMG, McKinsey) have warned about problems that threaten the global food supply system, both now and in the decades ahead. Although the focus of these reports differ, they broadly agree that vital questions have arisen concerning the ecological sustainability, public health and robustness of the global food supply system.

While the experts largely concur about the nature and significance of these problems, opinions differ as to how best to tackle them. At one end of the spectrum, there are those who advocate increasing production by means of intensification and economies of scale. They are banking on innovation, free trade, and large-scale agricultural enterprises. On the other end are those who argue for far-reaching changes to market structures and government policy, dismantling agri-food monopolies, and boosting the position of small farmers and local communities. Underpinning these differences of opinion are diverging ideas and perceptions concerning health, taste, the environment, animal welfare, fair trade, affordability, working conditions, employment, prosperity, global justice, and the role of technology, markets, and governments.

## 1.2 POLICY

Governments have concerned themselves with the food supply system for long (De Haas 2013). The Dutch post-war government initially aimed at increasing food production to meet domestic demand and to create a trade surplus to finance the reconstruction of the country. Food safety was also a concern. Gradually, government policies have extended into other domains and issues; agricultural policy became intertwined with policies in the areas of environmental protection, spatial planning, landscape management, public health, social welfare, and animal welfare. Increasingly policymaking has moved to European and international levels. Particularly the EU's common agricultural policy (CAP) and free trade agreements have a major impact on domestic food production and consumption.

Against this background of global trends and international concerns, reports have been published in Canada, Finland, the United Kingdom, and Australia that broadly reappraise domestic agriculture and food policy to propose national ‘food strategies’. These strategies focus on the sustainability of food production, public health risks associated with customary dietary patterns, market regulatory issues, and the economic position of the country in question. Similar strategies have also been developed for regions and urban areas, both in the Netherlands and abroad. Some of these local strategies also cover new issues, for example the relationship between city and countryside, logistics and business location issues, as well as the ‘food awareness’ and ‘food literacy’ of consumers and citizens.

The trends and challenges that have been widely noted abroad have implications for the Netherlands too – or better put, for the Netherlands specifically, given its position in the international food world. The present report discusses these trends and the challenges that they pose for government policy in the Netherlands. It provides recommendations for the Dutch government. With this report, the Council also aims at contributing to constructive public discussions about current and future issues associated with the broad topic of ‘food’.

### **1.3 STRUCTURE OF THE REPORT**

The present report is based on a vast number of studies published by academics, government bodies, NGOs and the private sector. The project team conducted more than a hundred background interviews with Dutch and foreign experts from academics, government, politics, consultancies, NGOs and businesses.

The chapters are based on the following questions:

- What has changed in the food supply system in recent decades? What trends have been dominant? (Chapter 2);
- What challenges does the present and future global food supply system face? (Chapter 3);
- What is the position of the Netherlands in the international food world and what challenges does it have to face? (Chapter 4);
- How much room for manoeuvre do businesses, governments and consumers have within the current food system? What features of that system should they bear in mind? (Chapters 5 and 6);
- What are the characteristics of existing government policy? How is that policy addressing the above-mentioned challenges? (Chapter 7).

Chapter 8 presents conclusions based on the preceding chapters’ analyses and offers policy recommendations for government.



## **2 KEY TRENDS IN THE GLOBAL FOOD SUPPLY SYSTEM**

### **2.1 INTRODUCTION**

In recent decades, four important trends have become apparent in global food production and consumption. They are outlined in this chapter. The first trend is the far-reaching industrialisation of primary production (agriculture and fishery). Economies of scale, specialisation, intensification, mechanisation and rationalisation have altered production processes in agriculture and fishery (section 2.2). Second, the food supply system has become much more globalised (section 2.3). Third, non-agricultural activities – transport, distribution, processing, packaging and retail – have become much more important to the food supply system (section 2.4). And finally, food consumption patterns have changed significantly in recent decades (section 2.5).

At the same time, alongside these dominant trends and sometimes in explicit opposition to them, other developments have transpired. For example, in many industrialised countries, organic farming has become popular, and locally produced food and short supply chains are on the rise. In terms of volume these trends are still minor ones, but they play an important role in the public debate about food. Two of these countermovements will be discussed briefly at the end of this chapter (section 2.6).

### **2.2 INDUSTRIALISATION OF PRIMARY PRODUCTION**

The industrialisation of agriculture and fishery began in North America and Western Europe. Systematic management and mechanized processes entered food production. Machinery replaced the ‘green thumb’ of yore and took over the work that for centuries had been carried out by farmers, farm labourers and animals. Agricultural industrialisation then spread to other parts of the globe. It allowed farmers’ incomes to keep pace with the rest of society’s earnings and led to a sharp decline in the share of the labour force employed in the primary sector.

The use of fertilisers in crop farming resulted in a tremendous rise in yields per hectare. Crop improvement techniques, better breeding methods and the introduction of pesticides further augmented and rationalised productivity (Fresco 2009; Bindraban and Rabbinge 2012: 100). These developments first appeared in the West at the end of the nineteenth century. By the 1950s and 1960s, they reached South America and Asia under the banner of the ‘Green Revolution’. New high-yielding varieties that were well adapted to local conditions were introduced (Lang et al. 2009: 37-38). The late twentieth century saw genetically

modified crops being cultivated in a growing number of places – a development that has met fierce public resistance in Europe, where it has not reached the North and South American levels (Oosterveer and Sonnenfeld 2012: 181). Livestock farming achieved productivity gains by specialising in specific stocks and by breeding animals with specific characteristics. The widespread use of antibiotics to prevent animal disease and growth-enhancing techniques also aimed at increasing productivity (Lang et al. 2009: 194). More recent technical innovations in precision agriculture make it possible – for example by means of satellite imaging – to pinpoint how much fertiliser and irrigation are required at specific locations, leading to the further optimisation of agricultural processes (Bouma and Stoorvogel 2005).

In fishery, the number of motorised and technically advanced fishing vessels has risen sharply around the globe. Today, about 60 percent of all fishing vessels are motorised (FAO 2012: 47). In addition to fishing, aquaculture has become more important. In 2011, it was responsible for 40 percent of global fish production (FAO 2012: 3).

Industrialised agriculture requires large investments; at the same time farms are constantly under pressure to reduce costs. As a result, many farmers find increasing the scale of production an appealing and, in many cases, necessary solution. The average surface area per farm has risen sharply, and so has the average number of animals per farm in livestock farming. Also, many farmers have transitioned from mixed farms that produced a variety of different products to specialist farms that concentrate on only a few crops (monoculture) or breeds (Lang et al. 2009: 154-155; Bieleman 2008: 467).

Agricultural industrialisation is a global phenomenon. However, it should be noted that the trends described above have not unfolded everywhere at the same pace. They specifically arose in the West and in emerging economies. In many developing countries agriculture remains a labour-intensive affair, with only limited use of technology and machinery. And even in countries where agriculture is highly industrialised, there are farms that use far less fertiliser and chemical pesticides (see also section 2.6).

### **2.3 GLOBALISATION OF THE FOOD SUPPLY SYSTEM**

The second trend is the increasing globalisation of the food system. Food supply chains increasingly stretch over different countries and even continents. As international trade and foreign direct investment increased, the food industry became more globalised. International trade in food products is centuries old, but the volume of that trade has grown considerably in recent decades, despite periodic collapses brought on by economic crises or natural disasters (Oosterveer and Sonnenfeld 2012: 15). Its real value is estimated to have increased fivefold in the

past five decades (FAO 2013b: 150). The nature of that trade has also changed. The worldwide trade in processed consumer goods has gained in importance relative to the trade in bulk commodities (see the insert).

### Altered nature of global trade in food products

Food products can be divided into four categories: (1) bulk commodities; (2) processed intermediate products; (3) fresh horticultural products; and (4) processed consumer goods (Gehlhar and Coyle 2001). In the past, most international trade concerned the first category, mainly wheat, maize, coffee and cocoa beans. Starting in the 1980s, however, the trade in processed consumer goods began to increase. It rose from 18 percent of all trade in food products in 1980 to 34 percent in 2002, although it seemed to level off in the years thereafter (Gehlhar and Regmi 2005). The trade in processed intermediate and fresh horticultural products kept pace with the overall trade in food products. The declining share of bulk commodities from 50 percent in 1980 (Coyle et al. 1998) to 21 percent in 2002 (Regmi et al. 2005) does not mean that such commodities were less in demand. It may also imply a growing trend towards processing bulk commodities prior to export (Gehlhar and Coyle 2001; Reardon and Timmer 2007). The relative decline in bulk commodities also says very little about the increase in the total volume of trade, of course; that increase has continued unabated in recent decades for bulk commodities as well.

Although the volume of international trade in food has grown sharply, still it accounts for only a modest share of the total food market. Of all the processed consumer goods sold worldwide, only ten percent are products traded internationally (Regmi and Gehlhar 2005). But the volume of international trade varies considerably from one product to the next. The trade in soy and grains crosses continents, most other crops are consumed in their country of origin or neighbouring countries. More than 80 percent of coffee, tea and other tropical products are destined for export (Oosterveer and Sonnenfeld 2012: 15), and 41 percent of vegetable oils, including palm oil and soy oil, find their way into international trade (Gunstone 2011). About 38 percent of fish products are also traded internationally (FAO 2012: 15). Dairy and meat are generally produced and consumed on the same continent, but on a continent they are often traded between countries.

Countries differ considerably in the role that they play in international trade, of course, and that role can also change over the course of time. The least developed countries have gone from being net exporters of food in the 1960s to net importers starting in the late 1980s (FAO 2013b). This shift came about partly because of the large (often subsidised) production surpluses that the OECD countries dumped on the world market. In addition, their rapidly expanding populations forced developing countries to import cheap bulk commodities such as wheat. At the other end of the spectrum, emerging economies in South America

(e.g. Brazil and Argentina) have become major export countries in the world market (FAO 2013b). Even so, the West is responsible for most of the export growth (Reardon and Timmer 2007).

The globalisation of the food sector was brought about not only by the growing level of international trade, but also by the increase in foreign direct investment. Food companies have invested heavily in other countries in recent decades by establishing businesses there or taking over existing enterprises. A number of authors consider this as a more important aspect of globalisation than the growing level of world trade (Gehlhar and Regmi 2005; Reardon and Timmer 2007; Wilkinson and Rocha 2009). Especially foreign direct investments of the food business industry, supermarkets and fast food restaurants have made a significant contribution to the globalisation of the food sector (Reardon and Timmer 2007; Frazao et al. 2008).

Food companies turned to internationalisation when markets in the West became saturated and they realised the growth potential in emerging economies. Populations in those economies were growing rapidly, along with the demand for processed consumer goods (see section 2.5). The ten biggest food companies worldwide – Nestlé, Kraft Foods, Unilever, PepsiCo, Mars, Danone, Cadbury, Kellogg, General Mills and Ferrero (Alexander et al. 2011; based on Euromonitor 2011) – all have a strong presence in international markets. The products of for example Unilever, Nestlé and PepsiCo are sold around the world; these companies generate much of their revenue outside their domestic market (IMAP 2010).

Food companies often pursue a strategy of producing in the country of consumption (i.e. foreign direct investment) instead of exporting their wares from their home market (Gehlhar and Regmi 2005; Wilkinson and Rocha 2009). That way they are better able to anticipate local demands (by supermarkets/consumers) and to comply with statutory obligations. In 2002, for example, the revenue earned locally by the foreign subsidiaries of American food companies (\$ 150 billion) was five times greater than the export value of American food companies (\$ 28 billion) (Gehlhar and Regmi 2005: 16).

Starting in the mid-1990s, supermarkets, through mergers and acquisitions, became active in countries in which retail was still in a ‘pre-supermarket era’, for example in Central and Eastern Europe, East and Southeast Asia, and South America (Vorley 2007: 247). This strategy was not always a successful one, but it did lead to the introduction of the supermarket concept in many emerging countries. That concept has resulted in the global convergence of the way in which the retail market is organised (Reardon and Timmer 2007). European multinational

supermarket enterprises now generate a considerable percentage of their revenue outside their home market (frequently more than 40 percent in the case of large corporations) (Deloitte 2012: 23).

The major fast food chains have also contributed to the globalisation of the food sector (Reardon and Timmer 2007; Frazao et al. 2008). American chains such as McDonald's, YUM! Brands (including Kentucky Fried Chicken and Pizza Hut) and Burger King have restaurants around the world. McDonald's, for example, now has more restaurants abroad than within the United States (Christian and Gereffi 2010). These American chains began by conquering first the European market (they are the top three chains in Europe), and subsequently emerging economies such as Mexico, Brazil, India, Vietnam and the Philippines. This had implications for local food production in these countries. Local producers increasingly turned their production to supply large multinational fast food companies and overhauled their methods accordingly, often assisted by the companies themselves or their international suppliers. American companies were not alone in this, though. Local businesses imitated the American fast food concept (mass production and standardisation of meals). There are now a number of large restaurant chains in Asia, for example; one of them is Jollibee, which has a large presence in Southeast Asia (Christian and Gereffi 2010).

## **2.4 INCREASED ROLE OF NON-AGRICULTURAL PLAYERS**

The third trend is the increasing role of non-agricultural businesses in the food supply system. Food is processed, prepared, packaged, traded, and ultimately sold to consumers in a number of steps. The chains in which much of our food is produced have grown long and complex: primary production is only one of the many steps of that chain (Dicken 2007: 349; see also Chapter 5).

Many non-agricultural enterprises are involved in putting food on the table, for example companies that produce fertilisers, animal feed, pesticides and seeds, and businesses that process, package, transport and sell food. Their role has become much more important compared to that of agriculture. Another factor is that in many parts of the chain concentration has taken place, resulting in increased dominance of a few large enterprises. As a result, the power relations in the world of food production have shifted in recent decades.

The growing importance of biochemical technology has accorded businesses that produce seed, fertiliser and pesticides a prominent place in the food system. A wave of mergers and acquisitions has allowed a small number of companies to secure a dominant market position (Fuglie et al. 2011). Approximately half of the global market for seed is now in the hands of ten enterprises, the most important being DuPont, Monsanto and Syngenta. Eighty percent of the global market for

pesticides is dominated by ten companies. Bayer, Syngenta and BASF are the biggest among these (Dicken 2007). Because these firms link certain seeds to certain pesticides, their markets overlap to some extent (specifically with regard to genetically modified crops or GMOs). For example, Monsanto, DuPont, Bayer and Syngenta are active both in seed and pesticide production. As a result, farms around the world have become heavily dependent on the products of these companies (Dicken 2007).

The sector that procures, processes and sells food crops and intermediate products has also seen far-reaching concentration and integration. The biggest companies – Archers-Daniels Midland (ADM), Bunge, Cargill and the Louis Dreyfus Group, known as the ABCD firms – are global enterprises active in various food categories and in diverse segments of the food supply chain (Vorley 2003). Cargill, for example, is active in trading and producing grain, cocoa, soy, rice, yeast, maize, sugar, meat, oils and vegetables. In markets for individual crops, these companies sometimes enjoy a dominant position. Cargill, ADM and Bunge are responsible for an estimated 80 percent of the global trade in grain (Dicken 2007). Furthermore, these companies are active in various segments of the agri-food complex. Cargill, for example, not only processes and trades various crop and meat varieties but is also active in storage, transport, financial services, pesticides, seed sales, consultancy, and land acquisition (Murphy et al. 2012).

The food industry – i.e. the producers of packaged foodstuffs suitable for immediate consumption – has also become more important. A small group of enterprises is responsible for the enormous range of products that fill supermarket shelves. For example, Dicken (2007: 369) estimated that Nestlé owns 8,000 brands in 20,000 product varieties. This wide range of varieties allows the company to respond to specific cultural and traditional consumer preferences in different countries and regions (*ibid.*).

Compared with the seed and pesticide or supermarket sectors, there is a lower level of concentration in the food industry. The top four enterprises account for between 10 and 20 percent of the global market for processed products (Gehlhar 2003). The picture changes, however, if we differentiate by region and zoom in on specific food categories. The market for baby food, soups, soft drinks and breakfast cereals is much more concentrated – between 50 and 60 percent worldwide, and much higher in some regions. Gehlhar (2003), for example, estimates that the four largest baby food producers have a market share in North America of 90 percent. The same percentage applies for breakfast cereals in Latin America (*ibid.*; Bolling and Gehlhar 2005). The market for soft drinks is also highly concentrated in many places, with The Coca-Cola Company and PepsiCo as the largest players. In Europe, the four largest soft drinks companies have a combined market share of

64 percent (Bukeviciute et al. 2009), and in the USA, the three largest producers alone dominate 66 percent of the soft drinks market (IBISWorld 2012; via Change Lab Solutions 2012).

One important change of the past few decades is the ‘supermarket revolution’, which has altered the structure of the food sector significantly. It began in the West, but is now taking hold elsewhere in the world. What used to be a ‘producer-driven’ chain, in which the producers decided which products would be produced and at what price, has become a ‘buyer-driven’ chain, in which the major supermarket chains have a large influence on food production (Vorley 2003). Owing to their greater purchasing power, their on average lower overheads and more efficient distribution systems, the large conglomerates enjoy lower costs than smaller supermarkets and specialty shops. As a result, retail has become highly concentrated in many Western countries. In many West European countries, the top four supermarket conglomerates have a combined market share of more than 60 percent (Vorley 2007: 249). All in all, the supermarket chains have become much more powerful and have gained a negotiating position that is much stronger than that of other players in the food supply chain, both agricultural and non-agricultural.

### Technological changes

Technological changes have had a defining impact on the distribution and sale of food. The introduction of the barcode was of crucial importance for supermarkets. It made it possible for cashiers to work faster and eliminated the need to attach price tags to every product, thus allowing savings on labour costs. It also made it possible to computerise stock management, with just-in-time delivery leading to significant savings (Harvey 2007; Konefal et al. 2007). Other key technological advances have also been especially advantageous for the major supermarket chains. Container and air transport and cold chain technologies (which enables perishables to be stored at a specific temperature), allow them to offer a broader assortment of products year-round. The wide range of fresh produce represents an important share of their revenue and gives them an edge over smaller retailers (Konefal et al. 2007: 276).

Two other related trends have increased the influence of the major supermarkets on food production. The first is that they have introduced their own store brands and thus have started to compete directly with established brands. In many European countries, store brands now have a market share of between 40 and 50 percent (PMLA 2012). The second is that by introducing private safety and quality standards, supermarkets have come to exercise a direct influence on the primary production process and the rest of the production chain (Burch and Lawrence 2007: 11). GlobalGAP (previously: EurepGAP) for example, is a private standard aimed at food safety. Because the major European supermarkets apply the

GlobalGAP protocols, they have a strong impact throughout the chain, with food producers around the world applying for certification (Oosterveer and Sonnenfeld 2012: 73).

Finally, the food service industry has become more important. This sector has also seen the rise of a few large players. Especially fast food chains such as McDonald's and Burger King have attained a strong position in the market (Friddle et al. 2001; Christian and Gereffi 2010). This trend began in the USA but in recent decades it has extended to other parts of the world. By introducing the mass production concept in the food service sector, these chains have gained a significant influence on food production. McDonald's is the biggest buyer of potatoes in the United States, for example, and through two crucial suppliers (McCain Foods and J.R. Simplot) it can put considerable pressure on potato production in the USA. Kentucky Fried Chicken is one of the biggest buyers of chicken in the world, putting it in a position to influence production standards (Christian and Gereffi 2010). Table 2.1 summarises the changes in power relations.

**Table 2.1** Changing power relations in Western food supply chains

Period	Farming	Industry	Retail	Food service
< 1900	<b>Dominant</b>	Minor	Very minor	Dominant (domestic)
1900 - 1950	Declining (except: WWII)	<b>Dominant</b>	Minor	Declining (except: WWII)
1960-1970	Rebuilding (subsidised)	<b>Dominant</b>	Emerging	Minor
1980 - 2000	Declining	Declining	<b>Dominant</b>	Emerging
2000 - 2010	Returning?	Uncertain	<b>Dominant</b>	Emerging

Source: Based on Lang et al. 2009: 166 and Von Schirach-Szmigiel 2005

## 2.5 CHANGING DIETARY PATTERNS

The fourth trend in food is the change in dietary patterns. What people eat, in what form they eat it, and where they buy their food have all changed dramatically in recent decades. Growing prosperity in many countries has led to a rise in the average per capita consumption of food – measured in number of calories – and to a change in dietary patterns (Frazao et al. 2008; Kearney 2010; Alexandratos and Bruinsma 2012). This trend generally unfolds in two phases. In the first phase, the expansion phase, people consume extra calories in the form cheaper foodstuffs of vegetable origin (Smil 2000, via Kearney 2010). Regardless of location, this phase develops in the same way. In the second phase, the substitution phase,

the composition of diets changes. People start to replace carbohydrate-rich staples – cereals, root vegetables and tubers – with vegetable oils, animal products (meat and dairy) and sugar. Precisely how this second phase evolves differs from country to country (Kearney 2010). The substitution phase generally follows Bennett's Law: as people become wealthier, they eat fewer starchy staples (rice, wheat and maize) and spend more of their money on fresh fruit and vegetables, processed food and meat. They also consume more high-sugar and/or caffeinated beverages (Gehlhar and Regmi 2005: 8).

Besides increasing wealth, urbanisation is another key factor in the changing consumption patterns (Regmi et al. 2008). Urban areas generally have a wider range of food products available, a better educated population, and a larger percentage of women who work outside the home. The combination of growing prosperity and urbanisation thus leads to different consumption patterns in which animal and processed products and convenience foods take a prominent place (Regmi et al. 2008; Rae 1998; Regmi and Dyck 2001; FAO 2006; 2010a).

### Trends in meat consumption

Average per capita meat consumption has risen sharply in recent decades, although of course there are major differences between (and within) countries. Consumption figures are usually based on the 'carcass weight' per capita that is available for consumption. Actual meat consumption is a little more than half that weight (PBL 2011: 72-73). The available quantity of meat per capita worldwide (based on carcass weight) rose from 30 kg in 1980 to more than 41 kg in 2005 (FAO 2010a: 11). In developed countries (discounting former planned economies), it rose from 82 kg to 96 kg. The United States is way ahead of the rest of the world, with approximately 125 kg per capita in 2005; in comparison, countries in the developing world have an average of 31 kg (FAO 2010a). Meat consumption in emerging economies has risen more sharply than in the OECD countries, however (FAO 2013b). In China, for example, per capita meat consumption increased ninefold between 1963 and 2003 (Kearney 2010). Average consumption in the European Union is high by international standards (approximately 86 kg per capita), although there are major differences between countries. Average meat consumption in the 'old' Member States (EU-15) rose sharply in the 1960s and 1970s (PBL 2011: 70), but began to stabilise around the millennium (at about 95 kg) and has since gradually declined. Average meat consumption in the new Member States continues to rise, but was initially much smaller than in the EU-15 (European Commission 2012: 40; FEFAC 2013).

Not only have dietary patterns changed in recent decades, but the form in which food is presented to us has also changed. We are buying more and more processed and packaged food. Packaged products (processed food and beverages) now account for approximately half of all consumer spending in the West (Gehlhar and

Regmi 2005: 6). Increasing prosperity, the rising number of single-person households and working women, and the associated growing demand for convenience have led to a growing availability of processed food and ready-made meals (Reardon and Timmer 2007). This trend has been facilitated by the arrival of the refrigerator, the oven, and the microwave – initially in wealthy countries, but increasingly elsewhere too (Gehlhar and Regmi 2005: 12-13). As the consumption of processed and packaged food products has increased, so has the importance of food marketing. Packaging makes branding and better marketing opportunities possible.

Another change is where we buy and consume food. A growing percentage of grocery purchases are made in supermarkets. In the West, this trend is well advanced; in Europe, supermarkets are responsible for an average of 70 to 80 percent of food sales for at home preparation (the ‘at home’ channel). Food service (the ‘out of home’ channel) has also grown significantly. These are meals that are prepared outside the home, for example by restaurants, fast food chains, and company cafeterias. Food service accounts for 40 percent of global food sales (Gehlhar and Regmi 2005: 5). In the United States, 47 percent of the food budget is now spent in this sector, compared with 26 percent in 1970 (Stewart 2012). That percentage is lower in Western Europe, currently at around 33 percent (Bord Bia 2011; Eurostat 2011). Eating out, especially in fast food restaurants, generally leads to consumption of more meals prepared with a large number of processed products, more calories and less nutritional value (Christian and Gereffi 2010; Todd et al. 2010).

## 2.6 COUNTERMOVEMENTS

The trends discussed above have been major factors in transforming the global food production and consumption. At the same time, other trends have emerged, outside the influence of these major factors, or even in direct opposition to them. Many prosperous countries, for example, have not only seen the industrialisation of primary production, but also – more recently – an interest in organic farming. Moreover, in response to the increasing length and complexity of food chains and the globalisation of the food supply system, there is now a growing interest in ‘short food supply chains’, ‘locally produced food’ and ‘seasonal’ products. Consumers are furthermore not only interested in convenience, quality and price, but also in other aspects of food and food production, such as sustainability, animal welfare, health, and fair trade. Although these trends are still modest in scope, they play an important role in the public debate about food.

### 2.6.1 OTHER PRODUCTION METHODS: ORGANIC FARMING

In many prosperous countries the industrialisation of agriculture has since the 1960s been accompanied by a growing interest in organic farming. Some farmers and consumers became concerned about the number of chemicals used in food

production (Morgera et al. 2012). Food scandals and the public's growing distrust of GMO food added extra fuel to the rise of organic farming (Raynolds 2004). Organic farming uses a combination of traditional farming methods and modern ecological insights (Morgera et al. 2012). Organic farms typically use mechanised farming methods but renounce growing GMO crops and the use of chemical pesticides, fertilisers, additives, antibiotics and/or growth hormones for animals.

### EU rules for organically grown food

Consumers cannot tell by its appearance how food has been produced. Organic food is therefore generally certified. The EU has developed a specific set of rules in *Council Regulation (EC) No 834/2007 on organic production and labelling of organic products*. It has introduced an 'organic production logo' to ensure consumers that the food they have purchased is in fact organically produced. Food producers (farmers and processing companies) must adhere to these rules and may be subject to inspection. The EU has signed bilateral agreements with countries that wish to export organic food products to the EU. The most important global standard for organic food production is set out in the *Codex Alimentarius*, whose governing body, the *Codex Alimentarius* Commission, developed these guidelines in 2005 (Morgera et al. 2012).

Although interest in organic farming is growing, the amount of land devoted to organic crop production still represents only a small share of all farm acreage. Approximately 37 million hectares of organic farmland are in cultivation worldwide, or less than one percent of total farm acreage. But in 1999, that was approximately 11 million hectares, so the amount of acreage has increased more than three-fold since then. Australia has the most organic farmland (approx. 12 million ha), but much of this is extensively managed grassland meant for grazing livestock. Next in line are Argentina (approx. 4 million ha) and the United States (approx. 2 million ha) (Willer and Kilcher 2012). The EU countries have a combined total of approximately 10 million hectares of organic farmland, or 5.4 percent of EU farm acreage in total (EU DG Agriculture and Rural Development 2013). By comparison, this is 0.6 percent in the USA (Willer and Kilcher 2012: 44).

The global market for organic products has grown considerably in recent decades. Between 2000 and 2011, revenue in this market increased from about USD 18 billion to USD 63 billion (Soil Association 2013; Willer and Kilcher 2012). The majority of sales is in North America and Europe, which together account for more than 90 percent of revenue from organic products. The market share of organic products is largest in Denmark, Switzerland and Austria (7.2, 6.0 and 5.7 percent respectively of total food sales). The market share in the Netherlands is about 2.7 percent (ibid). Because demand exceeds supply in North America and Europe, many organic food products are imported from Asia, Latin America and Africa (Ray-

nolds 2004; EU DG Agriculture and Rural Development 2010). Organic production in these parts of the world is primarily aimed at export to the West (Willer and Kilcher 2012).

### 2.6.2 SHORTER FOOD SUPPLY CHAINS AND LOCAL PRODUCTION

In reaction to the ever-expanding food supply chains, consumer groups and citizen initiatives have made an effort to shorten chains. Sometimes this is done by reducing the number of intermediaries, in other instances by shortening the geographical distance between production and consumption (Kneafsey et al. 2013). The two are related, but do not necessarily coincide.

One of the primary reasons consumers want to reduce the number of intermediaries is to get rid of the ‘anonymity’ of food producers. With shorter supply chains, it becomes easier to trace the places of production and the identity of the food producers (Marsden et al. 2000). In many European countries, abandoned market halls are being restored and farmer’s markets are on the rise, allowing consumers to purchase produce directly from growers. In the Netherlands, a number of farms that run their own shops have united under the *Landwinkel* (‘Country shop’) banner (PBL 2012a).

Buying food on the farm allows consumers better sight on the production methods that are deployed. Minimising the number of intermediaries in the chain allows farmers to gain a bigger share of the added value of the food chain (Kneafsey et al. 2013). Another motive for shorter food supply chains is that some consumers simply wish to avoid buying products from the big food companies and supermarket giants.

An evident disadvantage of minimising the intermediaries is that both consumers and producers have to work harder to ‘find’ each other. Online shops may provide a solution, but they do not offer the same level of personal contact between farmer and consumer that some desire (European Network for Rural Development 2012: 6).

‘Shorter supply chains’ may also mean that food is produced locally, that is, in the consumer’s geographical vicinity. In reaction to ongoing globalisation of food trade, consumers are becoming increasingly interested in local food (Spaargaren et al. 2012; Kneafsey et al. 2013). Regional products are becoming more common in supermarkets. Companies that distribute food boxes filled with locally produced food have gained a position on the market. Consumers feel the need for more direct contact with producers and/or the region of origin (Kneafsey et al. 2013: 44). Climate change concerns have also focused attention on a meal’s ‘food miles’, although the connection between food miles and sustainability is far from clear

(Lang et al. 2009). What exactly counts as 'local' is not fixed. It is a relative concept that signifies a smaller geographical radius for some consumers and countries than for others.

### The importance of the geographical origin of food

A Eurobarometer survey (2012) shows that 71 percent of the EU's inhabitants consider the geographical origin of their food an important consideration. But there are substantial differences between Member States. In Greece (90 percent) and Italy (88 percent), where food comes from is an important consideration for a large majority of the consumers. The survey shows that Dutch consumers are less concerned about this than any other EU inhabitants. Of those surveyed, 47 percent consider this important, as opposed to 48 percent who found it not important (Eurobarometer 2012: 21). It should be noted however that they were not asked how important they found 'locally produced' food, but only to what extent geographical origin was important when buying food. An earlier Eurobarometer survey (2011:23) revealed that 89 percent of the EU inhabitants questioned agreed (entirely or in part) that it would benefit consumers to purchase farm products and food that came directly from a farm close to their home. That figure was 90 percent for the Dutch survey participants.

#### 2.6.3 MORE AWARENESS OF CONSUMPTION PATTERNS

Over the past few decades, consumers in the West have got used to having a stable supply of (relatively) deluxe food products. They base their purchase decisions on price, taste and convenience. A smaller but growing percentage of consumers also factor other considerations into their purchase and consumption decisions, such as the nature of the production process (e.g. organic), the distribution of profits (fair trade) and animal welfare.

There is also more interest in the health aspects of consumption patterns. With the rising number of calories consumed, the growing share of processed products in consumption patterns and the higher intake of unhealthy fats, salt and sugar, people are starting to pay more attention to the health aspects of their dietary patterns and are trying out all sorts of diets. There has been simultaneously an increase in the number of TV cooking shows, a development of a raw food movement, and a rise in the consumption of convenience food and ready-made meals. The food industry has responded to the growing concern for health, for example by offering functional foods to which vitamins, minerals and other nutrients have been added for specific target groups such as the elderly, or by selling healthier products in certain food categories (Van Boekel 2011).

## 2.7 CONCLUSIONS

The nature of food production and consumption has changed dramatically in recent decades. Agriculture has become industrialised and systematised. The food system has globalised thanks to the increase in international trade and, especially, foreign direct investment. The role of non-agricultural players such as seed and pesticide firms, the processing industry, the retail and food service, has become much more important. Dietary patterns worldwide have shifted from basic food-stuffs to more processed food, more meat, more sugar, and more caffeinated beverages.

At the same time there have been countermovements, in the form of organic farming, shorter supply chains, locally produced food, and more dietary awareness. Although modest in scope, these movements exert or could exert an important influence on other developments in the food system and the public debate.

## **3 PROBLEMS IN THE GLOBAL FOOD SUPPLY SYSTEM**

### **3.1 INTRODUCTION**

Agriculture has achieved unprecedented levels of productivity in recent decades. Enough food is now being produced to feed the entire world population, but owing to political, economic and institutional impediments, the available food is unevenly distributed (PBL 2012a: 140). Of the seven billion people who inhabit the earth, almost 850 million are estimated to be malnourished and to suffer hunger on a regular or even daily basis (FAO 2013a). At the other end of the spectrum, 2 billion people are overweight or obese (Ng et al. 2014).

As in many Western countries access to sufficient food had become an issue that could largely be taken for granted, the global attention for agriculture and food declined. That changed during the food crises of 2007-2008 and 2010, when sharp price increases and unrest in some countries put the issue of food security firmly back on the agenda. A steady stream of reports by renowned research institutes, government committees, private advisory organisations and NGOs appeared.<sup>1</sup> Their message was clear: the world's food supply system is facing a number of significant challenges. The publications point to the scarcity of essential raw materials, to the adverse effects of food production on the environment, the climate and biodiversity, to the consequences of these effects for food production itself, to problems associated with food security and public health, and to the vulnerability of the world food system as a whole. These issues can be grouped under three headings: (1) ecological sustainability, (2) public health, and (3) robustness. This chapter discusses each of these three groups of problems separately, along with their associated uncertainties. Our perspective is a global one. The extent to which these problems affect the Netherlands – as a country that produces, imports, processes, exports and consumes food – is addressed in Chapter 4.

### **3.2 ECOLOGICAL SUSTAINABILITY**

In all likelihood, the global demand for food will continue to rise in the decades ahead. This will have far-reaching implications for agricultural production. To meet the growing demand, food production will have to increase drastically, requiring a further increase in agricultural productivity. But the extent to which food production and agricultural productivity can be increased in the decades ahead is limited by a scarcity of raw materials, problems associated with climate change and environmental pollution, declining biodiversity and the availability of land and water.

World food production is sufficient to feed the current world population, but that has not eliminated hunger. The Food and Agriculture Organization of the United Nations (FAO) estimates that between 2011 and 2013, 842 million people were unable to provide for their daily dietary energy supply (FAO 2013a: 8). Although the total percentage of the world population facing malnourishment has declined in recent decades (from 18.9 percent in 1990-1992 to 12.0 percent in 2011-2013; FAO 2013a: 8), that is still one out of eight people around the world.

### 3.2.1 INCREASE IN DEMAND

The challenge of feeding the world population will grow more urgent in the decades ahead. The global demand for agricultural products will rise sharply, although estimates vary. Three variables play a decisive role in the estimates of increase in demand (Ray et al. 2013): (1) demographic trends; (2) changing consumption patterns; and (3) competition from alternative purposes of crops.

First, the demographic trends. The world population is likely to grow significantly in the coming decades. The United Nations had projected an increase of up to 9.1 billion by 2050. In 2013, it adjusted its estimate to 9.6 billion in 2050 and 10.9 billion in 2100 (UN 2013). We must be cautious about such long-term estimates, however. The UN has also published alternative scenarios in which the world population ultimately declines (8.3 billion in 2050 to 6.8 billion in 2100) or experiences even stronger growth (10.9 billion in 2050 to 16.6 billion in 2100) (ibid.: 2). Then there are forecasts by other organisations based on other premises and assumptions (see Even et al. 2011 for a number of examples).

Second, global rises in prosperity and urbanisation are expected to drive up the demand for food. Various studies predict that by 2050, around 70 percent of the world population will live in cities or 'megacities' (FAO 2009a; Satterthwaite et al. 2010). An increase in prosperity is mainly expected in Asia, Africa and South America. As we indicated briefly in the previous chapter, increases in prosperity and urbanisation impact the demand for food. Greater prosperity initially triggers a rise in the number of calories consumed per capita (expansion phase), followed by a shift to different types of food, i.e. animal products (substitution phase) (Kearney et al. 2010; cf. Chapter 2). Whether this pattern will repeat itself in every culture is open to debate, however (Even et al. 2011; Foresight 2011: 14).

A shift in demand from vegetable to animal products will drive up the demand for crops for animal feed. Important crops like maize, soy, grains are already being used on a large scale to produce animal feed, in addition to their consumption by humans. In the EU, two thirds of all farmland is devoted to feed production. Every day, it takes 3 kg of feed to supply European consumers with 0.1 kg of meat and 0.8 kg of dairy (PBL 2011: 12). In terms of resource use, the conversion of plants into meat is inefficient. It is true that some of the crops (e.g. grass) used as feed are unfit

for human consumption, but grass accounts for less than 50 percent according to estimates by the Netherlands Environmental Assessment Agency (PBL 2011:23). Moreover, some grassland could be used to cultivate crops that *are* fit for human consumption. If the substitution effect continues and world meat consumption increases, substantially more land would be required for dairy and meat production.

Third, the future will bring more ‘competition’ between different purposes for crops (EC SCAR 2011; Hallström et al. 2011). Agricultural crops are increasingly being used to produce biofuel and as a raw material for chemicals. In the USA and the EU, petroleum and diesel are mixed with biofuel to reduce the consumption of fossil fuels. Germany generates energy from green maize. The current generation of biofuels uses agricultural crops that are also suitable for human consumption or animal feed. The demand for biomass is forecasted to grow in the future. The development of ‘second-generation’ biofuels from agricultural and forestry residues and non-food crops could help mitigate the ‘food versus fuel’ dilemma (EC SCAR 2011: 68). However, the necessary conversion technologies are still in the R&D phase and they will require substantial additional investments (EC SCAR 2011: 124).

The growing world population, changing patterns of consumption, and competition between different purposes of crop production will drive up the demand for food significantly. Given the various uncertainties, it is not surprising that estimates of the necessary production increases differ considerably. Some studies assert that global food production must rise by 70 percent by 2050 to meet demand (FAO 2009b; FAO 2010b; IFPRI 2010; EC SCAR 2011). Berkhout (2009) argues that a doubling of vegetable production is needed to feed the world population in 2050. Other researchers have suggested a growth interval of 50 to 70 percent (between 2010 and 2050; PBL 2013a). Based on a number of studies, Ray et al. (2013) propose an even larger interval of 60 to 100 percent. Although the estimates vary and the necessary increase in production is impossible to calculate exactly, all available estimates point to the need for a considerable rise in production.

The spectacular growth in agricultural productivity over the past century made it possible to limit the amount of land required to produce food, even as production increased (ESF-COST 2009). Initially, that put substantial pressure on the local environment. Owing to a combination of legislation, regulations and better production methods, the impact on the environment has decreased in developed countries. Precision agriculture has made it possible to determine more precisely how much input (irrigation, manure, fertiliser and pesticides) is needed to cultivate crops, sparing scarce raw materials and reducing the stresses on the

environment. Nevertheless, even countries that have access to advanced agricultural techniques are confronted with degradation of fertile agricultural land and with environmental pollution linked to agriculture.

To raise worldwide production, one can either expand the acreage of fertile farmland and/or increase crop yields per hectare. The possibility of increasing farm acreage, however, is limited. Food production already claims approximately 37 percent of the earth's land surface (EC SCAR 2011: 30). Intensive use has degraded a significant share (32 percent) of that land (FAO 2011), and the remainder is often inaccessible or less suitable for farming. In addition, agriculture often has to compete with housing, commercial activity, leisure pursuits and nature conservation for the acreage that is accessible (OECD/FAO 2012: 53). It is unrealistic, then, to expect a substantial expansion of the amount of farm acreage (Berkhout 2009). The necessary rise in production will thus mainly have to come from a further increase in productivity.

Agricultural productivity has improved dramatically over the past century, but experts doubt whether equally spectacular improvements will be possible in the decades ahead. Since the mid-1990s, productivity growth in the developed world has slowed compared to the previous period (Alston et al. 2009). It has in fact been declining for some time for certain key crops. For example, productivity growth in important grains (wheat, maize, rice) has fallen from about 3 percent in 1965 to 1.5 percent in 2000 (ibid.). Based on projections, Ray et al. (2013) conclude that productivity growth in four major crops – maize, rice, wheat and soy – will lag behind what they assume is a necessary increase in food production.

The increase in production will, moreover, have to be achieved at the same time as food production begins to experience the limits of its ecological sustainability (FAO 2006; Foresight 2011; IAASTD 2009; IFPRI 2010; OECD/FAO 2011). The Rabobank is crystal clear about the challenge ahead: in the next forty to fifty years, the agri-food sector will have to double the agricultural production, while dealing with about half the resource base of land, water and minerals currently available (Rabobank 2011:46).

### **3.2.2 RAW MATERIALS AND NATURAL RESOURCES**

It is doubtful whether there will be enough raw materials and natural resources available to support the necessary production growth. Various studies predict that some raw materials and natural resources essential to agriculture – specifically fresh water, phosphate and fossil fuels – will become scarce in the longer term (FAO 2006; 2011; Foresight 2011; EC SCAR 2011). To discuss the issue, it is useful to distinguish between scarcity of non-renewable resources and scarcity of resources that are renewable, provided exploitation remains within limits and exhaustion is prevented.

Phosphate is an essential nutrient element for crop growth and therefore crucial for food production (Cordell et al. 2009; Smit et al. 2009). In agriculture, fertilisers are major providers of phosphate to crops. Phosphate is mined for that reason. There are only a few places in the world with recoverable phosphate deposits (Morocco, China, USA), and they are slowly being depleted. Estimates of how long this will take diverge. Some studies estimate that natural deposits will be exhausted in 50 to 100 years (e.g. Cordell et al. 2009), while others say it will take longer (the Netherlands Environmental Assessment Agency estimates about 125 years; PBL 2010). A considerable share of the phosphate used in agriculture disappears into the groundwater and ultimately flows into the sea, where it is no longer recoverable. By now, the importance of phosphate recovery for long-term food production has found its way onto the European Union's agenda (European Commission 2011).

Fresh water is of great importance to food production. A significant part of the increase in agricultural production over the past fifty years, can be attributed to proper irrigation. The same period saw a doubling of irrigated acreage worldwide. The FAO (2006) has estimated that agriculture was responsible for 70 percent of worldwide water consumption in 2000; it was also responsible for 93 percent of water depletion (i.e. lower groundwater levels, depleted reserves and diminished water quality). The supply of fresh water is not unlimited and it is unevenly distributed around the world. The availability of sufficient water is an important concern (FAO 2006: 126-127). Rosegrant et al. (2009) assert that the demand for fresh water will increase in the future, both for food production and for other purposes. At the same time, supplies of fresh water are under pressure from pollution and the non-sustainable use of groundwater. On top of this, both the population and food production are expected to increase most in regions where the water supply is under pressure (FAO 2006: 126).

Energy is another crucial component of food production. At present, the food supply system depends heavily on energy derived from fossil fuels (EC SCAR 2011). Fossil fuels play a major role in the production of fertiliser and pesticides. They are also needed to operate the vehicles and machinery used in the production, processing and distribution of food. Because fossil fuels are used in the production of fertiliser, the price of oil has a considerable impact on the price of food (Pfeiffer 2006; IFPRI 2008; OECD/FAO 2012: 15). Various studies emphasise that the expected scarcity of fossil fuels could have a major influence on food production (EC SCAR 2011). That scarcity is of course also a point of concern beyond the domain of food production. However, alternative sources of energy (wind power, hydropower and solar energy) cannot offset the demand for fossil fuels for fertiliser and pesticide production. And, as noted above, biofuel as an alternative source of energy competes with food production.

The increase in production thus depends on a number of scarce resources whose reserves are often unknown or hard to estimate. It is also unclear how technological, political and economic factors will affect our future use of these resources. These factors combined make it difficult to make a firm statement about the potential for an increase in production. What is clear, however, is that these issues are highly relevant when it comes to our ability to produce enough food in the future.

### **3.2.3 CLIMATE CHANGE AND BIODIVERSITY LOSS**

The challenges become even more pressing if we take into account the effects of climate change and biodiversity loss in our projections concerning land use, productivity increases, and the availability of raw materials.

Climate change will affect food production in a number of ways (FAO 2009b; PBL 2010; IFPRI 2010). First of all, desertification and soil erosion may take place and water cycles may be disrupted, leading to local water shortages. A rise of the sea level may affect food production as well, for example owing to flooding or salinisation of the soil. Climate change is also expected to lead to more extremes in weather, like drought or heavy rainfall, making harvests more irregular. However, for a few regions climate change could also be beneficial as the rise in the average temperature may turn previously non-arable land into land suitable for cultivation.

The decline in biodiversity poses a risk to productivity. Production may be impeded by changes in ecosystems brought about by a decline in biodiversity. This could result in reduced resistance to new pathogens, weeds and pests (UNEP 2009). Biodiversity loss also makes production more vulnerable to the impact of climate change. Another effect is that agricultural production becomes more susceptible to changes in the price of energy, water and fertiliser, because the crop varieties that are traded internationally tend to depend heavily on these resources (EC SCAR 2011: 58). The effects of biodiversity reduction are difficult to predict, however. Ecosystems can suddenly arrive at a tipping point after a long period of (dynamic) stability. Such tipping points are hard to foresee and are often not factored into ecosystem modelling (PBL 2010: 26-27).

Climate change and biodiversity loss thus pose potential threats to food production. At the same time food production itself also contributes to these global problems. The food system is responsible for a substantial part of the world's greenhouse gas emissions and it that way contributes to climate change (FAO 2006); Foresight (2011) estimates that it is responsible for about 30 percent of these emissions. The biggest source of greenhouse gas emissions in the food system (measured in carbon dioxide equivalent) is land conversion (deforestation). Livestock farming is a significant contributor because of deforestation for feed crop cultivation and of the emission of methane. The Netherlands Environmental Assessment

Agency estimates the contribution to global greenhouse gas emissions of livestock production at approximately 12 percent (PBL 2011: 51), while the FAO puts it at 18 percent (2006: xxi).

Food production also has a major impact on regional biodiversity, both directly and indirectly (as a result of climate change). This concerns both a decline in genetic diversity as well as a loss of ecosystem and species diversity. The main causes are the conversion of natural systems into farm acreage, the expansion of infrastructure, overexploitation, environmental factors (nitrogen, climate change) and the introduction of exotic species (PBL 2010: 24). The effects of such loss are difficult to quantify.

The main threats are in the tropics, where deforestation takes place for agricultural production (FAO 2013c). Biodiversity is also declining within agriculture itself. Of the tens of thousands of edible plant species, only a few hundred are actually being cultivated. The vast majority of calories that people consume, come from rice, maize and wheat (Loftas 1995).

Because the international markets concentrate on a limited number of animal breeds and plant varieties and marginalise local breeds and varieties, genetic biodiversity is on the wane (EC SCAR 2011: 58; Khoury et al. 2014). There is also little diversity in the livestock sector; breeders tend to work with only a few breeds of each animal (Taskforce Biodiversiteit 2012:58). The decline in marine biodiversity is a point of serious concern. Two thirds of the biomass of top predatory fishes has disappeared over the past fifty years (Christensen et al. 2003). It is estimated that approximately half of fish stocks are already fully exploited. Most of the ten species most popular in fishery have been overfished. This is one of the impacts of industrialized fishing fleets, which affect the ocean floor and therefore the habitats of species, and which discard bycatch dead or dying (FAO 2013c: 48). Aquaculture does not automatically help to limit the loss of marine biodiversity. Because consumers prefer predatory species like salmon, large quantities of smaller fish are being caught to feed the cultured fish.

#### **3.2.4 FOOD WASTE**

The final factor to consider is waste. The FAO (2013c) estimates that a third of food produced for human consumption is lost or wasted. In poorer countries, a large amount of food is lost, for example because producers lack the infrastructure and organisation to ship it to buyers in time (Gustavsson 2011). In richer countries, food is wasted due to production surpluses, losses during processing, the removal of products from shops after their sell-by date, and disposal by households. Of course, when there is less wastage and loss, less food needs to be produced.

It should be noted that waste prevention might well reduce the problems associated with each of the ecological issues described above. Food that is wasted still requires raw materials for its production and therefore puts pressure on the environment, the climate and biodiversity. Worldwide food losses represented twice the amount of greenhouse gases emitted by all road traffic in the USA in 2010. Although harder to quantify, food losses also contribute to biodiversity reduction (FAO 2013c: 47 ff.).

### **3.3 PUBLIC HEALTH**

The second significant food-related concern is public health. Public health risks can arise in different places in the food supply chain, from primary production to consumption.

#### **3.3.1 PUBLIC HEALTH RISKS IN PRIMARY PRODUCTION**

Around agriculture, specific risks to public health can arise. It mainly concerns toxic pesticides and animal diseases that are dispersed by air or spread after direct contact with animals, leading to (sometimes fatal) illnesses in humans. Diseases that can be transmitted from animals to humans (and that may spread further owing to human-to-human contact) are known as zoonoses or zoonotic diseases. According to research by the International Livestock Research Institute (2012), thirteen zoonoses are responsible for an annual 2.4 billion cases of illness and 2.2 million deaths. The risk is greatest in countries like India, Nigeria and Ethiopia, where large numbers of people depend on livestock farming and thus come into daily contact with livestock. The risks of zoonoses will increase in the future (Grace et al. 2012; RIVM 2010), because the production of animal products is expected to increase sharply in Latin America, Asia and Africa (OECD/FAO 2013). That production will take place in industrial livestock farms, but also in smaller enterprises that are often located close to or even within densely populated areas and rapidly growing cities. Because of inadequate regulatory oversight of these enterprises, the health risks are substantial (Roberts 2009). Due to the intensity of international traffic, outbreaks of zoonoses could rapidly turn into epidemics or even a pandemic. International vigilance is therefore advised, and is organised by the World Health Organisation (WHO). But weak monitoring and national (export) interests that rapidly come into play when an outbreak is made public, can impede early detection and the introduction of appropriate measures (Arie 2014).

## Antibiotics resistance

The dangers of contamination by animal pathogens increase because of antibiotic resistance. Such resistance is associated with the widespread use of antibiotics in livestock farming. Animals and people that have contracted a drug-resistant strain of bacteria are more difficult – and in some cases impossible – to treat with antibiotics. The risk of antibiotic-resistant bacteria being transmitted from animal to humans is expected to increase (PBL 2013a: 56).

Antibiotics use is especially prevalent in the intensive livestock farming sector that breeds animals for consumption (Kornalijnslijper 2008: 7). Antibiotics are commonly used here because, in the short run, they offer a quick, effective and inexpensive mean of preventing, curing or masking diseases among animal stocks that are prevalent in situations of large numbers of animals being crowded together or transported over long distances – circumstances in which bacteria thrive.

### 3.3.2 PUBLIC HEALTH AND FOOD SAFETY

Food is safer than ever (in the wealthier countries), but due to the internationalisation of food markets and the greater complexity and length of the production and trade chains, food safety concerns rise again. Such concerns were initially sparked by the BSE crisis, when it became clear that the food safety authorities had insufficient oversight of international movements of livestock, meat, and offal products (Oosterveer 2005). Food can become contaminated at any point in the chain.

Contamination can occur in the processing industry (for example in abattoirs and deboning plants) and in the food industry. This not only concerns accidental contamination by microorganisms (e.g. listeria and salmonella) and contaminants (for example from crop protection products). Also substances that the food industry adds to food to enhance its flavour (additives) and to extend its shelf life (preservatives) can be harmful to health if consumed in large quantities. For this reason, their use is regulated.

The complexity of contemporary production and trade chains does not only increase the challenge for food safety authorities to trace unintentional contamination. It also generates more opportunities for food fraud. Food fraud is, of course, nothing new. For long, to fight food fraud local and national authorities have issued detailed regulations (Harcourt 2011). When fraud is committed, it is unclear what ingredients a food product contains. Somewhere along the chain, cheaper additives have been used instead of more expensive but safer ones. Or perhaps more expensive ingredients have been mixed with cheaper ones without buyers, consumers or regulators – who at most can test random samples – noticing. There is evidence that organised food crime is on the rise. Investigative authorities and regulators currently have little knowledge about its scale and how to tackle

this crime effectively (Elliott 2013). Not only is food fraud a public health risk, it also poses a threat to the ecology and living environment, the stability of markets, and consumer confidence in general (Gussow and Kuiper 2014).

### 3.3.3 HEALTH RISKS RELATED TO CONSUMPTION

Besides food contamination, there are other public health concerns. Even a diet that is free of contamination can pose a danger when it contains too little or too much of a certain nutrient.

When their daily diet pattern leads to a systematic shortage of energy intake, people become malnourished. As noted before, one person in eight suffers from malnourishment, specifically in developing countries. Malnourishment not only leads to acute hunger; it also stunts growth and permanently damages cognitive and physical development. A healthy diet also requires the consumption of a sufficient quantity of essential micronutrients (vitamins or minerals, such as vitamin A, iron, iodine, zinc, selenium and vitamin B12). A lack of micronutrients can lead to severe health problems. For example, vitamin A deficiency is the leading cause of childhood blindness (FAO 2013a: 15). About two billion people worldwide suffer from a deficient in one or more micronutrients. The health-related problems that ensue have both personal and social consequences. The FAO (2013d: 16) estimates that 166 million Disability-Adjusted Life Years (DALYs) are lost every year to malnourishment and micronutrient deficiencies.<sup>2</sup> These health problems also have an economic impact, due to productivity losses and health care costs.

On the other end of the spectrum are those whose daily dietary pattern has them consuming too many calories and too much of certain ingredients (sugar, salt and unhealthy fats). This pattern leads to overweight and, in more extreme cases, to obesity, with a higher risk of cardiovascular diseases, diabetes type 2 and certain types of cancer. The ingredients listed above are consumed mainly in the form of processed products and beverages. This is encouraged by an environment in which the temptation to consume convenience food is constant and ubiquitous.

The number of people who are overweight or obese is rising rapidly (Stevens et al. 2012). The WHO (2013) estimates that in 2008, approximately 1.4 billion adults worldwide were overweight, 500 million of which were obese. Between 1980 and 2008, the percentage of overweight individuals rose from 24 to 34 percent of the adult world population. The rise in obesity was even sharper, from 6 to 12 percent. More recent studies quote even higher figures and estimate that the worldwide number of overweight or obese people was 2.1 billion in 2013 (Ng et al. 2014). The same authors estimate that in 2010, 3.4 million people died prematurely due to the consequences of overweight and obesity.

There are differences between regions, however. The problem is widespread in the United States and Mexico, where 70 percent of the adult population is overweight, and more than 30 percent obese. Given the prevalence of childhood obesity and overweight, the problem is likely to further increase in the future. The FAO (2013a: 16) estimates that an annual 94 million DALYs are lost owing to overweight and obesity among adults. Overweight and obesity also lead to an economic loss, due to health care costs and productivity losses. If the global trend to follow a more Western dietary pattern continues, the problem is likely to increase. Ng et al. (2014) observe that there are scarcely any examples of countries in which the number of overweight people is stable or decreasing.

### 3.4 ROBUSTNESS

The robustness of the food supply system is the third matter of concern identified by the international literature. A system is robust when it continues to function properly both in case of severe shocks, and under a variety of conditions. Can the food system cope with such shocks and changing conditions?

Shocks that might disrupt the food system may vary in nature. They can occur because natural disasters, such as long-term drought, storms and flooding, hit agriculture. As the world will experience higher temperatures, more extreme weather and rising sea levels due to climate change, the frequency of such shocks is likely to increase (Zselezky and Yosef 2014). Also a shortage of resources or an outbreak of animal or plant disease can send a serious shock through the system. In addition, incidents external to the food system can cause shocks. For example, a volcanic eruption that disrupts air traffic across a wide region can block the supply of certain products. Also large-scale technical crises, such as ICT malfunction, can have far-reaching consequences. Due to the international interconnectedness of activities and trade flows, regional or local shocks can have repercussions far beyond the region. None of these shocks can be predicted with any precision. However, the food crises of 2007-2008 and 2010 showed that shocks can occur, with unexpected, far-reaching consequences.

#### Volatility of food prices

After years of relative stability, food prices have become more volatile in the past decade. The prices of agricultural products rose sharply in 2007-2008 and again in 2010-2011 (Figure 3.1). The International Food Policy Research Institute (IFPRI 2010) identified the main causes of the 2008 price hike as the rise in energy prices, the growing demand for biofuel, the devaluation of the dollar, and drastic changes in weather conditions (persistent drought) that had led to failed harvests. In addition, it appears that shrinking global reserves have played a role – but on this

matter only limited and unreliable information is available. In public debates it has been suggested that speculation in food markets has also contributed to the price hike. It is difficult, however, to prove that this did in fact play a role.

**Figure 3.1 Global food prices by month**



Source: FAO food price index

The way in which actors in the food system react to shocks further increases the risks. If harvests fail, countries that are normally major exporters of agricultural products may decide to close their borders to employ the production solely for domestic use. That is what Russia did with grain when its harvest failed in 2008 (Headey and Fan 2010: 47). Conversely, countries may decide to ban imports of foods in the face of a major food safety crisis or an outbreak of plant or animal diseases or zoonoses elsewhere. Because food is of primary importance, when major problems arise, governments will be inclined to put their national interests before international trade agreements.

Given the expected future shortages of resources and the rising demand for food, various countries are already taking steps to secure their food supply in the long term. They are creating strategic stocks of raw materials, purchase farmland elsewhere, or conclude long-term bilateral contracts for the supply of resources or semi-finished products (SER 2012: 56). The future scarcity of raw materials and natural resources has thus taken on a geopolitical dimension (HCSS 2013).

China, for example, is investing heavily in food production in Africa, a trend that the World Bank (2011) believes is likely to continue. Qatar is building a port in Kenya, in return for acreage. European companies are also active in this regard, mainly by establishing palm oil and sugar cane plantations. Thousands of hectares of land are involved according to estimates, mainly in Africa (Berkhout 2009: 27). Precise figures are unknown, however, because most of the agreements are not made public. IFPRI (2010) estimates the total volume of land purchases at 15 to 20 million hectares; the World Bank's (2011) estimate is 57 million hectares; and the International Land Coalition, an NGO, has calculated that almost 80 million hectares have been up for negotiation with foreign investors, with more than half of this land being located in Africa. That is more than the total agricultural land of the United Kingdom, France, Germany and Italy combined (*The Economist*, 5 May 2011).

Actors' responses to shocks can therefore increase the stresses on the food system. This applies not only to the authorities, but also to businesses. The concentration of enterprises in certain food market segments does raise the question whether some of these corporations are not becoming – by analogy with the financial sector – ‘too big to fail’. Further concentration is to be expected, partly as a reaction to the scarcity of raw materials. Financial institutions and international consultancy firms have advised the business sector to prepare itself for the impending scarcity (ING 2012; McKinsey 2011; KPMG 2012). Although boom and bust cycles are nothing new in the food and agribusiness, Rabobank (2011) writes that “this time things really are different. We are moving into an era of scarcity, with higher prices and increased volatility [as] the new standard for a more globalised food industry” (Rabobank 2011: 3). In the transition to a period of scarcity, the coming decades will be dominated by a “battle for raw materials” and a “battle for agri-commodity supply” (Rabobank 2011: 46). Companies are therefore advised to adapt their strategies accordingly. Corporations that operate internationally are advised to buy up agricultural land and suppliers, or use their market power to keep production chains in line so that they can ensure themselves of direct access to the necessary raw materials and processed intermediate products. Although these strategies may serve specific corporations, they can put pressure on the robustness of the food system as a whole.

### 3.5 CONCLUSIONS

In recent decades, agricultural productivity has increased impressively. The availability of food seemed more or less certain to large parts of the world. The food crises of 2007-2008 and 2010 and the FAO's warning that in the coming decades food production will need to rise by 70 percent, however, have put food firmly back on the international agenda. Although the FAO's forecast is anything but certain, we do know that the global food system will be facing major challenges in the decades

ahead. The world will have to come up with solutions to various persistent problems, covered in this chapter under three headings: problems related to ecological sustainability; problems related to public health, and problems related to the vulnerability of the global food system to a variety of shocks.

Some of the problems discussed here have already materialised, while others will make themselves felt in the longer term. We do not have a crystal ball that tells us when, where and to what extent these problems will arise. Projections – for example for population growth, urbanisation, changing dietary patterns, raw materials reserves, and the availability of natural resources – are, as yet, uncertain. The many interactions that are involved in food production has turned the food system into a complex system; one that can have unpredictable effects and can set off unexpected changes. Moreover, geopolitical developments are hard to predict accurately. The severity of the problems we have outlined depends on how much trust we put in technology for solutions and alternatives, on whether timely institutional changes and investments will be put into place, on whether market signals will force businesses to adjust their strategies on time, and on unpredictable political, social and cultural developments.

In the past few decades, the emphasis has been on increasing productivity in the primary sector. Inarguably, that strategy has led to important improvements in global food security. To meet the rising global demand for food, future productivity increases will be necessary, but this cannot be the only answer to the problems that present themselves around the world. Questions about ecological sustainability will require strategic adjustments. In addition, higher productivity does not address other issues, like those related to public health. Neither does it offer a solution when a food system is vulnerable to shocks and cannot timely adapt to changing circumstances. The following chapter will look at how the global challenges affect the Netherlands.

## NOTES

- 1 The main reports used in this study are Bindraban and Rabbinge 2012; Cabinet Office Strategy Unit 2008; ESF-COST 2011; FAO 2006, 2009b, 2012, 2013a; Foresight 2011; IFPRI 2010; ING 2012; KPMG 2012; Lang et al. 2009; McKinsey 2011; OECD-FAO 2011, 2012, 2013; Oxfam 2011; PBL 2012a; PBL 2013a; Rabobank 2011; EC SCAR 2011.
- 2 'The burden of disease is expressed in DALYS (Disability-Adjusted Life Years), a concept developed by the WHO. The number of DALYS is the number of years of healthy life that a population loses to disease. Using DALYS, it becomes possible to compare the influence of different diseases on public health. Four important factors are used to calculate DALYS: the number of people suffering from the disease, the seriousness of the disease, the number of deaths that it causes, and the age at which death occurs' (Gommer 2014, translated).



## **4 THE DUTCH HUB**

### **4.1 INTRODUCTION**

The Netherlands may be called a ‘food country’ for good reasons. It is renowned for its highly productive agricultural sector and it has various agri-food companies that play important roles on the international stage. The country houses a number of renowned agricultural and biotechnical research institutions. Furthermore, as an important producer, importer, processor and distributor of agri-food products, the Netherlands serves as a main hub in the global agri-food network.

This chapter starts by looking at the Netherlands through the prism of the trends described in Chapter 2 (section 4.2). Its leading position in food and its close relationship with other countries entail vulnerabilities, responsibilities and opportunities related to the issues discussed in Chapter 3: ecological sustainability, public health and robustness. We will discuss these in section 4.3 and conclude the chapter in section 4.4.

### **4.2 A FOOD COUNTRY**

Food occupies a prominent and visible place in Dutch society. It is a basic need, it is an important factor in public health, and it makes a significant contribution to the economy. As a whole, the Dutch agri-food sector (agriculture, processing industry, food industry together with suppliers, retail, distribution and foodservice) accounts for 10 percent of the Dutch economy and employment (Van Leeuwen et al. 2014: 48). Agriculture is still a visually prominent factor in the appearance of the Dutch landscape. Although farm acreage has contracted somewhat in recent decades, from approximately 25,000 square kilometres in 1950 to about 22,600 square kilometres in 2010 (CBS), 55 percent of the Netherlands’ surface area is still used for agricultural purposes (see Figure 4.1). Of all cultivated land, 53 percent is pasture, 29 percent is arable land, 13 percent is used for green fodder, and 5 percent for horticulture (Berkhout and Roza 2012).

**Figure 4.1** Surface area of the Netherlands by land use (2010)Netherlands 41 543 km<sup>2</sup>

Source: Statistics Netherlands (CBS)

The Netherlands is a frontrunner when it comes to the rationalisation and modernisation of agriculture and food production. Dutch agriculture has undergone far-reaching intensification thanks to scaling up production, specialisation, mechanisation and the industrialisation of the primary production process. Also in other respects, the trends in the Netherlands correspond with the developments discussed in Chapter 2. Trade in agricultural products has become increasingly important to the Netherlands. Non-agricultural activities – food transport, distribution, processing, packaging and sales – have increased too. And finally, also consumption patterns in the Netherlands have changed significantly in recent decades, with the Dutch population consuming more animal products and processed consumer goods. We will look at these trends in more detail below.

#### 4.2.1 INDUSTRIALISATION OF AGRICULTURE

The Netherlands has played a pioneering role in agricultural industrialisation, a process that spread to large parts of the globe. In the post-war decades, agriculture became increasingly mechanised, larger in scale, and more specialised, considerably altering its nature in the process. After the Second World War, Dutch farmers quickly began using tractors and milking machines. By the 1960s, they were using combines to harvest most of their grain crops (Bieleman 2008: 464-466). Automation started becoming widespread in the 1980s. IT and automation rationalised agriculture even more. The farms of former times gradually developed into the high-tech enterprises of today (Coolman 2002).

The use of fertilisers increased from 160 million kg per year in the early 1950s to 500 million kg in the mid-1980s. Although these volumes have declined since then, Dutch farmers still use fertilisers on a large scale. The use of pesticides and concentrated feed also rose (Bieleman 2008: 466). The Netherlands has a higher surplus of nitrogen per hectare of farmland than other EU Member States (Eurostat 2011: 54).

The transformation of agriculture has led to significant productivity increases. Since the early 1980s, the volume of production per hectare has increased approximately fivefold (Van Bruchem and Silvis 2008: 57). The production per worker and per animal has also increased (De Bont et al. 2007: 18).

At the same time, agricultural enterprises have become larger. The average number of hectares per farm rose, whereas the number of farms fell from 410,000 in 1950 to 72,000 in 2010. The number of animals per farm increased simultaneously; between 1960 and 2010, the average number of pigs rose from 20 to 1,751, the average number of chickens from 213 to more than 46,326, and the average number of cows from 18 to 120 (CBS). These are nationwide averages per farm, but there are outliers as well. A number of industrial farms have much higher numbers of animals (see the insert).

In addition, Dutch farms began to specialise. Starting in the 1960s, they began to focus on one or two products. Mixed farms gave way to specialist dairy, pig and chicken farms (Bieleman 2008).

#### 'Factory farms'

A fierce public debate has waged in the Netherlands in recent years about industrial livestock farms that keep a very large number of animals compared to the average, in Dutch called '*mega-stallen*' (mega stables) (Commissie Alders 2011). The unit often used to indicate the size of Dutch

livestock farms is the NGE (Dutch Size Unit), a measure of the economic scale of an agricultural enterprise. A distinction is usually made between mega-sites and mega-businesses. Mega-sites are sites of at least 300 NGEs. When converted to animal units, this means: 7,500 fattening pigs, 1,200 breeding pigs, 120,000 laying hens, 220,000 broilers (chickens kept for meat production), 120 dairy cows or 2,500 veal calves (Gies et al. 2007; Van der Peet et al. 2008; Van Os and Gies 2011). Mega-businesses are farming businesses that do not necessarily keep all their animals at a single site. Van Os and Gies (2011) estimate that in 2009, the Netherlands had 660 farming businesses of at least 300 NGE, with an average size of 465 NGE; back in 2000, the corresponding number was 334. Almost three quarters of these businesses are active at a single site. According to these calculations, then, the Netherlands had just under 500 mega-sites in 2009.

At the same time as productivity rose, the number of people working in agriculture declined from more than 500,000 in 1950 to less than 200,000 in 2013 (Van Bruchem and Silvis 2008: 51; CBS). Agriculture and horticulture have also come to depend more on part-time workers (Van Bruchem and Silvis 2008: 53). The total number of hours worked in agriculture fell by almost 75 percent between 1950 and 2005 (*ibid*: 54).

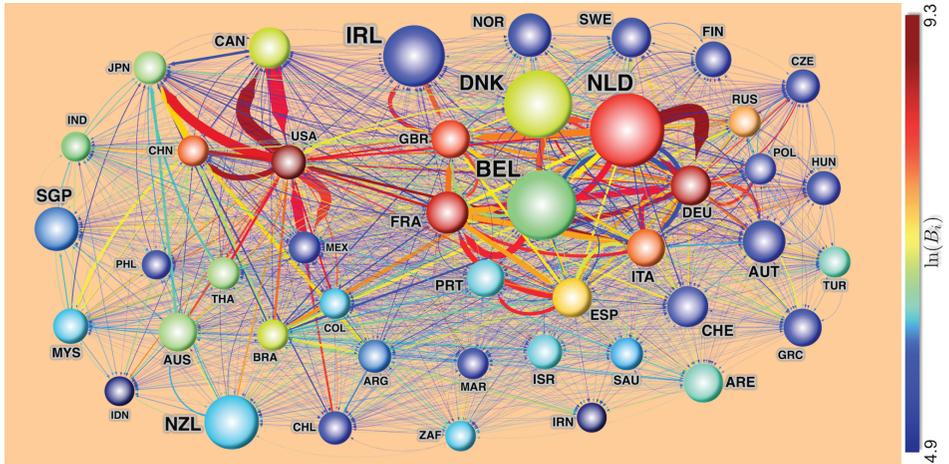
As elsewhere, there is more to the Dutch story of agriculture than large-scale industrialisation. There are organic farms here as well, which avoid using chemical fertilizers and pesticides. However, the Netherlands is among the EU Member States with the smallest percentage of organic farmland. In 2011, approximately 47,000 hectares, or less than two percent of its total farm acreage, could be classified as organic. That puts the Netherlands ahead of only Malta, Bulgaria, Ireland, Romania and Hungary. Austria has the largest percentage of organic farmland, approximately 19 percent (EU DG Agriculture and Rural Development 2013).

#### 4.2.2 THE NETHERLANDS IN THE GLOBAL FOOD SYSTEM

The Netherlands is a trading nation. Trade is important in many areas and sectors, but this is most certainly the case in the food sector. The volume of trade is considerable on both the export and the import side. The Netherlands is one of the world's biggest exporters of agricultural and horticultural products, second only to the United States. A significant part of that export consists of the re-export of imported products, sometimes after light processing. In terms of national agricultural production, the Netherlands comes in twenty-second in the world (PBL 2012a). Approximately 80 percent of its exports go to other countries in Europe, mainly Germany. The Netherlands also has a large volume of imports. In 2011, the Netherlands was the fourth largest importer of food<sup>1</sup> in Europe, after Germany, the United Kingdom and France (Eurostat). Most of the country's

imports come from Europe, with the exception of fruit, which largely arrives from outside the EU (Van der Knijff 2011). Figure 4.2 shows the prominent position of the Netherlands in the global food trade network.

**Figure 4.2 The Netherlands as a node in the global food trade network**

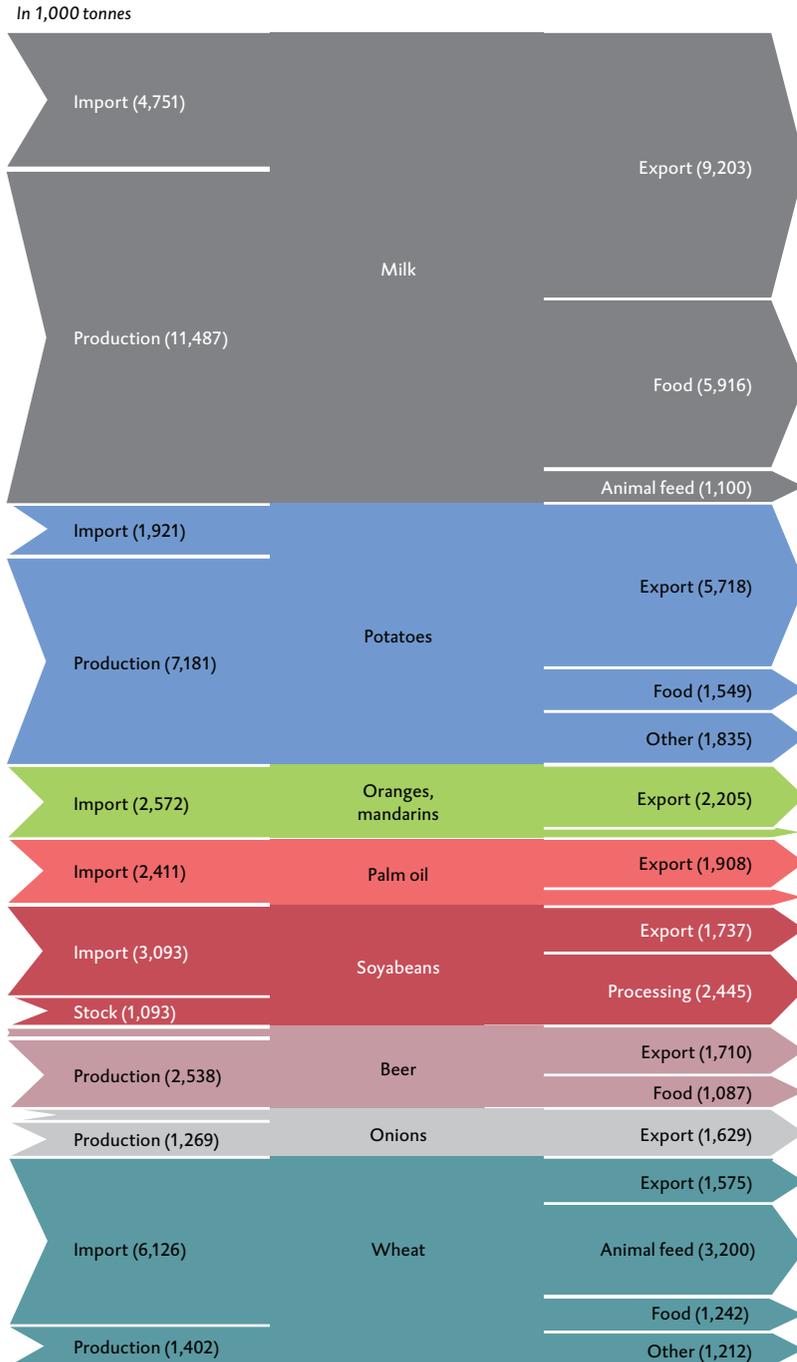


This map of the International Food Trade Network, IFTN, shows the 44 countries that have the highest food trade activity (import + export) and the 300 biggest food trade flows. The figures are from 2007. The structure of the IFTN remained the same between 1998 and 2008.

- The colours of the nodes and the connections (increasing from blue to burgundy) show how important they are for traffic in the network as a whole.
- The size of the nodes is proportionate to the logarithm of their total per capita trade activity (export + import).
- The thickness of the direct connections is proportionate to the logarithm of the trade flow in that direction.

Source: Ercsey-Ravasz et al. 2012

The Netherlands produces, imports, processes, trades and exports raw materials and (intermediate) food products. Part of its import and production is of course intended for human consumption, part is used for animal feed, an important part is (re-)exported. Figure 4.3 shows the connection between those activities for the eight biggest export products. Some export products are mainly produced domestically (such as milk), while for other products (such as oranges and mandarins) the Netherlands is mainly a transit country.

**Figure 4.3 Top eight Dutch export products by origin and destination (2009)**

Source: FAO stat Food Balance

If we consider the categories of the food products that make up Dutch agricultural exports, we see that between 2008 and 2010, 9.5 percent consisted of primary, unprocessed products, 39 percent of processed intermediate products, 17.5 percent of fresh products (end products) and 34 percent of processed consumer goods (end products, non-fresh) (Van Berkum 2012: 3). Compared to the 1995-1997 period, the pattern has not changed much: end products (fresh and non-fresh) have become somewhat more important at the expense of processed intermediate products. In international terms, the Netherlands accounts for a relatively large share of end products and a relatively small share of processed intermediate products (ibid: 2).

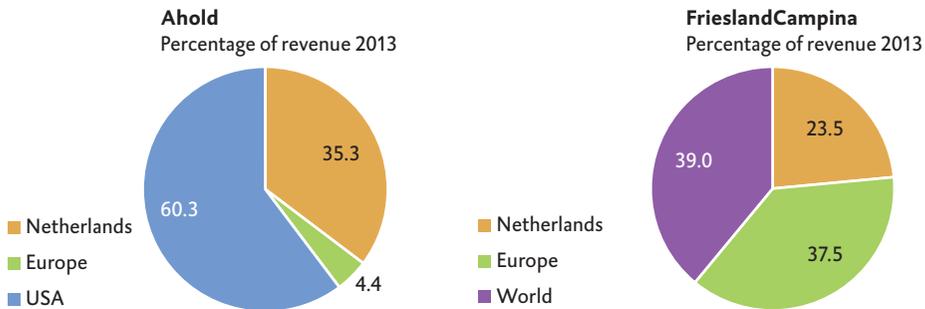
A part of the import flows are destined for direct consumption. Scheer et al. (2011: 14) estimate that approximately 35 percent of Dutch consumption consists of imported foods. That is considerably less than countries like Japan (approx. 60 percent; USDA 2013b) and the UK (approx. 50 percent; Food Standards Agency 2007), but more than the USA (approx. 16 percent; USDA 2013a). Obviously, the share of imported food in domestic consumption differs from one product group to the next. Particularly fish (more than 60 percent) and fruit (more than 80 percent) are mainly imported, the percentage for dairy is considerably smaller (Scheer et al. 2011; see also Van der Knijff et al. 2011). In addition, both Dutch livestock farming and the food industry depend heavily on international supplies (Bijman et al. 2003). The formerly close relationship between Dutch primary production and the Dutch processing and food industry has weakened (Bijman et al. 2003; Van Bruchem and Silvis 2008). About 40 percent of the added value of the agro-food complex (including supply and distribution) was based on foreign raw materials in 2005. In 1970 that was only 18 percent (Van Bruchem and Silvis 2008: 35).

Besides food products, Dutch agri-food businesses also export technical systems and expertise. Although they contribute to the Netherlands' prominence in the worldwide food system, their share in Dutch export is more difficult to quantify, because expertise and technology are not coded separately in trade statistics but embedded in products and services (Van Berkum et al. 2013).

Conforming to the global trend, trade volumes are only part of the Netherlands' international interdependencies. Outbound investment by Dutch companies and inbound investment by foreign companies also contribute. Dutch large food businesses – for example Unilever, Heineken, VION and FrieslandCampina (FoodDrinkEurope 2012: 23) – are very active international players and investors. They earn a significant share of their revenues outside Dutch and even European markets. FrieslandCampina earns 39 percent of its revenue outside Europe, 37.5 percent in other European countries, and 23.5 percent in the Netherlands (FrieslandCampina 2014, see Figure 4.4). Among Dutch supermarket chains, Ahold has been leading in internationalisation, although accounting scandals in the 2000s meant a major set-

back in this regard. In 2011, Ahold was sixteenth in the rankings of global grocery retailers (PlanetRetail 2012); 35 percent of its revenue is earned in the Netherlands, 60 percent in the USA (60 percent) and 4 percent in other European countries (Ahold 2014, Figure 4.4).

**Figure 4.4 Revenue of Dutch businesses at home and abroad**



Sources: Ahold 2014 and FrieslandCampina 2014

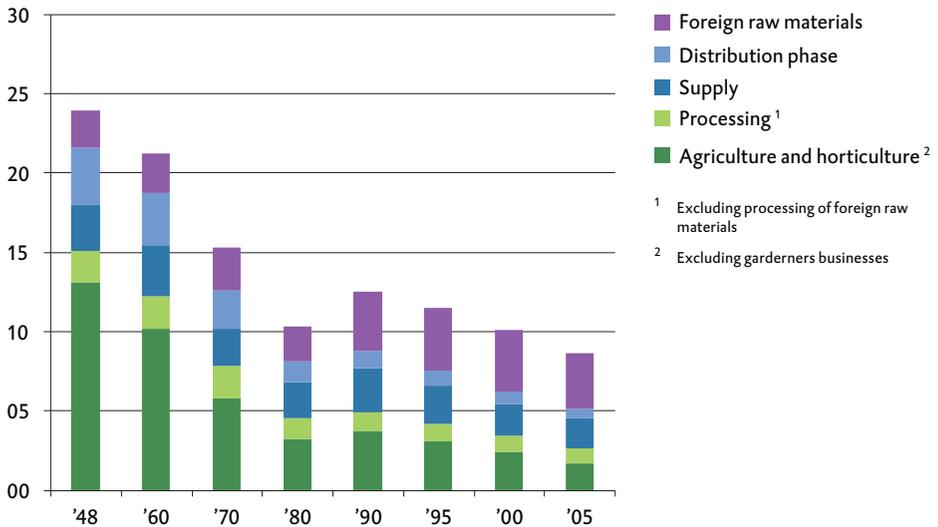
The Netherlands is an important gateway to the EU and, as such, an attractive location for foreign businesses. Foreign direct investment in the Dutch food industry has increased sharply since the 1990s. In 1990, it amounted to little less than 8 billion euros; ten years later, investments had increased fourfold to 30 billion euros (Bijman et al. 2003: 47), and by 2010 foreign direct investment in the food sector had reached 70 billion euros (Van Berkum 2012: 20). Starting in the 1990s, this growth was first fuelled by the United Kingdom (with Dalgety, Hazlewood, United Biscuits and Hillsdown taking over Dutch companies) and then by the USA, when American firms like Archer Daniel Midlands, Sara Lee, Heinz, Cargill and Mars became active in the Netherlands (although the latter two had been active there for quite some time) (Bijman et al. 2003: 47). In the supermarket sector, Aldi and Lidl set up operations in the Netherlands and have now captured 7.5 and 9 percent of the market respectively (Nielsen 2013). In the foodservice sector, McDonald's is far in the lead, followed by Burger King, FEBO and Kentucky Fried Chicken. In the catering sector, Sodexo Nederland (a subsidiary of French company Sodexo) is the market leader, while a subsidiary of the British firm Compass also has a strong presence (Bord Bia 2011: 59-60).

#### 4.2.3 GROWING IMPORTANCE OF NON-AGRICULTURAL PLAYERS

In line with international trends, non-agricultural enterprises in the Netherlands have gained importance relative to agricultural businesses. The share of primary production in the more broadly defined agri-food sector has clearly dwindled, whereas food supply, processing and distribution have gained ground. Around 1950, these three activities were responsible for about 45 percent of the agri-food

sector's contribution to GDP, but today it is about 80 percent (Van Bruchem and Silvis 2008: 18). Besides, the overall agri-food sector's share of GDP has been declining for decades, from about 24 percent in 1948 (ibid.: 18) to 9.8 percent in 2011 (Leeuwen et al. 2013). Its decline has not been linear: there was a sharp drop to 10.4 percent in 1980, a recovery to 12.8 percent in 1990, and a downward trend again to 9.4 percent in 2005 (Berkhout and Roza 2013).

**Figure 4.5 Added value of the agri-food sector in percentage of total economy**



Source: Van Bruchem and Silvis 2008

As in other countries, the Dutch seed and feed industry, processing industry and retail sector have been scaled up and undergone consolidation. These processes have allowed a number of Dutch firms to position themselves firmly in the international markets. On the world market for vegetable seeds, the nine biggest vegetable seed companies have captured 83 percent. Three of these are Dutch (RijkZwaan, Bejo and Enzo), and the remaining six all have Dutch subsidiaries (Louwaars et al. 2009: 23, in SEO 2013: 12). In the domestic dairy industry, FrieslandCampina has a market share of 80 percent (ibid.: 44), and VION a market share of more than 50 percent of the pork slaughter sector (ING Economisch Bureau 2011). The transformation of the food industry in the Netherlands occurred in the 1980s and 1990s, in line with trends in the rest of Europe. National and international acquisitions and mergers led some markets to be highly concentrated. The degree of concentration in the food industry varies from one product group to another, however (Bijman et al. 2003: 45-46). The meat processing industry and the dairy sector – the most important food industry groups in terms of revenue

(Berkhout and Roza 2013: 43) – are highly concentrated. Four Dutch agri-food internationals (Unilever, FrieslandCampina, VION and Heineken) rank in the global top 40 of Food & Beverages firms (Topsector Agro&Food 2011: 29).

Supermarkets have also grown in importance. The Dutch spend about 66 percent of their budget for groceries (the ‘at home’ channel) in supermarkets (Backus et al. 2011: 20). This has had an adverse effect on smaller speciality shops. In the 1990s the ratio of supermarkets to speciality shops was still 60:40 percent (Bijman et al., 2003: 26). The number of small retailers, for example butchers, greengrocers and bakeries, has declined (idem: 18-19).

After many years of acquisitions, three major supermarket buyers have emerged: Albert Heijn, Superunie (buyer for thirteen food retailers) and Jumbo Group. Their market shares are 33, 29 and 21 percent respectively (DistriFood 2014), or 84 percent combined. Aldi and Lidl account for most of the remainder. Similar to elsewhere, Dutch supermarkets have gained greater influence on the food chain by working with detailed contracts, standards and certification and by introducing private labels (which generate an average of almost 30 percent of their revenue; ABN AMRO Economisch Bureau 2013).

#### 4.2.4 CHANGING DIETARY PATTERNS

Consumption patterns in the Netherlands have changed along with the general trend in Western societies. Post-war prosperity added more luxury products to the Dutch diet, such as meat, fruit and vegetables, at the expense of basic foods like bread and potatoes (Van Bruchem and Silvis 2008: 29-30). At a certain point, however, a saturation level is reached and the consumption of animal products stabilises. In the Netherlands, that likely happened sometime in the 1990s (ibid: 29). Consumption of fruit and vegetables declined in the years thereafter, whereas the share of processed products and soft drinks increased (Gezondheidsraad 2002; Van Rossum et al. 2011).

Meanwhile, the way food is consumed and served has also changed. For example, the Dutch used to eat mainly boiled or baked potatoes, but today much of their potato consumption is in the form of fries, crisps, potato croquettes and other snacks (ibid.: 30). Eating out has increased. The Dutch spend approximately 32 percent of their food budget on eating out (food service, food stands) (FoodService Instituut 2012), which is about average for Western Europe (33 percent) (Bord Bia 2011). En route consumption (food purchased at food stands) and fast food meals account for a large share of this, i.e. approximately a third of all money spent on eating out (Bord Bia 2011: 9).

## Focus on convenience

An important trend in food consumption is the focus on convenience (Bijman et al. 2003). The introduction of domestic appliances (refrigerators and microwave ovens) made convenience products such as ready-made meals and ready-to-cook frozen foods available to households (Van Bruchem and Silvis 2008: 31). Rising prosperity, the larger numbers of women in the workforce, and the growing number of single-person households drove the demand for quick and easy food preparation (Bijman et al. 2003: 13-15).

Dutch consumers spend a relatively small proportion – about 15 percent – of their disposable income on food (Bijman et al. 2003; EuroStat 2011; CBS 2012).<sup>2</sup> In 1960 that was 30 percent, and in 1900 about 50 percent (Van Bruchem and Silvis 2008: 32). The precise figures vary depending on whether food service purchases are included. According to Eurostat (2011), the Netherlands, Germany, Luxembourg and Denmark are among the countries that spend the least on food. The EU average is around 22 percent (Eurostat 2011: 145).

## 4.3 VULNERABILITIES OF THE DUTCH FOOD SYSTEM

The Netherlands is both a densely populated, urbanised country and an important agri-food player on the international stage (Faber 2013; PBL 2012a). This position offers economic opportunities and a fertile ground for knowledge generation and innovation. But in addition to opportunities, the Netherlands' prominent position also induces specific vulnerabilities and responsibilities. We consider these below through the prism of the core issues discussed in the previous chapter, i.e. (1) ecological sustainability, (2) public health, and (3) robustness.

### 4.3.1 ECOLOGICAL SUSTAINABILITY

In Chapter 3, we pointed out the threats global environmental problems – such as the scarcity of raw materials, the exhaustion of natural resources like water, climate change, and declining biodiversity – pose to the global food system. These problems will also affect the Netherlands. In addition, the Netherlands has its local environmental problems related to food production.

#### *Raw materials and natural resources*

The 'ecological footprint' – a measure of the environmental impact – is a useful indicator for the ecological impact of food consumption. This includes both land use and the environmental effects of the production and processing of goods consumed by the Dutch, including biodiversity loss, climate change and water shortages. In 2005, the land used to produce all the food, wood and paper consumed by the Dutch amounted to an area three times the surface area of the Netherlands

(Van Oorschot et al. 2012). The land that is needed for forestry, agriculture and livestock farming had the largest share. Most of that land use (more than 85 percent) lay outside the Dutch borders. Per capita land use is around the global average, since mainly intensive agricultural methods are being used to produce the goods consumed (ibid.). The 'depth' of the footprint also plays a role. Because in Dutch diets animal products take up a significant part of consumed food, Dutch food consumption requires a relatively large share of natural resources and leads to high levels of greenhouse gas emissions (PBL 2013a: 34).

As Dutch agriculture is dependent on external inputs (chemicals, fertilisers), a scarcity of raw materials would affect the Netherlands, as it would affect other countries. At the same time, some of the raw materials that are becoming more scarce (phosphate) are leached into the soil and water. We will return to this issue in our discussion of local environmental problems.

### ***Climate change***

While climate change is a global phenomenon, its consequences will differ from region to region and from country to country. Being a northwest river delta bounded by the sea, with a great deal of land below sea level, the Netherlands will be affected in specific ways. The Netherlands Environmental Assessment Agency has modelled the impact of climate change on agriculture and livestock breeding in the Netherlands (PBL 2012b, see Table 4.1). For these sectors, not all of the effects of climate change are negative. A very significant lengthening of the growing season (by five weeks) is especially favourable compared to circumstances a hundred years ago. But there are also negative effects, like salinisation of the soil, and more frequent damage by flooding and drought (see Table 4.1).

The Netherlands is not only vulnerable to the climate change *effects*; its food production and consumption patterns also add to the problem. The production and consumption of meat are a significant contributing factor in that regard. Livestock breeding accounts for 11 percent of greenhouse gas emissions in the Netherlands (PBL 2012a: 131-132).

**Table 4.1** Effects of climate change on Dutch agriculture and livestock breeding

Agriculture and livestock breeding	Observed	Possible future according to KNMI <sup>1</sup> scenarios
Growing season	Five weeks longer than early twentieth century	Further lengthening; opportunities for new crops
CO <sub>2</sub> -concentration	Slight rise in potential yields	Further rise in potential yields if concentration increases
Flooding	Slight increase	More frequent damage
Drought	No trend	More frequent damage
Salinisation	More frequent damage. Agriculture can still cope and adapt to some extent	Continuing change. Especially challenging in dry years
Diseases/pests	No trend, relationships still uncertain	Possible increase in frequency, especially with higher humidity and temperatures; considerable uncertainty at this point

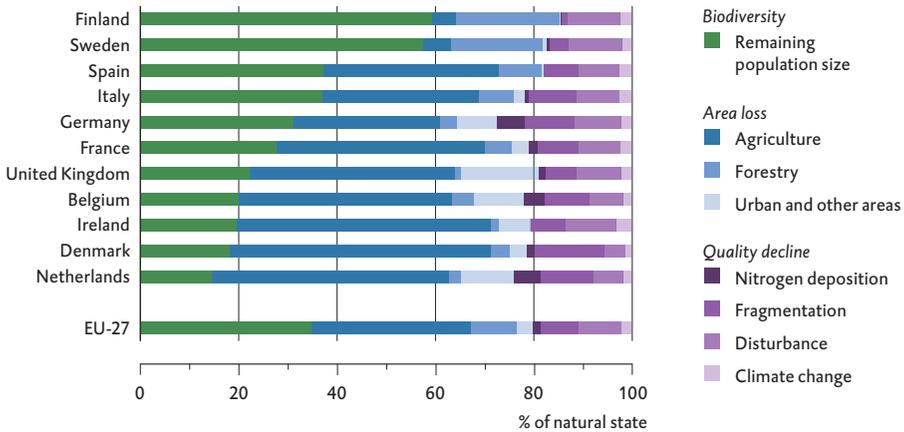
<sup>1</sup> Koninklijk Nederlands Meteorologisch Instituut (Royal Netherlands Meteorological Institute)

Source: PBL 2012b

### **Biodiversity**

Biodiversity is under pressure in the Netherlands. Most farmers only grow maize, potatoes or sugar beets. Monoculture crop acreage is getting larger. Specialisation in arable farming has reduced the variety of crops being cultivated. This practice also reduces landscape variation and the range of food products available.

Dutch livestock breeding also impacts biodiversity. Both chemical fertiliser and animal manure make the landscape more uniform, because nitrogen and phosphate have a major impact on plant and animal populations and on variety within those populations, both on farmland and beyond (PBL 2010). In 2013, the Netherlands Court of Audit determined that the government's efforts to reduce ammonia emissions and consequently nitrogen deposition gave inadequate protection to biodiversity. The PBL's *Assessment of the Human Environment 2012* (PBL 2012a) shows that of all the EU Member States, the pressure on biodiversity is greatest in the Netherlands (see Figure 4.6).

**Figure 4.6 Causes of biodiversity loss in Europe, 2010**

Source: PBL 2012a (data from GLOBIO and PBL)

Biodiversity loss in the Netherlands is largely due to agriculture and urbanisation. These factors are accompanied by area loss, greater pressure on the environment and land fragmentation. Population density and intensive land use continue to put pressure on biodiversity. Modelling studies (PBL 2012a) have forecasted a further deterioration, making recovery increasingly difficult. The designation of Natura 2000 areas to protect the biodiversity of valuable European natural resources and the development of larger ecological networks may well be able to slow the downward trend, but will not reverse it (PBL 2011).

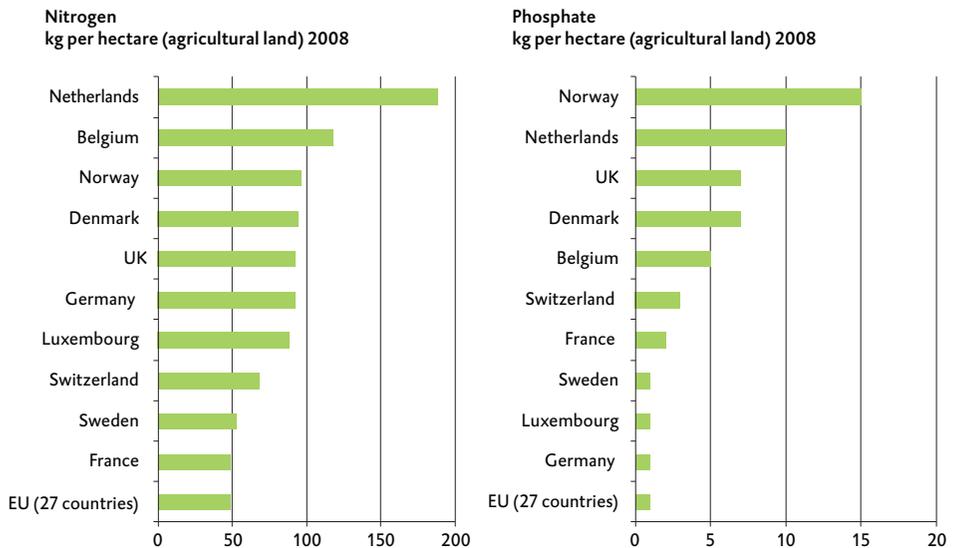
Some progress has been made in recent decades, however. The extent of emissions of harmful substances and of soil and water pollution gradually decreases. The environment in the Netherlands has even improved in that respect, despite the growth in production (PBL 2013a). On balance, however, biodiversity continues to decline. The pressure on nature conservation areas remains, largely due to the impact of intensive agriculture (PBL 2012a).

#### **Local and regional environmental problems**

Besides global climate change (with its consequences that vary per region), ecological sustainability is also under pressure due to numerous other local and regional environmental problems. In the Netherlands, for example, animal manure and the resulting pollution of the ground water and soil are an important issue. Livestock farms are for a large part responsible for the ammonia emissions, the leaching of nitrates and phosphates into the ground water and surface water, and dehydration of grounds (PBL 2012a: 131-132). Because of intensive agriculture, large-scale livestock breeding, and large amounts of animal manure, the Netherlands has the highest gross nitrogen surplus per hectare of agricultural land in Europe

(Figure 4.7). It also has a higher gross nitrogen surplus than other livestock-intensive regions of similar size in France, Germany and the United Kingdom (PBL 2012a). Finally, the discharge of pesticides into surface waters causes further damage. Almost nowhere in the Netherlands does the eco-quality of the surface waters comply with the targets set in the EU Framework Directive on Water (Faber 2013).

**Figure 4.7 Nitrogen and phosphate balance**



Source: Eurostat

#### 4.3.2 PUBLIC HEALTH

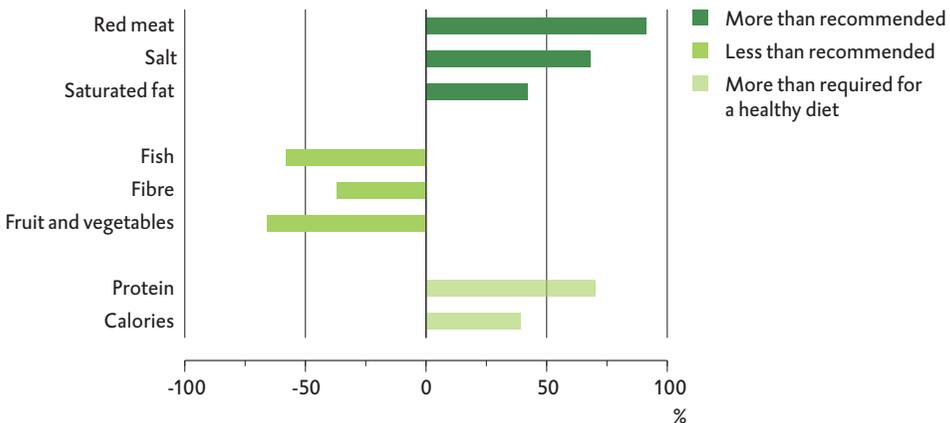
##### *Poor nutrition and unhealthy consumption*

Consumption of unhealthy food products and poor diets are increasingly leading to overweight and obesity. The health problems that occur as a result (such as diabetes type 2, cardiovascular diseases and cancer) have been known since the 1950s. However, the unhealthy food products of today (fast food, ready-made meals) are very different from those of more than fifty years ago, and so are the quantities consumed. The suppliers of food products (supermarkets, caterers) have also changed.

The Dutch have followed the international trend towards consuming more processed products. Dietary patterns are similar to those in other prosperous countries. As a consequence, excessive and unhealthy consumption is also a problem in the Netherlands, although, compared with other European countries, the scale of

its food-related health problems is still limited. Problems do however exist, as several studies have shown (Mackenbach and Roskam 2007; Hoeymans et al. 2010; Van der Lucht and Polder 2010; Seidell and Halberstadt 2011; PBL 2012a). On average, the Dutch eat too much unhealthy fats, sugar and salt and not enough fish, fibre and fruit and vegetables (PBL 2012a). Only 1 to 14 percent of the population (depending on age group) consumes enough fruit and vegetables (Van Rossum et al. 2011).

**Figure 4.8 Food consumption compared to dietary guidelines, 2007-2010**



Source: PBL 2012a

Poor dietary patterns have contributed to the fact that more than half of the Dutch population is overweight and that 13 to 14 percent is obese (Van der Lucht and Polder 2010; Blokstra et al. 2011). The National Institute for Public Health and the Environment (RIVM) estimates that as a result of overweight, approximately 40,000 people fall ill every year (with diabetes, cardiovascular disease and/or cancer) and about 7,000 people die prematurely (RIVM 2004). In addition, researchers estimate that an annual 40,000 people in the Netherlands fall ill and 13,000 die prematurely because their diet is high in saturated fats and trans fats and low in fish, fruit and vegetables (RIVM 2004). The fact that the country performs better than the worldwide averages in this regard is only partly reassuring.

### The socio-economic dimension of health problems

Food-related health problems are associated with socioeconomic status and income in many countries, and the Netherlands is no exception in that regard. The life expectancy of low-educated Dutch persons is on average six to seven years shorter than that of high-educated Dutch per-

sons. The difference in life expectancy without physical limitations is even greater, namely 14 years. Van der Lucht and Polder (2010) claim that unhealthy habits often occur in combination. Low-educated groups in particular contend with multiple unhealthy behaviours (smoking, excessive alcohol consumption, unhealthy diet, little exercise). Low-educated persons are 2.5 times more likely to be overweight, and more than four times more likely to be obese (Hoeymans et al. 2010).

### **Food safety**

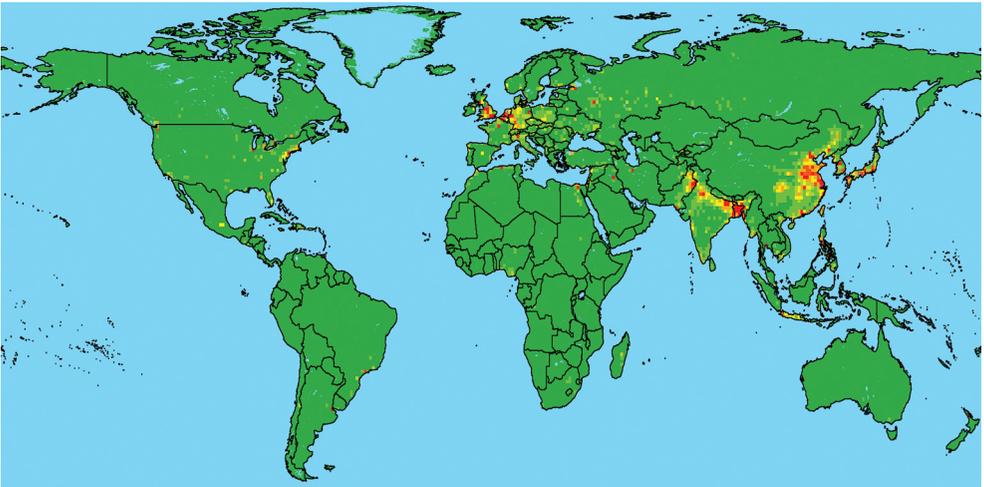
There are of course other food-consumption related hazards to public health. In production, processing or distribution, food can be contaminated with chemical substances or harmful viruses and bacteria. Food is relatively safe in the Netherlands, but food safety risks still exist. In 2009, 650,000 people suffered gastrointestinal infections caused by pathogens, such as salmonella and campylobacter, in food that they had consumed (Havelaar et al. 2011). The food sector was most concerned about animal products, with consumption transmitting bacteria and viruses to human beings. But as the EHEC crisis demonstrated in 2011, people can also fall ill after consuming vegetable products contaminated with harmful bacteria.

Recent meat sector scandals have shown that food safety cannot be taken for granted. What were initially thought to be incidents (horsemeat sold as beef, industrial farm meat sold as organic, meat processed after its sell-by date, unhygienic conditions at abattoirs) turned out to be signs of more structural shortcomings (OVV 2014). Major changes in the meat industry and the growing international trade in meat and meat products have been paralleled by significant pressure on prices, narrow margins, complexity, lack of transparency and greater food safety risks.

### **Human-animal diseases**

Harmful viruses and bacteria can also pose a threat to humans via other channels than food consumption, for example when they are dispersed through the air or when humans come into direct contact with animals. Two remarkable cases of animal diseases that posed a danger to public health in the Netherlands were the outbreaks of bird flu (2003) and Q-fever (2007) (Georgiev et al. 2013). Animal diseases also put livestock welfare at risk. Large-scale outbreaks have led to the mass slaughter of livestock in recent decades. For example, in 2001 a quarter of a million animals had to be put down preventively after an outbreak of foot-and-mouth disease. Figure 4.9 shows in which countries the risk of zoonotic pathogens from non-wildlife is greatest. The Netherlands is one of the places where the risk is high (marked red).

**Figure 4.9** Global distribution of relative risk of an emerging infectious disease (EID) event from non-wildlife zoonotic pathogens



Source: Jones et al. 2008: 993 (Figure 3b)

In addition, the large-scale use of antibiotics in intensive livestock breeding poses considerable risks. Antibiotics resistance endangers animals and people: if they contract an infectious disease caused by a drug-resistant strain of bacteria, it will be more difficult – and in some cases impossible – to treat them.

The Dutch health care system is extremely prudent when it comes to administering antibiotics, but in intensive livestock farming this is not the case. Antibiotics use increased by 83 percent in the Dutch livestock sector between 1999 and 2007. The tide began to turn a number of years ago, with sales of antibiotics for animals falling by 63 percent between 2007 and 2013 (MARAN 2014). Even so, the problem of antibiotics resistance – whether global, European or national – should not be underestimated; much of that problem has been caused by incorrect use of antibiotics (Nethmap 2014).

#### 4.3.3 ROBUSTNESS

As we saw in Chapter 3, in addition to ecological sustainability and public health, there are concerns about the robustness of the system as a whole. A number of studies have investigated the robustness of the Dutch and European food supply system.

In 2008, the Technology Assessment Steering Committee studied the robustness of the European food system (Bindraban et al. 2008). It focussed on the impact of disasters on Europe's food supply until 2020. Because Europe is largely self-sufficient – soy and vegetable oils being the two exceptions – the European food

supply system is expected to be able to cope with international disasters. Current consumption patterns allow for a large buffer because sixty percent of the grain is used as animal feed and meat consumption can be halved without posing a risk to human health. The collapse of soy imports would, however, have an important impact on the meat industry because alternative protein-rich crops are not readily available. The study further found that climate change is likely to have a bigger impact on the food supply than such calamities.

The Dutch Platform for Agriculture, Innovation and Society (PLIS 2011) studied how vulnerable EU Member States are to (combined) disasters, such as volcanic eruptions that disrupt (air) traffic, droughts or flooding, large-scale outbreaks of animal diseases, and accidents at nuclear power plants. It also looked at problems that could emerge if soy became more difficult to import (for example because China buys all the stocks).

The Platform concluded that in the case of vegetable oil, the EU's self-sufficiency level is 'half' and in the case of soy used for animal feed, virtually zero. That makes the EU vulnerable to *external* disasters. Specifically, a sharp decrease in the availability of soy, due to failed harvests overseas or geopolitical shocks, poses a risk. Because it imports large volumes of soy, relatively speaking, the Netherlands may be the most vulnerable of all the EU Member States. *Internal* disasters also pose potential risks in the EU. Examples include a large-scale decline in agricultural production (including grassland) due to a prolonged drought or a violent volcanic eruption (which would affect the cattle breeding sector most of all), and widespread epidemics of infectious animal diseases. The Netherlands is less vulnerable than the other Member States to the first mentioned type of disaster, and more vulnerable to the second (PLIS 2011).

The Platform's conclusions are consonant with those of the Technology Assessment Steering Committee. The described disasters would result in substantial economic damage. For example, if China were to buy up all the soy available on the world market, the production of pork, poultry and eggs would fall sharply. That would result in higher meat prices and might also set off a wave of bankruptcies in the livestock, meat and dairy sectors. The Platform believes, however, that food security in the EU and the Netherlands would not be at risk in such situations. Essentially, there would be enough meat and dairy for all, even if disaster strikes. But there is a risk that meat and dairy will become unaffordable for low-income groups, specifically city-dwellers in the least prosperous Member States. Although that would not lead to health problems for most of the population, the lack of iron and vitamin B12 in children's diets would put them at risk of malnutrition.

In its 2014 follow-up report, the Platform repeated its conclusion that the EU is largely self-sufficient when it comes to basic foodstuffs (PLIS 2014). This time, however, it also observed that the EU has almost no natural reserves of non-replaceable raw materials vital to agriculture. Soy is a problem in the short and medium term. Other risks loom in the longer term. The EU has no or only limited supplies of recoverable phosphate, potassium, zinc, selenium and boron. These are all resources whose recoverable reserves will become more scarce; they are recycled only to a limited extent. The short- and medium term risks relate to geopolitical threats and market manipulation by cartels of private and/or state-owned enterprises that are playing an increasing role in the world market. Countries that export these resources can drive up prices for political or economic reasons or restrict exports in order to apply pressure on import countries. In 2011, Rabobank warned that future resource scarcity and price volatility would have a wide-ranging impact.

Enterprises perceive a prolonged or permanent unavailability of electricity and a crisis in road transport as the biggest threats to the robustness of the food system (PLIS 2010). According to this study, individual businesses have put proper risk management practices in place to ensure their own continuity. To ensure the continuity of food security in Europe, however, the businesses believe that public authorities have the primary responsibility, especially in managing resources at international level, creating emergency plans and by building resource stocks (*ibid.*). Although the focus of the various studies differs, they basically paint the same picture. International disasters will cause economic damage, but given the EU's high level of self-sufficiency, they will not endanger its food security directly. In the long term, however, the scarcity of resources and the way businesses and foreign countries respond to that scarcity may pose a threat to the robustness of the food system. Much less has been published to date about the system's robustness in the face of specific plant or animal diseases.

#### **4.4 CONCLUSIONS**

The Netherlands undeniably plays a prominent role in the international agri-food world. So far, it was at the forefront of many of the global trends in the agri-food sector. It also serves as an important hub in the network of international food trade. Whereas the vast majority of food production worldwide is traded locally and regionally, and not on the world market, Dutch exports and imports focus largely on Europe and more specifically on Germany, while some of its products are traded globally. Also export of expertise and technology adds to its reputation in the international world of food.

Like other countries, the Netherlands has seen the intensification and rationalisation of its agriculture. Economically, the emphasis has shifted from agriculture to other players in the chain, and thus from rural to urban areas. As elsewhere, Dutch consumption patterns have moved towards less fruit, vegetables and fibre and more animal and processed products, sugar and salt.

The Netherlands' prominent position in import, export and transit of food and agricultural products entails vulnerabilities, responsibilities and opportunities. The Netherlands contributes to key problems related to ecological sustainability, public health and robustness, the country depends on worldwide trends in each of these areas, and it also has to face related specific local problems. At the same time, the advanced expertise of its agri-food sector offers the Netherlands opportunities to take responsibility for these future challenges. It can produce and export more sustainable, nutritious food and capitalise on its knowledge of innovative production systems.

## NOTES

- 1 Including alcohol and tobacco.
- 2 The data differ considerably depending on the publication. According to Statistics Netherlands (CBS, 2012), the Dutch spend 11 percent on food, but that figure does not include spending in the foodservice sector or purchases of alcoholic beverages.

## 5 FOOD CHAINS, THE FOOD SYSTEM AND THE FOOD NET

### 5.1 INTRODUCTION

The global food supply system is facing substantial problems in the area of ecological sustainability, public health and robustness (Chapter 3). About the specifics of these problems many uncertainties still remain. Nevertheless, businesses, governments and the public at large would do well to assess the related vulnerabilities, opportunities and responsibilities. Given the position of the Netherlands in the world of food, also Dutch businesses and the Dutch government face these challenges (Chapter 4).

The challenges that have to be faced, emerge within a rapidly changing context. In considering them, developments in the way food is produced and consumed will have to be taken into account (Chapter 2). To discuss the policy consequences of these developments, sections 5.2 and 5.3 will introduce the chain perspective and the food system approach. Subsequently, in section 5.4, a revised perspective, the food net, will be introduced.

### 5.2 FOOD CHAINS

#### 5.2.1 CHAINS 'FROM FARM TO FORK'

A radical functional differentiation has taken place in the food sector (Lummus and Vokurka 1999). Businesses are buying and selling intermediate products from and to other businesses sometimes on the other side of the world. To account for this development, in current reflections on the agri-foodsector the 'chain from farm to fork' concept is introduced (Van der Vorst 2006; Lang et al. 2009: 145; Ahumada and Villalobos 2009: 2). Usually, a distinction is made between *types* of businesses as separate elements in the chain, such as suppliers, farmers, industry, retail and foodservice, as well as the consumers (see Figure 5.1). Reference is also made to specific supply chains, in which a specific end product is produced, e.g. the veal chain.

**Figure 5.1** The food chain



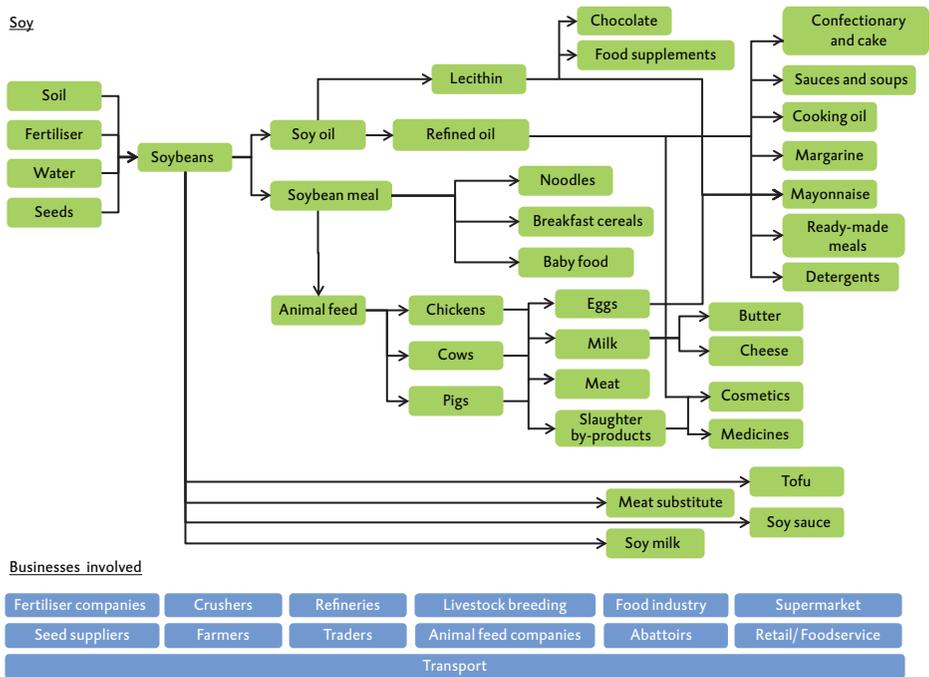
Thinking in terms of chains is certainly not unique to the food sector. The chain concept was popular in all kinds of sectors in the 1980s and 1990s (Croom et al. 2000: 69; Goldin and Mariathansan 2014). A chain is defined as a system in which three or more organisations are directly involved in a flow of products, services, finances and/or information from a source to a consumer (Mentzer et al. 2001). Depending on the perspective chosen, this could be a supply, production or added value chain. Businesses usually look at supply and production chains as they are mostly interested in the place their activities occupy in the chain and their relationships with suppliers and buyers. Economists, on the other hand, tend to emphasise the added value created in successive steps within a chain, while social scientists often focus their attention on the power relations within the chain.

Food chains come in all shapes and sizes. Chains of fresh horticultural products are organised differently from chains of processed products and products with a longer shelf life (Aruoma 2006: 120). The way the cocoa chain is organised differs from the way the veal chain is organised. Whereas the cocoa chain consists of many separate links, the Dutch veal chain – from animal feed to processed consumer goods – is for a large part controlled by one company, the VanDrie Group (Van den Burg and Overbeek 2012: 14). A diversity of economic relationships therefore exists between the businesses in a chain: sometimes they meet in spot markets, sometimes they have long-term contracts and sometimes there are vertically integrated, consecutive links within a single parent company. The numbers of suppliers a business deals with can vary considerably. Sometimes there is one supplier, sometimes many and sometimes the suppliers have organised themselves, for example in a cooperative. The geographical scale on which businesses operate also differs considerably: in addition to businesses that operate locally or nationally, there are businesses that are active in many countries and in international markets. Moreover, the geographical scale of the chain as a whole can vary widely. Sometimes a chain contains businesses that operate in each other's vicinity, in other cases chains cross national borders or connect activities on different continents.

Anyone wishing to gain a detailed picture of the relationships between businesses in the agri-food sector is therefore quickly confronted with tremendous complexity. A modern supermarket stocks thousands of food products, many of which are composed of many – often dozens – ingredients. Before reaching the retailer's shelves, they will often have made long, international journeys and undergone various processes. Raw materials, intermediate processed products and end products are traded on international and regional spot and futures markets – they constitute a transit yard through which materials find their way from suppliers to buyers. Product innovation can result in new connections and branches. It is therefore practically impossible to draw a comprehensive map.

We can, however, sketch out a number of main flows. If, for example, we focus on soy, we can draw the complicated route that this important ingredient goes through before reaching the end consumer in a variety of products (Figure 5.2). How many consumers are aware of the fact that about 150 grams of soy – probably imported from South America – are used to produce one kilogramme of Dutch cheese (Dutch Soy Coalition 2012)?

**Figure 5.2 Schematic overview of the soy chain**



Source: Based on Hoste and Bolhuis 2010

The popular saying ‘from farm to fork’ is therefore somewhat misleading as it suggests that one or only a few straight lines connect the raw material to the end product. If we follow the food materials, however, a different picture emerges. The materials zigzag between different businesses and countries (Kinsey 2001: 1126). On the way, they are processed, distributed and combined with other materials. There are both many branching points and many points in which different material flows are combined to end up in processed foods. A simple pizza has as many as twenty different ingredients. A coated cocktail nut has over thirty, which reach the end product along different paths. Moreover, in addition to foodstuffs, many non-food products are produced. Grain and maize are also used in the manufacture of biofuels. Residual products of slaughtering form the basis for products

such as gelatine, which is used both in the food industry and in the pharmaceutical industry, among others. If we follow the routes along which the materials flow, we may also encounter loops. This could indicate recycling, which is welcome, but could also mean bad news. For example, the processing of offal into animal feed led to the BSE crisis because pathogens (prions) were able to multiply and spread quickly via this route (Phillips 2000; Oosterveer 2005). Sometimes chains are also interlinked because waste products from one chain (e.g. chicken manure) are used in other chains (e.g. as fertilizer in vegetable chains).

The complexity increases even further because many companies operate in several markets and therefore deal with different buyers and suppliers. Animal feed companies supply many different meat flows; *The Greenery* operates in a variety of vegetable and fruit flows; the *VION Food Group* is active in both pork and beef flows; *Cargill* trades in all kinds of bulk commodities and is therefore involved in many different flows. In addition, producers depend on other types of businesses for the supply of goods and services, including greenhouse builders, carriers and logistics companies, the packaging industry, veterinary services, banks and insurance companies, knowledge institutions and many other organisations.

In other words, most food is not produced in a single chain but in a complex *network* of chains. For this reason, overview is almost impossible to attain. This applies to all the parties involved. Even influential players such as supermarkets can hardly check the details of what has happened more than two stages back in the chain, unless mandatory information is supplied. A Brazilian soy supplier does not know for what purposes his soy will be used after it has arrived in Rotterdam; a cattle farmer in the province of Brabant who uses the soy as animal feed does not know which plantation the soy was cultivated on. For consumers, this applies even more. EU rules state that the country of origin and the ingredients of manufactured food products must be stated on packaging. Yet, in many cases, consumers remain in the dark about the origin of the individual product ingredients. A label stating that a pasta sauce is produced in Italy does not mean that the tomatoes, sunflower oil, sugar, modified corn starch and other individual ingredients that it contains are from that country as well. All that is needed for this origin claim is that the various ingredients have been combined into pasta sauce in Italy.

### 5.2.2 CHAIN MANAGEMENT

The organisation of production into chains of businesses, each of which specialises in a limited number of tasks, means that, ever more frequently, it is not individual businesses, but chains of businesses that compete with each other (Lummas and Vokurka 1999; Croom et al. 2000: 68; Grewal 2008). This makes businesses dependent on the performance of their chain partners and on the functioning of the chain as a whole (Mentzer et al. 2001). A supermarket cannot be successful if its suppliers do not deliver the right products in the required volumes at the right

time. A food safety problem in any of the links immediately causes problems in other parts of the chain. The supply of essential materials may come to a halt and reputations might be damaged, resulting in a sharp drop in sales. Even businesses not directly involved in the incident can be seriously affected.

The mutual dependency of the various players in a chain, from primary producers to retailers, provides a good reason for explicitly organising the chains. Increasingly, therefore, *chain management* is developed (Van der Vorst et al. 1998: 487). The key elements of this are mutual agreements on production conditions and product standards, supply of information and control of these elements. This additional layer of organisation changes market situations.

Chain management implies that businesses that form part of a chain will abandon an antagonistic attitude towards their suppliers and buyers, to enter cooperation with them instead. This 'paradigm shift' is considered to be one of the major developments in modern management (Lambert and Cooper 2000). The cooperation can be laid down in a variety of ways, e.g. in contracts, or in agreements about product or process standards, or take place under the direction of a (parent) company within a vertically integrated chain.

Chain management focuses on the strategic coordination of tasks throughout the chain in order to improve the performance of individual businesses and of the chain as a whole (Mentzer et al. 2001). This requires 'an integrative approach to dealing with the planning and control of the material flows from suppliers to end users' (Jones and Riley 1985; via Van der Vorst et al. 1998: 487). Effective chain management can reduce costs within all the links in the chain, can lead to increased product differentiation and market segmentation and can improve overall quality assurance throughout the chain (Mentzer et al. 2001: 15; Van der Vorst 2006: 18). But chain management does not come about automatically, even if it would be of significant advantage to all the parties concerned. Successful chain management requires long-term relationships, an awareness of mutual dependency, mutual trust, a shared vision and a business that takes the lead (Mentzer et al. 2001). Additional factors for success are the ability to formulate clear mutual requirements, the codification of standards and a shared information management system (Van den Burg and Overbeek 2012).

There are still many chains for which spot markets are the most important place for making connections between the players. Despite this, there is undeniably a trend towards ever more intensive cooperation in food chains (Kinsey 2001: 1113; Young and Hobbs 2002: 428). The main drivers are the desire to reduce transaction and other costs and concerns about food safety. For example, in the 1990s, European supermarkets developed standards for 'good agricultural practices' in the British Retail Consortium (BRC) and EurepGAP (now GlobalGAP). This was done

in response to consumer concerns after various food scandals. For each stage in the chain, requirements have been laid down related to hygiene, the environment and the provision of information. Information must not only be provided on where food crops were cultivated, but also on where they were washed, stored and packaged. The participating supermarkets could, of course, also have imposed these requirements on suppliers individually but they decided on a joint approach because of its efficiency and effectiveness (Van Waarden and Havinga 2013: 143). Standards of this kind have an impact throughout the chain. This does of course also apply to similar measures taken by governments, such as the tracking and tracing system introduced for meat after the BSE crisis and dioxin scandals. Because, in principle, the place of origin and processing of each piece of meat can be traced using this system, it is possible to respond quickly and effectively to food safety incidents.

Apart from cost reduction and food safety concerns, there are other motives behind chain management, such as a sense of social responsibility (Spence and Bourlakis 2009). Certification marks and logos for healthy products, social or sustainable production conditions and fair trade, can also help producers to differentiate their products on the consumer market. However, they often require a major reorganisation of and cooperation within the chain as a whole. After all, the material flows must be kept separate from the flows that do not conform to the standards, additional information must be provided and shared and increased oversight is required (Whatmore and Thorne 2004).

### **Certification marks and logos**

Certification marks and logos are now in place for all kinds of product groups. There are, for example, international sustainability standards for soy, palm oil, coffee, cocoa and fish (PBL 2013b). The creation of these logos and certification marks involves a lot of parties, with diverse interests, in complex, prolonged rounds of (international) consultation (Schouten 2013; cf. Hoogeveen and Verkooijen 2010 on the production of sustainable wood). For example, the *Round Table on Responsible Soy* has 150 members (i.e. 29 producers, 16 NGO's, 73 representatives of trade, industry and the financial sector and 32 members with observer status and no voting rights). The *Round Table on Sustainable Palm Oil* has as many as 700 members (Schouten 2013: 89, 99). Even if the consultation on certification marks and logos is confined to chain parties within national boundaries, they are not built overnight. The introduction of the animal-friendly *Volwaard* mark for chicken production, for example, required over ten years' preparation time (Balthussen 2008).

For most foodstuffs – in particular processed products – it is very hard for the consumer to have knowledge of their origin, sustainability or production conditions. To gain an idea, consumers have to rely on certification marks and logos, but given

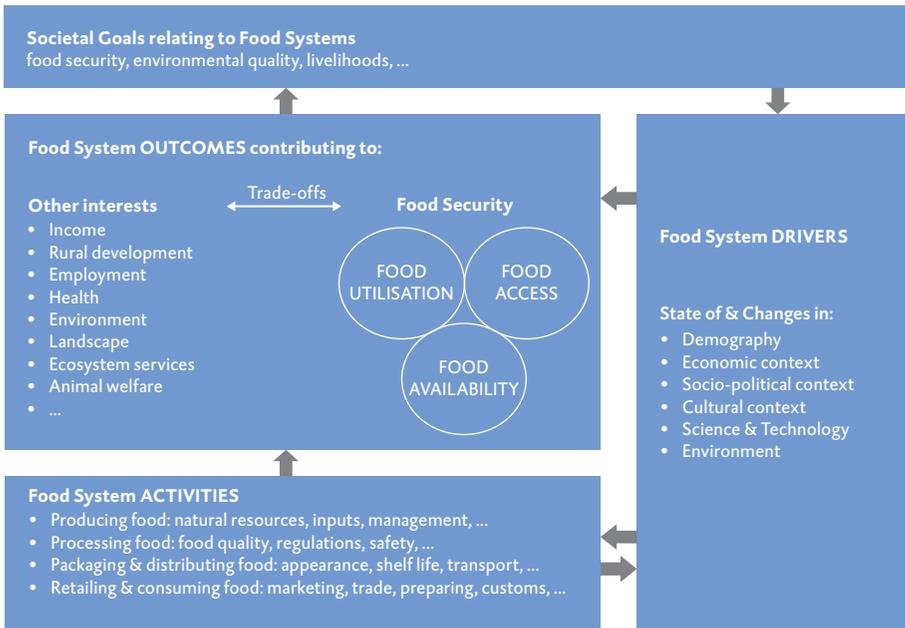
the number and variety of labels, consumers soon run the risk of losing their way (Gezondheidsraad, 2008). For example, the check mark of the *Ik Kies Bewust* ('I choose consciously') Foundation, which can be found on more than 6,600 food products in Dutch shops, indicates the 'healthier' products within a product group that the manufacturer has registered – on payment of a fee. The colour of the circle surrounding the check mark is different for products that are *really* healthy. There are now so many certification marks and logos that it seems we have a 'forest of certification marks'. The website and leaflets produced by the Netherlands Nutrition Centre, the Certification Mark App (*Keurmerkenwijzer*) from Milieu Centraal and publications such as *Eten & weten* by the Dutch Consumers' Association (Consumentenbond 2014) are now providing some help for consumers seeking information.

Chain management is the industry's answer at a time of increasing specialisation and the mutual dependence that goes with it. Businesses are prompted by the risks of reputational damage, fierce competition and the prospect of more sustainable production being required as a result of an increasing scarcity of essential raw materials (Rabobank 2011).

### 5.3 THE FOOD SYSTEM

Besides the businesses which are directly involved in production, many other parties influence what happens in the chain – financial institutions, veterinary services and greenhouse builders, as well as public parties such as governments and international organisations that set frameworks for the activities in the chain. To involve the role of all these actors in the debate, particularly if we also wish to gain an idea of the effect of the activities within the chain on society and the ecosystem, the chain perspective will have to be extended.

To this end, various models and concepts have been developed in the academic literature. For example, Lazzarini et al. (2001) introduced the concept of *netchains*. This concept encompasses not only the chain of businesses, but also the network of businesses around each link in the chain, e.g. financial institutions. Coe et al. (2008; cited in Oosterveer and Sonnenfeld 2012: 24) introduced the concept of the 'global production network'. With this concept, they wish to emphasise the complex, dynamic and flexible relationships between businesses and institutions involved. Finally, there is the 'food system approach' (Ingram 2011a; 2011b). In this approach, not only (production) *activities* are considered, but also *social goals*, *driving forces* and *outcomes* (see Figure 5.3). These outcomes include the availability, accessibility and use of food, as well as a wide range of social, ecological, landscape, health and ethical aspects. The food system approach initially leads to a comprehensive research agenda. It has also formed the basis of a scenario study (ESF-COST 2009).

**Figure 5.3 Food system approach**

Source: ESF-COST 2009: 10

These different concepts step by step broaden our view of the interactions and dependencies from a linear chain of production stages to a complex network of businesses within a social and ecological context. The chain perspective primarily focuses on production activities and trade relationships whereas, in the food system approach, attention shifts to also other actors and to the social and ecological *conditions for and effects of* these activities. This creates room for discussing not only the problems *within* the food sector, but also the problems that arise *for and because of* the activities in the sector.

In relation to the chain perspective, the food system approach introduces an important expansion of the aspects to be considered. However, this expansion has an obvious disadvantage. The list of aspects to be considered quickly reaches a daunting length. We then run the risk of losing sight of the major challenges and reference points for policy. This can be addressed by focusing on the *material and information flows* within and between chains and their environment. We call this the *food net* perspective.

The table below summarises the differences in focus between the food chain, the food system and the food net.

**Table 5.1** Food chain, food system and food net

Concept	Focus on
Food chain	The businesses involved in successive steps in the production of food and/or the added value which they provide.
Food system	The chain and other relevant actors (such as service providers and institutions), the impact of the activities on the natural and social environment and the driving forces behind the food system.
Food net	The material and information flows, both inside chains and from these chains to the natural and social environment.

## 5.4 THE FOOD NET

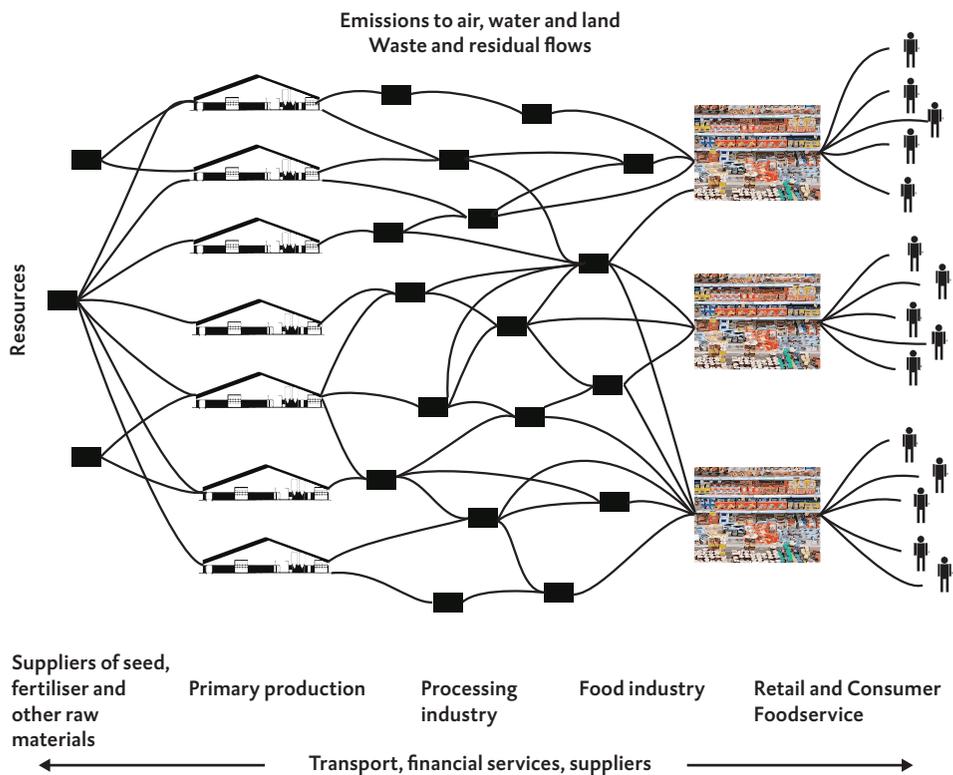
The food net is a network consisting of many interdependent subnetworks of material and information flows. Smaller, self-contained networks which are deliberately kept separate from the large flows e.g. for biological products also exist. Some parts of the food net span continents. In other cases, the flows of materials and information are confined to countries or specific regions, such as the European Union. However, the networks of flows are generally becoming increasingly international. A ready-made meal sold in a European supermarket may contain Argentinean beef, rice from India and beans from Kenya.

The problems referred to in Chapter 3 under the headings of ecological sustainability, public health and the robustness of food systems *manifest* themselves at various points in the food net. Questions about ecological sustainability are mainly raised in respect of primary production. Public health problems likewise arise in relation to primary production, but they are prominently present around consumption. The problems relating to robustness relate to the operation of the food net as a whole. Yet, in spite of the fact that the problems may manifest themselves at different points in the food net, they are closely related to other parts of the food net. When discussing the public health problems associated with the consumption of too much sugar, salt and unhealthy fats, we should not only be looking at consumer demand and choices, but also at the supply-side. Similarly, we should realize that the ecological sustainability of primary production also depends on the drawing power of the later phases of the chains, on changing dietary patterns and the 'greed' of the food net as a whole. And also that the questions relating to

robustness are partly raised as a result of the responses of countries and businesses to the anticipated shortages of raw materials and regional failed harvests which can have global (price) effects.

Food is available to consumers by virtue of all the material and information flows which together constitute the food net. This applies in particular to people living in urbanised societies. The combination of material flows and the processes that take place determine the composition and quality of what ends up on our plate and therefore also the positive and negative health effects of food and the burden that food production places on the natural environment.

**Figure 5.4 The food net**



Source: Based on Oosterveer and Sonnenfeld 2012: 29

The actors that operate at the different points in the food net – as producers, processors, distributors or consumers – are all network players. Their role is determined by their place and function in the network. They are therefore characterised differently (see the insert).

## The 'factory farm' as a hub

When viewed from the perspective of the food net, intensive livestock farming is a stage in the industrial production of pork and chicken meat, a node in a network that links soy production to meat production and export. This raises different questions than the ones that are being discussed when one talks about 'factory farms' and the upscaling of existing farming businesses. When a decision has to be taken on granting permission for a substantial expansion of a farming business, local considerations quickly become the determining factor. But if intensive livestock farming is regarded as a network node, other considerations also come into play. In addition to regional employment and considerations such as landscaping and the repercussions for local residents, questions arise that are common in relation to similar node activities – such as a trans-shipment terminal or a power station –, that is, questions that involve the national government as well as the municipal and provincial level. On that level, questions must be answered such as what added value the specific activity will provide, whether it is ecologically sustainable and future proof, which logistical and other infrastructural public facilities will be required and, ultimately, whether the country wants to differentiate itself with this activity.

### *Characteristics of the food net*

Anyone who actually wants to examine the food net will soon run against practical boundaries. This is of course not surprising: the food net as a whole spans the globe and the materials that flow through it end up in thousands of products on supermarket shelves.

It is hard to determine the starting points of the food net. Materials such as seed, animal feed and fertiliser flow to farms and market gardens; and different flows, such as oil and phosphate, converge in the production of fertiliser. Emissions from materials used in production can have not only a local but also a global impact, as in the case of greenhousegas emissions, with secondary effects. The end points of the food net are equally hard to determine with any certainty. Consumers are not the end of the line. For example, households produce substantial flows of waste, some of which then go back to businesses to be recycled. Moreover, their purchasing behaviour sends signals that can result in changes upstream.

The complexity of the food net is further increased by the diversity of material flows. The methodology of material flow analysis – originally derived from environmental science (Ayers and Ayers 2002) – can therefore only be used in research into specific ingredients. For example, the Netherlands Environmental Assessment Agency (PBL 2011) analysed European meat, fish and dairy production and consumption, including their impact on the environment, climate, biodiversity and health. Flows such as nitrogen flows and phosphate flows have also been analysed – both globally and for specific regions (PBL 2011: 118-121; Billen et al. 2013;



The food net adapts to new circumstances time after time. Which trajectories are created is determined by many factors, including the availability, nature and quality of the materials to be supplied, technological advances, the infrastructure required to obtain materials and ship out products, trade agreements, available information, legislation, private standards, economic considerations, the availability of capital, and historical circumstances and path dependencies.

To detect how changing flows relate to changes in the social and natural environment we may look at the way producers gain *access* to the food net. Anyone wishing to produce materials and supply them to buyers will not only have to gain access to the necessary raw materials and resources but also be capable of delivering (intermediate) products in the quantities and quality and at the price that buyers require. The producer must also comply with the legislation and regulations imposed by governments on the production process (e.g. with regard to permissible emissions) and on the (intermediate) products themselves. This of course requires appropriate production techniques. But that is not the end of the story. Natural conditions – the quality of the soil and the local climate – provide opportunities and impose limitations. Moreover, arable and livestock farming requires an appropriate amount of space. A large part of the food net is dependent on the availability of fossil fuels and water. And no business can deliver without a good physical infrastructure to allow them to receive materials and ship out their products. Other infrastructural facilities are also key – such as the proximity of abattoirs or an auction; a supermarket will want a location close to its customers and accessible to carriers. Financing and knowledge must also be available: the success of Dutch agriculture is partly ascribed to the presence of agricultural cooperative banks and the triangle of research, training of farmers and education.

A range of mutually influencing factors is always at play, over and above the conditions that governments impose on production, products, locations and trade agreements. This also applies to the question of which flows gain *precedence* in the food net, although cost considerations are often the dominant factor. All of this is nothing new. Nowhere is this better expressed than in Cronon's (1991) classic study *Nature's Metropolis* (see the insert below).

### The interdependence of conditions

*Nature's Metropolis* narrates how Chicago was able to become the centre of the American wood, grain and meat trade in the nineteenth century through an accumulation of mutually reinforcing developments in the city and its hinterland. The study describes and analyses in detail the linkage between the primary production centre (Chicago's hinterland, the Great West), the developing network of flows (due to the construction of railroads deep into the hinterland), the

processing centre (Chicago) and the consumption centre (Chicago and later the big cities in the east of the US). A gradually expanding rail network connected the city to the Great West, which resulted in ever greater quantities of grain, cattle and wood being shipped. The introduction of futures markets on the Chicago Stock Exchange provided farmers with the financial resources to invest in their business and supply the rising demand. The city was also changing at the same time. Large-scale abattoirs and deboning plants were needed to process the growing numbers of cattle. This expansion was accompanied by pollution and social misery. In order to prevent meat from putrefying, it was initially salted and smoked, but was later transported by rail in refrigerated trucks to the big cities on the east coast – which increased the size of market and required even more cattle to be brought in and slaughtered.

Cronon (1991: 384-385) therefore concludes: ‘...the urban and the rural landscape ... are not two places but one. They created each other, they transformed each other’s environments and economics, and they now depend on each other for their survival. To see them separately is to misunderstand where they came from and where they might go in the future. Worse, to ignore the nearly infinite ways they affect one another is to miss our moral responsibility for the ways they shape each other’s landscapes and alter the lives of people and organisms within their bounds.’

The interdependencies to which Cronon refers still apply today, but have become even closer and more important. Products undergo more processing steps than in the past, major players are now operating between farm and fork and many flows now cross national borders. The food net consists of major international and national flows and is at the same time inevitably closely intertwined with the local context, both at the places of production and at the places of consumption. Although we may not immediately associate intensive livestock farming in the province of Brabant with the port of Rotterdam or South America, they are interconnected through the soy flow in the food net. And that applies equally to the strain placed on the environment by the production of animal feed in South America and intensive livestock farming in the Netherlands. The requirements imposed on international flows have an impact also at local levels. In order to be able to supply the international markets, producers are often required to produce large volumes at a constant quality.

### **Interconnectedness of local and global developments**

In order to acquire the important international position in soy production that Brazil enjoys today, major local changes to existing soy production methods were required. Bigger soy plantations had to be created (for which substantial areas of rain forest had to be cut down). New production methods, transport facilities and varieties were introduced. The new production methods called for different types of businesses and the provision of a national credit facility for

the sector. The development of new varieties also required the construction, almost from scratch, of an infrastructure for agricultural research (De Sousa and Busch 1998). One might observe this also elsewhere. Without changes in business management and the infrastructure in for example Kenya, it would not be possible to obtain green beans in Dutch supermarkets out of season (Minot and Ngigi 2004). To quote Cronon (1991: 385) once again: 'The city-country relations... now involve the whole planet.... We all live in the city. We all live in the country. Both are second nature to us.'

The food net is complex and flexible, with an enormous number of flows and branches. All the parties involved therefore face information problems. Only by means of chain management and by explicitly organising the flow of information, an understanding of the origins of materials and the production methods used can be obtained. Governments and industry have – as we have already seen – taken all kinds of steps in this regard. However, managing this kind of information is a complicated and costly matter. It can indeed be supplied for specific products, such as fruit, vegetables, and beef. But it is a great deal more difficult for processed products because product flows diverge and converge and formulations (recipes) of processed products change on a regular basis. The industry does however have a great interest in this. A food safety incident, and even ill-founded reports about it, can cause serious and lasting damage.

If we shift our view from the producers to the consumers, we encounter similar problems. Here, too, access is determined by different factors. In the 'food deserts' in some big cities in the United States, no fresh fruit or vegetables are sold in the immediate vicinity and consumers are sometimes dependent on a petrol station to buy their daily groceries. Choices are limited to mostly junk food. Where elsewhere supply is ample or even abundant, and food is available at many different locations and at many different times, there is of course greater freedom of choice. But even then, consumers are dependent on what is on offer: they do not determine the ingredients of processed food products and their choices are guided by advertising, product placement, information on product labels, nutritional advice, the media and by lifestyle, tradition and social conditions. Just like producers, consumers are players in the food net as well.

## 5.5 CONCLUSIONS

As a result of the trends described in Chapter 2, a twofold change has taken place in the food supply system. The activities that contribute to food supply have become both more *dispersed* and more *interconnected*. The industry has become more widely dispersed due to the functional differentiation and the increased internationalisation of the trade in raw materials and (intermediate) products. At the

same time, it has become more interconnected through different forms of chain management, the introduction of standards, the concentration of industry and the increased interest in processed products. Today's food supply takes place within a complex network of chains that is described in this chapter by the term 'food net'. The interdependencies of players in the food net have increased as a result of the increased interconnectedness and wider dispersal of activities.

This dispersal and interconnectedness also applies to the challenges that arise for the food supply system. Regional disruptions – due to natural causes such as failed harvests or political interventions – can have consequences far beyond the region where the problems originally manifested themselves. Ecological effects are sometimes confined to the local area, but in other cases they concern larger systems, such as the water system, the atmosphere or the global climate system. They also have the many interdependencies (see the insert).

Animal and plant diseases can spread on a smaller or larger scale and are interconnected with human health. Public health risks may present themselves locally – e.g. around areas of production – but, as a result of intensive international trade and traffic, zoonoses can also threaten whole regions or potentially develop into a pandemic. Food safety problems and food fraud can arise at any stage in chains and can also have repercussions far from the source. The health risks associated with overweight and obesity may manifest themselves at the level of an individual, but also become a challenge for national public health policy. The worldwide extent of this problem indicates that other factors are at play as well. Overweight is associated with major – partly international – social, economic and cultural changes in food production and consumption. The place where problems manifest themselves in the food net is therefore not always the place where they originate. Neither is it the place where the appropriate points of action can be found for effective measures.

### **Interconnectedness of ecological problems**

EU SCAR (2011) investigated different ecological problems, such as the lack of fertile land, fresh water, energy, phosphates and nitrates, as well as biodiversity and climate change. The researchers then tried to estimate how the scarcity problems might interact, where tipping points could arise and where threshold values and time lags would apply. The table below provides an outline and reveals the interconnectedness of the various ecological problems.

**Figure 5.6 Interactions between scarcities**

	Fertile land use	Fresh water	Energy	Phosphate	Nitrogen	Climate change	Biodiversity
Fertile land use		FB	FB	?	FB	FB	FB, TP
Fresh water	FB		FB	FB	FB	FB, TP	FB
Energy	FB	FB			FB	FB	
Phosphate	FB					FB	
Nitrogen	FB						
Climate change	FB, TH	FB	FB		FB		FB, TP, TH?, TL
Biodiversity	FB	FB	FB	FB	FB	FB, TP, TH, TL	

- FB** Feedback: this means intensification or acceleration of the system dynamics.
- TP** Tipping Point: this means an irreversible, catastrophic change to the system.
- TH** Threshold: if the system exceeds the threshold value, the system switches to a new condition, which means it can lose its function, e.g. for agriculture.
- TL** Time Lag: this can mean that the system responds after a long time lag or that the depletion of stocks could cause irreparable damage.
  
- White** No interaction.
- Green** Probable interaction, moderate interaction.
- Orange** Major interaction.
- Purple** Close interaction.
- Red** Very close interaction, fast or critical for agriculture.
- Grey** Interaction may be positive or negative, depending on the type of interaction.

Source: EC SCAR 2011

Due to the increased interdependence and the diversity and interconnectedness of the problems surrounding the food chain, the issues policy has to face shift as well. In the past, policy could be focused primarily on increasing the productivity of the primary sector. In the future, attention will have to be focused on the interdependencies between production, trade and consumption in the food net. This is the only way that policymakers will be able to meet the ecological and social challenges currently facing the food supply system. Lang and Barling (2012) summarise the shift needed point by point (see Table 5.2).

**Table 5.2** 'Classic' and 'emerging' food issues

Focus	'Old' food security analysis	'Emerging' sustainable food analysis
Core concern	Under-production	Mismatch of production, consumption and policy
Route to food security	Produce more	Redesign food system for sustainability, defined by multiple criteria: social, environmental and economic
Analysis of 2007–8 crisis	A sudden crisis caused by external shocks (e.g. banking and oil price crises) then exacerbated by national tariffs and export controls	A long-running failure coming to a head exposing new complex combination of factors straining an already stretched food system; a forewarning of a possible coming 'perfect storm'
Preferred action	Improved coordination among international food bodies; better information exchange on national production levels and food stocks	Begin twin-track short- and long-term reorientation of food supply and consumption patterns better to align environment, health and inter- and intra-society inequalities; rebuild buffer stocks as safety net
Conception of health	Malnutrition and hunger	A wide range of non-communicable diseases (NCDs), including malnutrition
Environmental concerns	Primarily on farm	Throughout supply chain
Where waste lies	At farm and distribution	Throughout the system, particularly consumption
Consumer issues	Under-consumption	Over-, under- and mal-consumption
Energy focus	Land use for energy generation	Carbon emissions through food chains
Geographical hotspots	Low-income developing countries	Global (markets are distorted by high-income countries)
Economic approach	Generate efficient supply	Need to internalise full costs
Role of science	Agricultural R&D, mainly life sciences	Social as well as natural sciences
Locus of power	Mainly Government but also commercial interests	Concerned about split between private governance (commerce) and government; international institutions and regimes; global governance

Source: Lang and Barling, 2012: 317

Lang and Barling call upon industry and governments to better match food production, trade and consumption. This requires a redesign of the food system based on social, environmental and economic criteria. This design will have to take into account the characteristics of the food net referred to in this chapter: its complexity, the large number of interdependencies and relationships involved and its geographical and functional distribution, which often extends far beyond the jurisdiction of national governments. Account will have to be taken of the network-like nature of today's food supply system, and also of the fact that in recent decades the power of non-agricultural players has increased at the expense of agricultural players.

The self-regulating effect of markets cannot be taken on faith in this regard. Quite apart from developments that can have a disruptive effect on markets (such as increasing concentration and the measures countries take to secure the supply of essential raw materials), market players will have to respond to problems and trends that are closely interrelated. Many signals emerge, but not all of them resonate equally loudly, and it is far from certain that the markets will respond to them in time.

All the players in the network – whether businesses, consumers or governments – must deal with information issues and uncertainties. Businesses can only see part of the network. Consumers often don't know where the various ingredients of the food they consume come from, never mind the social and ecological consequences of the production of their food in other countries. Governments also face information issues. Moreover, where the scale of the problem extends beyond their jurisdiction they have limited leeway to intervene.

The food net is a complex network that cannot be managed from one place – not from The Hague, not from Brussels, not from the WTO in Geneva and not from big supermarkets or food manufacturers. To promote a robust food net that will deliver healthier and more sustainable products is a challenge that the public, businesses and governments must face together. In Chapter 6, we discuss how this challenge can be addressed and what role the different parties can play in this process.



## 6 PROMOTING SOCIETAL INTERESTS WITHIN THE FOOD NET

### 6.1 INTRODUCTION

The transition towards a robust food net that provides healthier and more sustainably produced food will need to be brought about largely through changes in the business world and in consumer behaviour. However, governments will need to take steps too. In many cases, to enable proper collective action, agreements within supply chains have to be reached. The question therefore arises which parties can take appropriate initiatives and how they can encourage other parties to take responsibility too. Which roles should be attributed to companies and to citizens, and which tasks wait for governments?

What role citizens, businesses and governments ought to play in promoting the interests of society as a whole is a normative, political question. However, the question also has an empirical component: do the parties that are supposed to take responsibility for promoting a particular societal interest actually have the capacities for doing so (WRR 2000; WRR 2012)?

This chapter will address this latter, empirical question. Against the background of the characteristics of the food net, it discusses the opportunities and limitations that businesses, citizens, and government encounter when it comes to promoting societal interests concerning food. The chapter deals successively with the roles of businesses (section 6.2), citizens (section 6.3), and governments (section 6.4). Section 6.5 summarizes the governance challenges that lie ahead.

In discussing the issues considered in this chapter, it is useful to distinguish between various types of interests.

- When companies decide to collaborate because they have a shared interest (that motivates them to e.g. establish a cooperative or to coordinate their activities through supply chain management or shared product standards), we will speak of their *collective interests*.
- The term *societal interests* will be used for interests that regard society as a whole, or at least a substantial portion of society.
- If a societal interest is not adequately cared for by private parties alone, politics can decide that government should promote or secure this interest. It is then considered to be a *public interest*. In that case, government will take (*final*) *responsibility* for promoting this interest. Subsequently, politics will have to determine how the *operational responsibilities* for promoting this interest

should be allocated: to the government itself, or to private parties that will carry out their activities on the instructions of government, or under its supervision (WRR 2000; WRR 2012).

## 6.2 THE ROLE OF BUSINESSES

Entrepreneurship entails responsibilities towards society. After all, businesses operate on the basis of a *licence to produce* granted by government and a *licence to operate* bestowed on them by society. Businesses are becoming increasingly conscious of the latter and integrate ‘corporate social responsibility’ into their business models. Increasingly, their stakeholders – such as consumers, employees, financiers, and NGOs – impose demands on how companies should operate socially responsibly. Moreover, the weight of the public reputation of companies has increased in the past period (WRR 2012). Negative media coverage can quickly pose significant problems for companies (in particular for listed ones), to the point of even endangering the continued existence of enterprises that in other respects are financially robust. All of this puts pressure on businesses to take societal interests into account.

A part of the companies in the agri-food sector have already taken explicit steps to contribute to societal interests, or have formulated their intention to do so. They have started to operate more sustainably or have joined forces with other companies to serve societal interests (for example to enhance food safety). They may do so partly out of a sense of social responsibility, but also because this serves their well-understood self-interest.

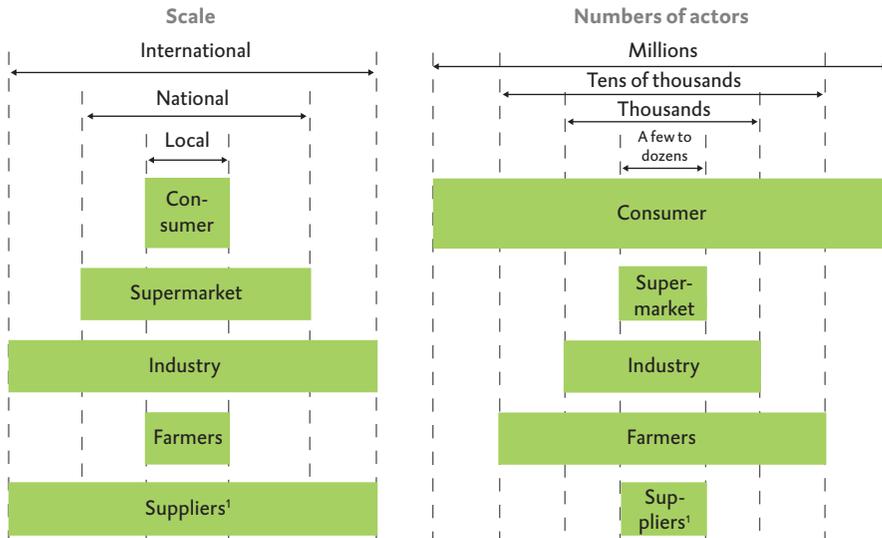
In some cases, the interests of individual businesses, or their collective interests, run parallel to societal interest. For example, reducing wastage in a company’s operations and increasing its resource efficiency, serve both the interests of society and of the company itself. The same applies to measures to improve food safety. Here, the company’s own interest is obvious: no food company wants to become involved in a food safety scandal as it may directly impact product sales, even for companies not directly involved in the incident. Even the suggestion of being implied in a food safety incident can have its consequences. In 2011, for example, the suspicion – which later proved to be incorrect – that Dutch cucumbers were the source of the EHEC outbreak led to a major fall in sales of cucumbers throughout the EU (KLIS 2011).

In other cases, convergence of companies’ self-interest with societal interests is less obvious. Wastage within one’s own company is a cost item, but wastage by its buyers will likely increase a company’s turnover. As a consequence, reducing consumer waste (e.g. by offering its products in smaller portion sizes) is not necessarily in the food industry’s own interest. Also many of the issues that would be

welcomed from the point of view of public health – eating less, no soft drinks machines in schools – are at odds with the food industry’s interests. Likewise, the use of sugar and salt in processed products promotes sales, but the abundance of sugar and salt in processed food presents a significant public health risk. Other societal interests affect only the long-term interests of companies. Non-sustainable production by suppliers may not lead to problems for a company in the short term, but it may well do so in the long run if it results in a gradual drop in the availability of resources and higher prices. To hedge that risk, companies have started to secure the long-term continuity of their supply of resources by means of mergers, acquisitions, or other forms of vertical integration; obviously, that does not automatically contribute to sustainable use of global resources. It is therefore not possible to give an overall positive or negative answer to the question of whether societal interests such as ecological sustainability and public health are adequately served by business and industry. The answer must be given on a case-to-case basis.

The leeway that companies have for taking social responsibility depends on a large number of factors. Size and financial factors play an important role. To take account of societal interests, often requires investments. Where intense competition narrows their margins, their resources to do so will be limited; in that situation, investments will be allocated primarily to cost reduction and economies of scale, to secure their short-term survival. With respect to size, the business community involved in the production, processing, and distribution of food is extremely varied. In some food market segments many thousands of small businesses operate, while in other segments a few big companies dominate the market. Some companies operate locally or nationally, others globally. Ownership relationships in the sector also differ considerably, ranging from listed companies to – still – many family businesses and cooperatives. It should be noted however that some of the latter have in fact developed into multinationals. In Figure 6.1, the left-hand column shows the geographical scale on which various parties within the Dutch food net operate, while the right-hand column shows the number of parties involved.

**Figure 6.1 Scale and numbers of parties within the Dutch part of the food net**



<sup>1</sup> Seeds, fertilisers, and animal feed

The position of the company within the supply chain also matters. In many cases, production of more sustainable and healthy products will require cooperation throughout the chain. Establishing such cooperation – as we saw in Chapter 5 – requires long-term relationships, an understanding of interdependencies, mutual trust, a shared vision, and companies that will take the lead.

### 6.2.1 POWER WITHIN SUPPLY CHAINS AND NETWORKS

What type of company is in a position to take the lead in establishing cooperation aimed at promoting collective or societal interests? To answer that question, we need to understand the power relations within supply chains and networks.

There are major differences in economic power within the food net, associated with the amount of concentration within market segments. In various markets, one finds oligopolies (i.e. only a small number of suppliers) or oligopsonies (i.e. only a small number of buyers). However, apart from its position on the market, a company's power also depends on its position within the supply chain. The strategic position of the purchasing organisations of supermarkets, for example, has given them a dominant position. Although supermarkets compete fiercely with one another on the consumer market, they jointly form a hub within the

supply chain through which a very large proportion of goods has to pass on its way to the consumer. That position might allow supermarkets to exact contracts on their own terms with the suppliers that precede them in the chain.

A number of studies have pointed to the increasing dominance of supermarkets within supply chains (see Chapter 2). Also SMEs frequently express concerns about this trend. The negotiating position of suppliers is said to be under so much pressure that acceptable terms can no longer be agreed (Van der Zeijden 2009). The European Parliament has also drawn attention to the power of retailers (EP, Written Declaration No. 0088/2007). The EU's European Economic and Social Committee (EESC 2013) has found that a limited number of supermarkets dominate the market in all the Member States. In the opinion of the Committee, one cannot speak about contractual freedom in their relationship with their suppliers.

However, there are also opposing views. Based on a study of pricing for a limited number of products (potatoes, onions, cucumbers, peppers, apples, bread, and eggs), the Netherlands Competition Authority (NMa 2009) concluded that between 2005 and 2008, Dutch supermarkets had been unable to unilaterally increase the prices for these products in order to generate profits at the expense of producers and consumers. The fierce competition on the consumer market means that supermarkets cannot automatically convert their crucial position in the food net into higher margins. According to the NMa, the fact that supermarket prices are much higher than the prices asked by producers can be largely explained by the high costs incurred by wholesalers.

All in all, a mixed picture emerges. In a detailed discussion of the matter, De Hoon (2013) notes that there is much talk and many complaints about purchasing power but that most of what is said and written is based on subjective experience, suppositions, and estimates of probable consequences that only to a limited extent are supported by empirical research.

But a lack of empirical research is not the only problem. What definitely also plays a role is that 'power' is a contested concept that is difficult to operationalize (Lukes 2005). Although competitive relationships and their effects on consumer welfare – the aspects that concern competition authorities – are of course an important indicator of economic power, power also has many other dimensions. It is shown not only by what a party does, but also by what it refrains from doing, attempts to prevent, or is able to exclude from discussion because engaging in certain activities is not consistent with its interests (Lukes 2005). The EESC notes, for example, that price competition on the consumer market means that social and environmental effects are accounted for insufficiently. Supermarkets feel pricing pressure or consumer concerns for food safety more strongly than the pressure that the natural or social environment imposes on farmers. Supermarkets will be more likely to

impose requirements concerning environmental effects of farming activities if negative publicity about them has direct adverse effects on their own image (Van der Burg and Overbeek 2012: 8). Moreover, there are also effects other than those that express themselves in prices and margins. The purchasing power of the supermarkets can also lead to bankruptcy and hence loss of suppliers, to less innovation, and to a drop in quality and variety of supplies and products (De Hoon 2013).

### 6.2.2 COOPERATION AND THE POWER OF SUPPLY CHAINS AND NETWORKS

Cooperation that focuses on promoting collective or societal interests within a supply chain often takes the form of standards for products and processes. Such cooperation can be very effective, but it can also lead to explicit or implicit exclusion of third parties. Besides the power *within* supply chains, we also need to consider the power *exerted by* such chains and networks.

Castells (2011) distinguishes between four different types of power (see insert). The first two relate to the power that individual companies may have over other companies participating in a supply chain. The other two forms of power relate to something else, namely the power exerted by a supply chain (or a network of supply chains) as a whole on parties that are not yet included.

#### Four types of supply chain power

##### Power *within* networks

- *Network-making power*: the power to program specific networks according to an actor's own interests and values ('programmers'), and the power to connect and ensure the cooperation of different networks by sharing common goals and combining resources while fending off competition from other networks by setting up strategic cooperation ('switchers').
- *Networked power*: the power of social actors over other social actors in the network. The forms and processes of networked power are specific to each network.

##### Power *of* networks

- *Networking power*: the power of the actors and organizations included in the networks over actors and organizations who are not included in these networks.
- *Network power*: the power resulting from the standards required to coordinate social interaction in the networks. In this case, power is exercised not by exclusion from the networks but by the imposition of the rules of inclusion.

Source: Castells 2011

'Network power' is a result of an increasing number of parties pursuing (implicitly or explicitly) the same standards. These standards can be imposed in a range of different ways: by a single powerful party (in Castells' terminology a 'programmer') or by companies jointly. Another possibility is that they develop by accumulation of numerous small decisions taken independently of one another, resulting in path dependencies. Also governments or international authorities may impose standards. If public authorities concern themselves with standards explicitly – for example by way of the *Codex Alimentarius* – these are often established within communities of experts that are largely out of the public eye (Bush 2000; Prestre 2003; Lee 2009; Millstone 2009).

Whether created explicitly or implicitly, once they are introduced and the number of actors that comply with them grows, standards exert power – *network power*. A party that fails to comply with the standards has the 'choice' between complying with the standard or becoming excluded and isolated (Grewal 2008). There is no one that compels that party to comply; there is merely the threat of becoming isolated. This type of power is characteristic of the globalising world. Although practically the whole world now accepts English as the language for international communication, nobody is actually forced to learn it, but those who do not adapt are fated to become isolated. The classic concept of power does not cover this type of power sufficiently. That concept concerns relationships within which one actor has the ability to impose its will on others (Weber 1972). That is not the case with 'network power': in that case, actors comply to a standard because the price of not doing so – isolation – is too high. Whereas in a case of the classic concept of power a party with power knowingly and deliberately restricts the freedom of other actors, in the case of 'network power' it is the parties themselves that decide to comply with the standard, although they may do so reluctantly.

The introduction of standards may be motivated not only by collective interests (such as reducing transaction costs and protecting reputations) but also by the intent to achieve objectives that are desirable from the perspective of societal interests. Hence, one has to answer not only the question whether competition is restricted because market parties are excluded, but also whether the effects of these standards are consistent with the interests of society. This requires not only assessing whether the criteria of current competition law have been met, but also whether apart from collective interests (also) societal interests are served. And even where it is concluded that respectable societal interests are being pursued, consideration should be given to a potential downside. Standards, logos, and certification marks have two faces: they may be an expression of corporate social responsibility, but their flipside is that they give buyers power over suppliers (Spence and Bourlakis 2009: 293).

An example of this is the role of supermarkets in developing requirements (over and above those required by law) related to hygiene, the environment, and food safety (Dolan and Humphrey 2000). Companies that do not meet the standards of GlobalGAP and the BRC are excluded from supplying the participating supermarkets. This reduces the risk of reputational damage for the supermarkets and contributes to the societal interests of environmental protection and food safety, but it also restricts access to the market for some suppliers. In developing countries, the introduction of standards is therefore sometimes seen as an implicit form of protectionism.

### The power of certification marks

The standards and certification marks for sustainability, health, and food safety are often the result of lengthy negotiations between companies. They must agree on the conditions under which they will participate and on the details of the societal interests (Van den Burg and Overbeek 2012: 37). In this process, some companies are included and others excluded (Aruoma 2006: 121; Young and Hobbs 2002: 432). The requirements set by the chain are often at the expense of small businesses (Spence and Bourlakis 2009: 294). That criticism applies, for example, to the Marine Stewardship Council's 'MSC ecolabel', whose high accreditation costs restrict participation to large companies. As a consequence, in 2010 only one single fishing company from the developing world was MSC-certificated (Jacquet et al. 2010).

*Network power* therefore requires a broader assessment framework than what we encounter in many economic analyses and in current competition legislation. To properly assess the competitive relationships in and around supply chains, we need to look not only at the enterprises that occupy powerful key positions in those chains but also at the *network power* that the standards that have been imposed exert.

Where cooperation leads to standards, they should be assessed for their substantive effects – do they actually serve the interests of society? – and their exclusionary effects. That may require investigating the power that some companies – as 'programmers' – have *within* the supply chain. But in assessing exclusionary effects, we need to look beyond the behaviour of individual parties, because standards can also develop stealthily, in day-to-day practices that result in path dependencies that subsequently acquire formal status in contracts. So in addition to knowing the behaviour of individual parties within the supply chain, knowledge is needed about the backgrounds, genesis, and the characteristics of standards. Is the network that has developed around a standard *compatible* with other networks? Is it *open* to new participants? Can the standard be *adapted* gradually to the

interests of outsiders and to societal interests? Does the network have adequate procedures for resolving disputes (Grewal 2008; cf. also Ostrom 1990 and WRR 2012)?

### **6.2.3 TO CONCLUDE**

Initiatives aimed at promoting societal interests may be expected particularly from companies that have a great deal of power within supply chains. After all, they are in a position to encourage other companies to make the necessary adjustments. In practice, they may fail to do so, meaning that societal interests are not sufficiently allowed for. With the public interest in mind, governments should then enforce the changes that are considered necessary, not only at these particular companies but also elsewhere within the supply chain.

Cooperation within supply chains also leads to new types of power due to the exclusionary effects of standards. From a societal point of view, they should therefore be assessed for both their actual content and these exclusionary effects. Public competition legislation still takes too little account these effects. NGOs are more vigilant. However, they lack the capacity to introduce new standards on their own. To introduce them, or to adapt established standards, they have to encourage companies that do have the necessary power to team up. They might do so by addressing the reputation of these companies, or by putting pressure on them by way of consumer activism.

## **6.3 THE ROLE OF CITIZENS/CONSUMERS**

Besides companies, also citizens can contribute to promoting societal interests. As consumers, while making purchasing decisions, they can weigh not only the price, quality, and convenience of a purchase, but also values like health and sustainability. By displaying statutory product information, logos, and certification marks, product packaging often already informs them on these values. They are introduced not only to serve the citizen's individual interests (e.g. health). It is widely assumed that signals from the consumer market will also encourage producers to innovate and to offer food that is healthier and produced more sustainably.

The ability of citizens to promote societal interests via their purchasing power has its limits, however. It requires them to be responsive to a lot of – often not easily comprehensible – information on packaging, and to be prepared to devote time and attention to this information when making purchases. Statutory product information is often presented in rather technical terminology. And who or what is behind a given logo or certification mark is often not clear. Neither is it evident to

what extent consumer choices lead to lasting changes elsewhere within the supply chain. Apart from consumer preferences, producers have to take into account many other considerations.

Apart from their purchasing behaviour, citizens of course have numerous other opportunities to express their preferences. They can show them via political organizations and at the ballot box, in traditional and the new social media, and by supporting civil-society movements and NGOs. Current analyses, however, attach increasing importance to the aforementioned role of 'consumer'. Reference is being made to 'active consumers', 'citizen consumers', and 'political consumers' (Clarke et al. 2007; Spaargaren and Oosterveer 2010). Blending the role of citizen and consumer reflects our times, prominent sociologists have argued. As the power of national, local and traditional authorities is waning, self-actualisation and personal identity has become increasingly framed in terms of consumption and lifestyle, rather than in traditional cultural and political terms (Giddens 1991; Giddens et al 1998; Hertz 2001).

However, to speak about 'the consumer' is rather misleading. Empirical research into consumer behaviour shows consumers' choice behaviour to be a multi-layered, varied affair (Dagevos and Sterrenberg 2003). Some consumers are far more aware than others of the societal interests involved in food. Moreover, as citizens, people tend to put higher requirements on products than, as consumers, they are prepared to pay for in the supermarket (TK 27 232, no. 2: 21). And even if citizens become increasingly aware of the societal interests that are at stake, the effects of that awareness may differ considerably from initial expectations. For example, De Bakker and Dagevos (2010) point out that apart from vegetarians and meat-eaters a new group of consumers has emerged, 'flexitarians', that is, people who alternate meat and vegetarian meals for environmental, health, or animal welfare considerations. They supposedly account for about a third of all Dutch consumers. At the same time, De Bakker and Dagevos observe that the total meat consumption – in terms of volume – has remained more or less constant.

That citizens, in their role of consumer, could play a major role in bringing about more sustainable food production, and healthier foods and dietary patterns, is by now widely recognized. Various civil-society organisations and NGOs therefore focus on this in their publications and public campaigning. Nutritional information provided by or on behalf of governments also contributes to this.

However, influencing consumer behaviour exclusively through mass media campaigns has turned out to be difficult. Despite years of efforts along this way, the market shares of healthier and more sustainably produced products are still modest. To a considerable extent, the government's hands are tied. Governments must exercise restraint when it comes to influencing the role of consumers.

After all, consumers are also citizens who quickly perceive overly intrusive government action as unwanted interference in their private lives. If the government restricts their freedom of choice for food products or considers other methods – for example, taxation – to reduce the consumption of certain types of products, the likely response is that this constitutes patronising meddling by a ‘nanny state’. Despite what leading sociologists report regarding the importance of the ‘active consumers’, ‘citizen consumers’, and ‘political consumers’, politically the citizen/consumer dichotomy constitutes a strong normative barrier to actively promoting the role of citizens/consumers.

### 6.3.1 ‘NUDGING’ PEOPLE’S CHOICES

The limited effectiveness of public campaigns to promote sustainability and healthy dietary patterns (and in doing so, to also encourage producers to make necessary adaptations in their production processes and products) has led to a search for other methods.

Inspired by developments in behavioural economics and psychology, Thaler and Sunstein (2008) have highlighted the potential of ‘nudges’, i.e. slight ‘helping hands’ aimed at getting consumers to change their behaviour through ‘choice architecture’. The latter may mean, for example, that the shelves in a shop or supermarket are arranged in such a way that the ‘sensible’ choice is also the easiest or most eye-catching one (Tiemeijer et al. 2009; RLI 2014; WRR 2014). By making use of this method, government is still exercising restraint. After all, the consumer’s freedom of choice is not being restricted because the available range of products on offer is not being limited and the consumer is not being deprived of the option of making other, less sensible choices.

Nudging has been greeted by policymakers as an exciting new idea, but in the retail world, choice architecture has been an established practice for many years in the form of product placement and sophisticated routing schemes. If governments start introducing policies aimed at nudging, one should perhaps speak of ‘counter-nudging’, as in many cases these policies serve *de facto* as a corrective to these established practices.

The current interest in nudging focuses mainly on individual choice behaviour in settings of only limited size, for example a shop or a company cafeteria. However, choice architecture can comprise more than this. It can, for example, be applied when structuring the social environment – such as neighbourhoods and public spaces (e.g. railway station concourses). Policies aimed at combating overweight and obesity call for a system-oriented approach on many levels (Huang et al. 2009). In the field of public health, in fact, that is not anything new. A coordinated

approach has already led to significant advances in this field, with policies focusing not only on the information provision and education, but also on the design of neighbourhoods and on building regulations for homes and businesses.

### **6.3.2 CONSUMERS AND SUPPLIERS: A MULTIDIMENSIONAL RELATIONSHIP**

In the individual choice behaviour of consumers, many levels and dimensions play a role. Businesses are well aware of this, with supermarkets attempting to influence choices through advertising, product placement, and store layout. They also realise that customers can express their preferences in other ways than by leaving products on the shelf or by switching to a competitor (what in terms introduced by Hirschman (1970) is called the ‘exit option’). They can also express their preferences verbally, for example in the form of a complaint (the ‘voice option’). In many cases, companies will allow for this by means of market research and by organising focus groups in which customers can have their say about products. Taking its customers’ voice option seriously enables a company to understand the factors that lead to complaints. It can, for example, help in understanding which changes need to be implemented in the company’s behaviour or its products in order to retain its customers. Businesses also invest explicitly in customer loyalty, through advertising, and branding, and by closely guarding their reputation. They realise that once a customer has left them, it will be very difficult to get him or her back. As Hirschman has shown, the long-term survival of the relationship between a company and its customers – and thus also the company’s survival – depends on the complex interplay of ‘exit’, ‘voice’, and ‘loyalty’ options.

However, discussions about the role of citizens/consumers in promoting societal interests often focus only on ‘exit’ and ‘voice’. As political actors, citizens are allocated the ‘voice option’ and as consumers the ‘exit option’. The triptych of ‘exit’, ‘voice’, and ‘loyalty’ goes beyond that dichotomy. We better conceive the relationship between suppliers and customers – and thus the role of consumers as network players within the food net – in terms of the interplay of three dimensions: ‘exit’, ‘voice’, and ‘loyalty’.

Encouraging more socially responsible consumer behaviour must therefore be achieved by combining those three dimensions. Consumers’ ‘exit options’ can be expanded by encouraging the supply of alternative products. The likelihood of consumers using the ‘voice option’ to encourage businesses to adopt socially responsible behaviour can be increased through information and education, and by raising public awareness. ‘Loyalty’ can be supported by branding, clear logos, and certification marks that help to make an easily visible distinction between healthier and more sustainably produced product range and the products that don’t meet these criteria.

In each of these dimensions initiatives are taken. However, specific government policies tend to focus exclusively on one specific dimension. For example, the innovation policy of the Ministry of Economic Affairs encourages alternative products, while the policies of the Ministry of Health, Welfare and Sport and of subsidised institutions such as the Netherlands Nutrition Centre focus on information provision. Meanwhile, logos and certification marks are largely in the hands of semi-public and private organisations. However, a system-oriented approach requires institutional design that tackles these dimensions in a coordinated way. That a coordinated, more broadly formulated integral policy can be effective has been shown by the remarkable, long-term health improvements that have been achieved in Finland (Puska et al. 2009; Puska et al. 2012; Steering Group for the preparation of the food strategy in 2010, Baril 2013).

### **6.3.3 TO CONCLUDE**

Besides businesses, citizens share responsibility for issues with societal interest. However, as consumers, citizens are guided often by convenience, price, and habit only – a pattern of behaviour that is encouraged by a plethora of advertising.

The discussion of how NGOs and government can encourage more responsible behaviour among consumers is limited by the focus on individual choices. To go the extra mile, discussions should be focused on all dimensions of the relationships between consumers and suppliers and the choice environment. Policymakers should account for the fact that consumers too are players within the food net, linked to and dependent on other players in the food net.

## **6.4 THE ROLE OF GOVERNMENTS**

If a societal interest is deemed to be not adequately promoted by citizens and businesses, politics may decide to take on responsibility for promoting this interest, making it a ‘public interest’. Subsequently, it has to be decided what will be the best way to do so. Public interests can be promoted by government itself (directly, or by way of its agencies, independent administrative authorities, etc.); but the operational responsibility can also be allocated to private parties who operate under the guidance of government regulation and oversight.

However, the complexity of the food net restricts the options of governments. Many flows of materials and information cross national borders and thus exceed national jurisdictions. Within the food net, moreover, players operate at different scales. As Chapter 5 showed, the food net is characterised by a multitude of dependencies and by the interconnectedness of production, processing, distribution, and consumption. This complex determines how, where, and what food is produced and consumed, and what consequences this has for society and nature.

As a result, governments experience a wide range of *information problems and uncertainties*, and they are confronted with *divergent scales* on which policy issues present themselves.

#### 6.4.1 INFORMATION PROBLEMS AND UNCERTAINTIES

The food net is complex and is constantly changing. As a consequence, all stakeholders face information problems. That includes governments. When designing policies, they furthermore have to face a variety of uncertainties.

As we have noted in Chapter 3, all forecasts that form the basis for signalling the key problems listed in that chapter are surrounded by numerous uncertainties. Demographic projections of population growth and urbanisation, the extent to which other cultures will take on Western dietary patterns, the size of available reserves of resources, the effects of climate change, and the decline in biodiversity – all of these are based on data and models that display various – known and no doubt also unknown – imperfections. That obviously also applies to the scenarios that form the basis for expectations regarding geopolitical developments and other risks that threaten the robustness of the food net.

Moreover, complex systems such as the food net and the ecosystems on which primary food production relies also entail inherent systemic risks that are virtually impossible to predict. The multitude of interdependencies leads to nonlinear effects and to tipping points, that is, situations where a small change can cause a previously relatively stable equilibrium to collapse, with unpredictable consequences (EC SCAR 2011; Goldin and Mariathasan 2014). We know that such tipping points can occur, but where, when, and to what extent they will manifest themselves is almost impossible to forecast by means of modelling.

#### 6.4.2 DIVERGING SCALES

In addition to these uncertainties, governments have to face a limited room for manoeuvre. In recent decades, the activities that form the basis for the food supply have become both increasingly geographically dispersed and increasingly interconnected. As a result of this twofold trend, problems present themselves at *diverging scales*. The production, processing, and distribution of food often involve many countries, sectors, and international markets. The interests at stake often extend beyond the jurisdiction of national governments, and require appraisal and coordination at international level.

The variety of scales limits governments' abilities to take decisive action. In a globalising world, this is of course a problem that governments face in other fields as well (WRR 1998), but it is pre-eminently the case in the domain of food supply. The food net and the societal and public interests that are at stake cut through numerous judicial, geographical, institutional and temporal scales, and involve a

wide range of stakeholders, sectors, and policy fields. For many issues, it is also far from obvious at what level they present themselves, and which stakeholders are most involved. This leads to complex collective action problems: who can and should identify, articulate, assess and deal with which problems – and how (WRR 2012)? How can values and interests that do not directly affect local or national interests be expressed? Who, for example, is to represent the interests of future generations, or the value of biodiversity? Will they be the same parties who represent the direct national or economic interests, or is it better to invite other, designated parties to represent them?

### Collective action problems at differing scales

Deforestation in South America to make way for large-scale soy bean plantations may appear at first sight to be a (major) local problem. But that is not the case. The problem is due in part to changes taking place far away from the rainforest, namely in Europe, where the demand for soy is increasing. Soy enters the Netherlands via the port of Rotterdam and is an important factor behind the expansion of intensive livestock farming. The intensive livestock farming sector produces an abundance of relatively cheap meat that is readily purchased by European consumers. At what level should this complex of interdependencies be discussed, and what should be placed on the agenda? Is this a problem created by consumers, who buy too much meat at a price that is too low? Or is it a problem created by the Dutch government, which encouraged the expansion of the livestock sector? Is it an EU problem, because it was the EU that – in the 1962 GATT negotiations – accepted a zero rate for cereals substitutes – and thus for soy – in exchange for import duties on cereals? Is it a problem created by the Brazilian authorities, because they have paid too little attention to the ecological importance of the rainforest? Or is it an international problem? What should be the forum for discussing this multifaceted problem, and who should be involved in the discussions? Or is it a problem for all of these parties, and will they start pointing the finger at one another when solutions are discussed, to enjoy the advantages of ‘freeriding’?

#### 6.4.3 TO CONCLUDE

Within the food net, governments are confronted with a wide range of governance problems. They must orient themselves and formulate policies under many uncertainties. Within their own jurisdiction, they can hold individuals and companies accountable for their activities if these are detrimental to public interests, and they can encourage behaviour that is desirable from a public point of view through information, education, and the provision of facilities. But in the case of the food net, activities, interests, and problems quickly extend beyond the territory over which a government has jurisdiction. Not only do many problems need to be tackled at international level, but in many cases they have to take the great variety of actors and scales into account.

## 6.5 CONCLUSIONS

The transition to a robust food net that provides healthier and more sustainably produced food will require a major effort on the part of businesses, citizens and governments. However, the options open to companies and citizens for helping to promote societal interests are restricted because of the various reasons outlined above. That also applies to governments.

The room for manoeuvre of governments is limited by information problems and scale issues. Governments have to deal with networks of both geographically dispersed and interconnected activities; in these networks, the location where problems manifest themselves does not necessarily coincide with the location where the problems originate, nor is it automatically the location where policies can be implemented effectively. To meet the three major challenges in the domain of food described in Chapter 3 will require taking the situation governments finds themselves in into account. A reorientation in *policymaking* is required.

Government policies aimed at promoting a robust food net that provides healthier and more sustainably produced food will more than in the past need to take account of the interconnectedness of production, processing, distribution, and consumption. The development of the food net and the challenges that are ahead call for better coordination of policy portfolios between ministries and for associated changes in policy information. In the process of formulating policy, governments will need to factor in the opportunities and limitations of businesses and consumers within the food net. This will require a better understanding of the position of companies within the supply chain and the opportunities to generate positive effects elsewhere within the supply chain by targeting certain players. In addition, a realistic, multi-dimensional overall vision is required regarding the role of consumers. The increased role of product and process standards and of other forms of cooperation throughout the supply chain requires adjustment of established competition legislation and free trade policies.

The diverging scales and the interconnectedness of problems implies that policies soon exceed the jurisdiction of national states. International coordination is thus required; this means complex collective action problems. Because a wide range of interests are at stake and because problems can be formulated at very different levels, even reaching agreement on how the problems at hand should be defined, can present a major problem.

The options for governments, businesses, and consumers to bring about changes are thus subject to restrictions. At the same time, there are major uncertainties regarding the various problems and precisely when and how they will become urgent. All of this implies a different role for government: rather than imagining

itself in the control room of society, governments will need to work on enabling the food net itself to be sufficiently resilient, so that it can adapt to changing conditions and will be able to resist shocks.

Complex systems such as the food net do not become resilient by having a central director who oversees the system and encourages, facilitates, or enforces changes if necessary. Such systems are resilient because of three specific *system features*:

1. *Variety, redundancy, and modularity*: to ensure that, if subsystems fail, alternatives are available and local disruptions will not threaten the functioning of the system as a whole.
2. *Effective management of resources*: because no system will be able to function when the natural resources and scarce raw materials required for its functioning are exhausted, no matter how resilient the system may be in other respects.
3. *Learning capacity*: this allows the system to identify changes in circumstances in time, and to adapt the system to function under new conditions.

Government policy needs to focus on creating the necessary conditions for attaining these three features and policymakers will need to remember that they are *system features*. The variety required will therefore come not only from the diversity of suppliers and customers within markets – the primary concern of competition policy – but also from the diversity of flows of materials. Prudent management of resources also needs to be viewed from that perspective, with a distinction being made between non-renewable resources and those that renew themselves – at least as long as depletion remains within certain limits. Capacity to learn requires adequate information and room for experimentation and innovation. Here too, policy must provide the necessary room.

The transition to a food net that produces healthier and more sustainably produced food will require changes on the part of businesses and of citizens/consumers. It also demands a policy reorientation on the part of government.

The *policy* challenge that the food net entails is therefore a double one:

1. Policies need to be established that acknowledge the interdependencies between production, processing, distribution, and consumption. This implies a coordinated approach to aspects that are now often dealt with separately. It also means approaching parties as network players. Policies will need to allow for a realistic view on the opportunities and limitations of the various parties within the food net.
2. More needs to be done to create a food net that is resilient in itself and that adapts to changing circumstances. This implies promoting variety in material flows, prudent management of resources, advancing learning capacity, and adequate information provision.

In order to consider what changes this challenge implies for the Netherlands, Chapter 7 outlines existing policies. Based on the challenges set out above, Chapter 8 will offer policy recommendations for government.

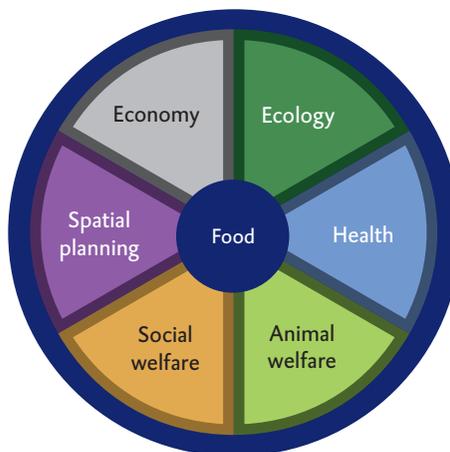
## 7 MAIN CHARACTERISTICS OF DUTCH POLICY

### 7.1 INTRODUCTION

Public authorities have been involved in securing and regulating the food supply for long (De Haas 2013). Initially, cities took charge of securing the food supply, by overseeing food markets and by developing relationships with farming areas. Later on, national governments took the lead, in particular by giving shape to what became known as ‘agricultural policy’. After the Second World War, the number of bodies involved in the governance of agriculture and food trade has extended step by step, both nationally and internationally.

Long-term, systematic government support has substantially contributed to attaining the present prominent position of the Dutch agri-food sector (WRR 2013). Initially, Dutch agricultural policy primarily focussed on improving agricultural productivity. Both the domestic food supply and Dutch exports benefited from the coordinated, widely shared commitment to this aim. However, although remaining high on the policy agenda, increasing productivity is no longer the only consideration. Policymakers also need to address other issues, as food production and consumption play an important role in spatial planning and ecological issues, and have implications for public health and for social and animal welfare (see Figure 7.1).

**Figure 7.1** Food-related issues



Food-related issues touch on divergent questions, considerations and policy domains. An explicit ‘food policy’ – in the sense of a coherent, distinct policy domain – does however not exist. Instead, food-related issues are distributed over various policy domains such as agriculture, public health, environment and trade.

In this chapter, we first consider a number of general traits that characterise the Netherlands’ policies that relate to food (section 7.2). We then look at how government policy addresses the challenges of ecological sustainability (section 7.3), public health (section 7.4) and robustness (section 7.5), to finish the chapter with a conclusion (section 7.6).

## 7.2 CHARACTERISTICS OF CURRENT POLICY<sup>1</sup>

As is the case in many other policy domains, the Dutch food-related policies are highly path dependent. The original aims – achieving productivity gains in agriculture, securing a sufficient supply of food, and guaranteeing affordable consumer prices – have been constant policy objectives. But new accents have emerged, partly due to the environmental effects that became apparent in the 1970s and 1980s, and to the food safety crises of the 1990s and beyond. Yet, a distinct ‘food policy’ – in the sense of a coherent, distinct policy domain – did not develop. Food related policy issues are distributed over a variety of policy domains, including agriculture, trade, food safety, public health and spatial planning. That makes it hard to describe the characteristics of the policies on food-related issues in general terms. We nevertheless attempt to do so in this section, by highlighting three characteristics. The first is that food-related policies are shaped at diverging levels of governance. The second is that private regulation plays an important role. The third is that policy relating to production issues, policy relating to matters of consumption, and the governance of the flows in-between, are worlds apart.

### *Diverging levels of governance*

Food-related policy is shaped institutionally at different levels of scale. Historically, the national government played a leading role. Lower tiers of government are also relevant. Municipal authorities bear part of the responsibility for overall public health; a number of municipalities have established programmes concerning healthier food. Provincial and local governments have also come to play an increasingly important role in spatial planning and land use, giving them more influence on issues relating to the places of production and consumption.

In addition, international governance has become increasingly important. Agricultural policy has been a prominent issue in the European Union for decades. Issues such as income support for farmers, food safety, the environment, and food labelling are for a large part dealt with at the European level (Meester 2009). Besides the European Union, international organisations such as the World Health Organisa-

tion (WHO) and the Food and Agriculture Organisation of the United Nations (FAO) are influential policy actors in the domain of food. The *Codex Alimentarius Commission*, an auxiliary of these two institutions, has been developing minimum food safety standards since 1962. These standards have become an important reference point for the World Trade Organisation (WTO) in dispute resolution procedures; they help to decide whether national regulations should be regarded as illegitimate obstructions to international trade or as legitimate safety standards (Schaik 2013: 293). The *Codex* was originally intended to provide minimum standards for food safety, allowing national governments to demand stricter norms. However, since the *Codex* has come to play a role in the WTO procedures, it has evolved into a system of *de facto* maximum standards that define the boundary between legitimate product requirements and illegitimate trade barriers (Pestre 2003).

### **Private regulation**

A second characteristic is the growing importance of private regulation (Van der Meulen 2011). In response to the internationalisation and growing complexity of food production, and the public's interest in more information about the origin of products, chain management has come to play an increasing role (see Chapter 5). Two very influential initiatives are GlobalGAP (previously EurepGAP, initiated by a group of major European retailers) and the British Retail Consortium (BRC). GlobalGAP focuses on four key issues: food safety, the environment, workers' conditions, and animal welfare. It is a private, voluntary standard based on third-party certification. As a business-to-business initiative, it goes mostly unnoticed by consumers. Because the major European supermarket chains apply the GlobalGAP protocols, its impact is nevertheless considerable. GlobalGAP standards not only affect the businesses that deal directly with supermarkets, but they also affect the suppliers downstream the chain. Therefore, the protocols exert a significant influence throughout the chain, leading producers all over the world to apply for certification.

Many individual sectors and segments within sectors have their own (also private) form of regulation. *IKB Vleeskalveren*, the integrated chain management system for veal production, is a case in point. Private parties have also set up certification systems for specific (half-) products or purposes. They include certification programmes for soy and palm oil and the Marine Stewardship Council's certification programme for fish. The Dutch meat sector makes use of the '*Beter Leven*' ('Better Life') certification mark.

Private regulation is not exclusively in the hands of commercial enterprises; often also NGOs play a role, although usually a modest one. They are involved in developing transnational standards and certification programmes. Nationally, NGOs are involved as well. For example, the Dutch Society for the Protection of Animals

(*Dierenbescherming*) initiated the 'Beter Leven' certification mark referred to above. NGOs also have an important signalling function; by initiating public discussions on certain aspects of the food system or on the conduct of businesses, they encourage self-regulation in the private sector.

### **Limited coherence**

A third characteristic of Dutch food-related policy is that the primary production, food consumption and the intermediate steps in the food net are dealt with in separate policy silos. The EU's common agricultural policy (CAP) and EU environmental directives address the primary production sector. The policies that address food consumption comprise regulation on labelling information, educational programmes and supermarket location policy. The intermediate flows between production and consumption are the subject of international trade regulation and food safety policy. How these different policy perspectives relate, receives only scant attention. Thus policy efforts to encourage a healthier diet focus mainly on the individual end product of the supply chain, and hardly on incentives at the start of the production chain or on the trajectories of flows in the food net that affect dietary patterns. As a result, the EU's common agricultural policy may encourage the production of certain foods, while national authorities advise the public to cut back on their consumption.

## **7.3 ECOLOGICAL SUSTAINABILITY**

Ecological sustainability involves a number of different factors: the use of land, resources and water, greenhouse gas emissions, and biodiversity. Ecological sustainability plays a role at the global level (for example greenhouse gas emissions and resource scarcity) and at the local level (for example local soil and water pollution). Therefore, it involves quite divergent policy issues. This section explains the main characteristics of the policies addressing these issues.

### **7.3.1 COMPLIANCE WITH EUROPEAN POLICY**

Much of the policy concerning ecological sustainability of food production is developed at European level. In response to growing concern about environmental pollution in the 1970s and 1980s, the European Community introduced a number of notable directives that were meant to limit the negative impact of agriculture on the soil, water and air. Among these are directives concerning nitrates and water (see insert).

## EU directives

Under the Nitrates Directive, the Member States are obliged to adopt four-year action programmes. An important part of these programmes are standards that set the maximum quantity of nitrogen that may be deposited on a hectare of soil each year. Deviation from these standards is only possible with the European Commission's approval. The aim of the overarching Water Framework Directive is to maintain the good ecological condition of surface water and ground water and to protect certain vulnerable areas by imposing specific standards and objectives. Each Member State must draw up a programme that describes how it intends to achieve these objectives (Knotters 2007).

The Netherlands explicitly refrains from imposing more stringent national standards than those required by the EU. However, because the animal population density in the Netherlands is higher than elsewhere, to meet the European standards the requirements at the level of the individual farm may be stricter than in other countries (SEO 2011). The high animal population density results in a surplus of nitrogen that is larger than in other EU Member States. This makes manure policy a crucial issue in the Netherlands.

Manure policy has already undergone several permutations. There was, for example, MINAS (the Minerals Accounting System). It was ingenious, but it led to dispersion of the pressure on the environment, rather than an overall reduction. MINAS also turned out to be susceptible to fraud. Currently, Dutch manure policy consists of a combination of tradable animal rights (maximum number of pigs and poultry that can be kept) and manure production rights. Mandatory manure processing was added to the system on 1 January 2014. This means that all livestock farms that generate manure surpluses must have a certain percentage of that surplus processed, with government determining the precise amount. Mandatory processing is meant to build a bridge between the reduction of water, air and soil pollution on the one hand and the creation of a favourable business climate for agriculture on the other, with the restrictions going no further than necessary to achieve the environmental objectives (TK 33 322, no. 3). Manure processing has been cited as the solution to surplus manure for a very long time, but it has been quite difficult to implement in everyday practice (Hees 2012). Making it mandatory is supposed to help resolve that difficulty.

Ecological sustainability – and specifically, biodiversity – has recently gained a more prominent place in EU's new common agricultural policy. To qualify for full income support, farmers must develop environmentally friendly activities. Thirty percent of direct payments to farmers will be linked to three 'greening' requirements. The first is crop diversification. Farms with more than 30 hectares of land

must cultivate at least three different crops. The second is that farms must conserve 5 percent of their land as areas of ecological interest, in other words land that is not used for agricultural production. That includes wooded banks, natural riverbanks and field margins, or land devoted to protein-rich crops. The third requirement is that the amount of permanent grassland at national level must not shrink by more than 5 percent compared to 2012. Organic farms receive the ‘greening’ premium without having to satisfy these specific requirements.

The agri-food sector is virtually exempt from the EU’s climate policy (and in particular from the EU Emissions Trading System for greenhouse gases). Global efforts to reduce greenhouse gas emissions focus mainly on energy issues. However, the associated policy of partly replacing fossil fuels with biofuels has driven competition for the use of agricultural land and has led to more volatility of food prices. At the same time, subsidisation of bio-energy production makes it more difficult to recycle waste flows in a more sustainable way. The Dutch are also looking closely at using manure and organic waste as a source of energy, even though this makes it more difficult to recover phosphates from manure.

### 7.3.2 FREE TRADE AND PUBLIC INTERESTS

The main reason that the Dutch government refrains from imposing higher standards than the EU requires is concern about the competitiveness of Dutch agriculture. Unless similar demands were to be made on imports, supplementary national requirements could undermine the competitiveness of Dutch firms. But any attempt to stipulate how import products should be produced, will quickly be seen as violating free trade policy.

Dutch agriculture is thus caught between the sustainability requirements of a local ‘licence to produce’ on the one hand and the international arena on the other (PBL 2012a; Commissie Wijffels 2001). The sector benefits from the EU’s internal market and international free trade, but that very trade policy also makes it difficult to make production as sustainable as society wishes and demands.

Agriculture was long the domain of ‘embedded liberalism’: government promoted foreign trade in agricultural products but also took protective measures to shield farmers against buffeting by international markets (Margulis 2012). In the 1980s and 1990s, however, global food trade was liberalised (to some extent), and by now free trade agreements (either within the WTO or bilaterally) have a major impact on food production, also in the Netherlands.

A significant turning point in that regard was the founding of the World Trade Organisation (WTO) in 1994 as the successor to the General Agreement on Tariffs and Trade (GATT). The WTO’s tasks extended beyond food, but agricultural products and support for farmers were an important part of the negotiations. It led to a

specific Agreement on Agriculture (AOA). International food governance shifted from the United Nations to the WTO, with both food trade and food aid henceforth being subject to WTO rules (Margulis 2012).

The trade in food products has a separate status in the WTO. The principle of free trade is key, and exceptions mainly concern food safety issues (Oosterveer 2005). There are two WTO agreements that are especially relevant to food trade: The Agreement on Sanitary and Phytosanitary Measures (SPS) and the Agreement on Technical Barriers to Trade (TBT). The SPS Agreement allows governments to impose trade restrictions in order to (I) guarantee food safety, (II) protect animals and plants, and/or (III) protect public health against the spread of diseases or against harmful additives, contaminants and toxins in food. Governments that do so must show clear scientific evidence concerning the risks posed by the banned products, and must base themselves on the *Codex Alimentarius*, the International Office of Epizootics (OIE; animal health) or the International Plant Protection Commission (IPPC; plant health). The TBT Agreement allows governments to apply their own national standards and rules to food product imports. Such restrictions on trade must, however, be based on scientific evidence, must only concern *product*-related properties, and must be proportional and non-discriminatory (Oosterveer and Sonnenfeld 2012: 69-70). Requirements that are not product-related but rather *process*-related are not allowed (Oosterveer 2005: 151). This qualification is significant because some societal objectives such as animal welfare and sustainability in fact concern food production *processes*. The issue is not confined to the Netherlands but has led to discussion elsewhere as well. For example, in the United Kingdom, the Conservative Party has called for animal welfare production standards to be included in WTO negotiations (Conservatives 2010).

The WTO trade negotiations have not been running smoothly for a long time. The most recent round began in Doha in 2001 and only produced a few successes in December 2013 during negotiations on Bali. Agricultural issues are one of the main reasons for the difficulty of the Doha Round (Margulis 2012: 6). Among other implications, the squabbling has shifted the locus of international trade regulation to bilateral trade agreements like the Transatlantic Trade and Investment Partnership (TTIP) the European Union and the United States are currently negotiating. Food is one of the most sensitive topics in these negotiations (Somers 2014; Jolly 2014).

### 7.3.3 DELEGATION TO PRIVATE PARTIES

The Dutch government has decided not to impose stricter national standards than the EU rules on ecological sustainability. Free trade agreements make it difficult to impose requirements on the ecological sustainability of import products. This means that government is not to the fore in the area of ecological sustainability;

the ball has been placed firmly in the business sector's court (TK 31 532, no. 118). But the Dutch government does encourage and facilitate initiatives from the business sector on sustainability.

A number of different platforms have been set up that have supported or still support private sustainability initiatives. The initiatives that received government support were quite varied in scope and nature. The platforms tend to be broadly set up and they all apply a broad definition of sustainability. Each of them singled out their own focus area. Transforum (2005-2010) zoomed in on sustainable farming practices. The Sustainable Food Platform (*Platform Verduurzaming Voedsel*, 2009-2012) targeted food and has continued in a purely private form as the Sustainable Food Alliance (*Alliantie Verduurzaming Voedsel*). The Sustainable Trade Initiative (*Initiatief Duurzame Handel*) concerns itself with the trade in raw materials and food. It actively encourages the development of standards and their implementation. It has given rise to multiple alliances, such as the production standards for farmed fish developed by the Aquaculture Steward Council (PBL 2013b). Recently, Dutch employers' federations VNO-NCW and MKB Nederland and the farmers' organisation LTO Nederland have signed a 'green deal' umbrella agreement with MVO Nederland (the networking organization for Dutch companies that are striving towards corporate social responsibility), environmental organisations *Natuur en Milieu* and *Natuur- en Milieufederaties*, and the national government. More than a hundred sector-specific 'green deals' have been concluded so far under this agreement (a number of them related to food).

The business sector has also started other initiatives to improve ecological sustainability. It has developed various certification programmes, for example the Round Table for Sustainable Soy, aimed at curbing deforestation, and the Marine Stewardship Council, aimed at curbing overfishing. Unilever has made a public commitment to source one hundred percent of its agricultural raw materials sustainably by 2050. In its policy document *Agro & Food: De Nederlandse groeidiament* (Topsector Agro & Food 2011), the Dutch agri-food sector set itself a number of specific ecological goals for 2020 and is asking the Dutch government to support its efforts.

When companies cooperate, competition issues are never far away. If cooperation leads, implicitly or explicitly, to price agreements and less consumer welfare, the relevant agreements could contravene anti-cartel legislation under competition law. That may also be the case if the agreements serve societal interests. Various experts have noted that competition policy can therefore raise barriers to making food chains sustainable (De Zeeuw 2009; SER 2010; Gerbrandy 2013). A much-discussed Dutch example is shrimp fishery. The NMA, the predecessor of the Netherlands Authority for Consumers and Markets (ACM), rejected agreements between shrimp fishermen on limiting their catches. The NMA did not believe that there was any scientific basis for such limitations, and felt that they would drive up

prices. On a number of occasions, Dutch MPs have expressed concerns that the NMa was not taking social, cultural and ecological values sufficiently into account in its rulings on individual cases (Dubbink and Van der Putten 2008).

In response to a motion adopted by the Dutch Parliament in 2013 (TK 33 400, XIII, no. 99), the Ministry of Economic Affairs has published a set of policy rules that could offer a starting point. The relevant ministerial decree identifies a number of sustainability-specific aspects that the ACM must consider when reviewing possible exemptions from the ban on cartel agreements under Section 6(3) of the Dutch Competition Act, which allows such exemptions if most of the advantages deriving from the agreements accrue to users (Staatscourant 2014, no. 13375). Based on these new policy rules, the ACM can also consider the *long-term* advantages that accrue to users. This greater leniency is not limited to food chains but also applies to other sectors in which sustainability initiatives are being taken. There are also limits to this leniency, however. The provision stipulating that a review may only consider the long-term advantages accruing to *users* narrows the scope. According to the explanatory notes to the decree, the European Commission objected to greater leniency that would have allowed the advantages for society as a whole to be considered in addition to those accruing to users (Staatscourant 2014, no. 13375: 9). It is unclear whether this also applies for the advantages accruing to later generations of users.

However, considerations of competition have not been the only obstacle to cooperation between enterprises. Other hurdles such as a lack of trust between the players or an unwillingness to relinquish their independence also play a role (SEO 2011).

Most of the policymakers' attention is still focused on businesses and on their (technical) options to operate more sustainably (De Bakker and Dagevos 2010). Nevertheless, there is growing interest in the role that consumers can play in improving the ecological sustainability of food. Choosing a more sustainable diet is deemed to be a matter of consumer choice (TK 31 532, no. 118). Choosing a healthy diet often turns out to be also choosing a more sustainable diet. For example, eating fewer animal products and more fruit and vegetables is good for health *and* for sustainability (Gezondheidsraad 2011), although public education tends to focus on the health aspects.

## 7.4 PUBLIC HEALTH

The Netherlands faces a number of challenges when it comes to public health. Examples are zoonoses and multi-resistant bacteria, food safety and diet-related health problems. This section outlines some characteristics of the policy in this area.

#### 7.4.1 PUBLIC HEALTH AND NUTRITION: BETWEEN TWO MINISTRIES

The relationship between public health and nutrition is a policy matter that falls under and sometimes in-between the responsibilities of two different ministries: the Ministry of Economic Affairs and the Ministry of Health, Welfare and Sport. Public health and nutrition are shared responsibilities. The Dutch Food and Consumer Product Safety Authority (NVWA), which plays an important role in this respect, is an agency of the Ministry of Economic Affairs that works for both that ministry and the Ministry of Health, Welfare and Sport. The Netherlands Nutrition Centre (*Voedingscentrum*) – another important agency in this area – is subsidised by both ministries. If a food-related or food production-related threat to public health arises, the two ministries take joint action.

However, their cooperation has not always gone smoothly, as the Q-fever affair illustrates. In the opinion of the Ministry of Health, the fact that goats and sheep are the most common source of Q-fever in humans and that human cases of Q-fever had clustered around dairy goat farms were sufficient reasons to intervene in goat farming. However, the Ministry of Agriculture (which is now part of Economic Affairs) steadfastly pointed out that there was lack of scientific evidence supporting claims about causality. With the two ministries each sticking to its points of view, and with the Ministry of Health having no authority to take action, interventions were delayed and communication became confusing, according to the evaluation committee that examined the affair (*Evaluatiecommissie Q-koorts 2010*). The committee recommended that the Ministry of Health, Welfare and Sport be authorised to take action in similar future cases.

The relationship between nutrition and health receives relatively little consideration at both ministries. Health considerations did not play an important role in the negotiations leading to the new common agricultural policy (CAP). The Health Ministry seems to have shifted its focus more towards health care policy (curative care) (*Maarse 2011*). Prevention is an issue that struggles to get attention; curative health care dominates the political agenda (*IGZ 2012*).

Another, related issue is the sharp distinction between food safety policy and public health policy. Let us take a closer look at that distinction. Food safety policy is mainly focused on hygiene – limiting food contaminants, micro-organisms and toxic substances – and on regulating additives, preservatives and other substances. In many cases, it concerns substances that could cause major or minor forms of illnesses shortly after consumption. Food safety policy also covers substances whose health risks may only become manifest after many years (such as carcinogens). However, the distinction between additives and ‘normal’ nutrients is somewhat arbitrary and often has only an historical explanation. Sugar is regarded as a nutrient, but stevia, a vegetal sweetener, is considered an additive. It was recently approved and assigned an e-number (E960). The European Food Safety Authority

has issued a recommended daily allowance for stevia, but not for sugar. However, that a food complies with toxicological and microbiological standards does not mean that it cannot present a public health risk. On closer examination, then, the distinction between food safety policy and health policy is not as logical as it might seem at first glance. It is a distinction in policy, science and in institutions that has developed in the course of history.

#### **7.4.2 RELYING ON PUBLIC EDUCATION**

Leaving aside food safety matters, nutrition and health-related policy tends to focus almost exclusively on providing consumers with information. Consumers are deemed responsible for making the healthy choice. Government bodies acknowledge that it is difficult to do so in an environment with an abundance of unhealthy products, but contend that the responsibility for restraint and for making the right choices rests with individuals (TK 32 793, no. 2).

Dietary guidelines underpin the information provided to citizens. The Nutrition Consultation Group (now part of the Health Council of the Netherlands) is responsible for advising the Dutch Government on nutrition and for drawing up the Dutch dietary guidelines. After the Group finalises the guidelines, the Netherlands Nutrition Centre uses them as a basis for its dietary recommendations. The Nutrition Centre provides public information and undertakes specific public campaigns, for example about how to avoid overweight. However, it turns out that when it comes to informing people about a healthy diet, mass media campaigns fall short (Van der Klauw et al. 2012).

Although a solid scientific basis is important, other interests have an influence on the development of dietary guidelines too. When the WHO included a recommendation on sugar intake in one of its draft guidelines, the organisation was put under enormous pressure by the sugar industry. The recommendation ultimately did not make it into the final set of guidelines (Boseley 2003; Moodie et al. 2013). The debate is not over yet; in March 2014, the WHO once again included a recommendation on sugar intake in its draft guidelines (Daneshku and Bond 2014).

Product packaging is another source of consumer information. The food industry is held responsible for providing reliable, comprehensible and unambiguous information on the nutritional value of all pre-packaged foods (TK 31 899, no. 1). The European Union has determined what information food labels must provide: a list of ingredients, allergens, and a statement of the nutritional value of the food (the latter obligation only goes into effect in December 2016). A proposal to introduce a 'traffic light' rating system on packaging (with green, amber and red showing how healthy a product is) was rejected. Instead, product labels display only the recommended daily allowances.

The Health Ministry also encourages the use of logos, which can help people make healthy choices in supermarkets or food service establishments (Faddegon 2011). For example, the Dutch ‘check mark’ system is a private initiative that has been taken up by large number of companies. If their product compares favourably to others in the same category, they can then – for a fee – display this certification mark on their product packaging.

In addition to public education and information, consumers are informed and influenced by commercial advertising. Various studies indicate that a restriction or ban on advertising unhealthy food products can be an effective strategy (Veerman et al. 2009). In their agreement with the Dutch Advertising Code Committee, businesses have pledged not to advertise unhealthy products to children below seven years of age. There have also been calls for a similar ban applying to children under 12 (see for example Hastings et al. 2003; RVZ 2002). It is unclear however to what extent this advertising code is actually enforced.

#### **7.4.3 LOCAL INITIATIVES**

Public health is the joint responsibility of local and national government. At local level, various initiatives are under way to encourage people to adopt a healthier diet or lifestyle. Children are their main target group. Municipalities are joining the JOGG initiative (in Dutch, the acronym JOGG stands for ‘Youngsters at a Healthy Weight’). It was inspired by a similar initiative in France, EPODE (the French acronym of ‘Together Let’s Prevent Childhood Obesity’), and has local institutions and businesses joining forces to encourage children to get more exercise and to improve the choice of healthier products. Taste lessons and school gardens are other examples of local initiatives that encourage children and adults to take a different and healthier approach to food (Seidell and Halberstadt 2011).

The Netherlands Nutrition Centre also runs a programme known as ‘The Healthy School Lunchroom’ (*De Gezonde Schoolkantine*). This initiative encourages school lunchrooms to offer pupils a healthier range of foods. A similar project focuses on getting sports club canteens to sell healthier products.

#### **7.4.4 DEBATE ABOUT OTHER MEASURES**

Despite all of the above initiatives, very few people have a diet that complies with the Dutch dietary guidelines (only 1 to 14 percent of the population depending on age group consume enough fruit and vegetables) (Van Rossum et al. 2011). A significant number of children and adults are still overweight. As in many other Western countries, there is fierce discussion in the Netherlands about what the next steps should be. Should government regulate industry more strictly, limit advertisements for unhealthy products, impose a tax on unhealthy products, nudge consumers to make healthier choices, regulate serving sizes, or restrict some of the unhealthier ingredients? Opinions are divided and there is much discussion.

At the same time, the actual experience with such measures is limited. Examples include the ‘fat tax’ in Denmark (which has been abolished); the tax imposed on soft drinks in France; and the attempt by the mayor of New York City to regulate the size of soft drink servings.

Two different discussions have arisen. One concerns the *legitimacy* of possible measures, and the other concerns their *effectiveness* (see Maarse 2011). The two are obviously connected. A discussion about effectiveness assumes legitimacy, and a measure loses legitimacy if it is not effective.

The legitimacy debate is mainly about whether government either should confine itself to an advisory role and leave the issue of food and public health to the individual choices of consumers, or should intervene more vigorously. A number of reasons for a more vigorous policy have been suggested (IBO 2006). Firstly, the effect unhealthy diets have on others. For example, parents’ unhealthy dietary patterns can lead to their offspring being overweight, with a much greater chance of their continuing to be overweight later in life. There is also the impact on society as a whole, for example the health care costs of diet related illnesses. Secondly, counting on consumer choice assumes the choice will be a rational one. That assumption can be questioned (Tiemeijer 2010; WRR 2014). Although objective nutritional information is available to them, it is offset by an overabundance of food that is often reinforced by advertising (IBO 2006). Thirdly, normative considerations may play a role. There are concerns about inequality, for example, because the problems of unhealthy diets are concentrated in households that have a low socioeconomic status.

The debate about effectiveness is also far from over. It is not clear to what extent the measures that are considered will in fact reduce the prevalence of overweight. Interventions such as a ‘fat tax’ or a ban on advertising unhealthy food have scarcely been tested in the real world. We also know very little about the effects of using financial incentives to discourage unhealthy dietary habits (IBO 2006). Local initiatives that tackle multiple dimensions at once – for example the ‘Hartslag Limburg’ community intervention project and EPODE – have, however, been shown to be successful (De Gouw 2012).

The next step appears to involve looking at the composition of food products. Making products healthier by reducing the amount of sugar, salt or unhealthy fats they contain can improve consumers’ health without them being required to change their behaviour. In the area of trans-fats, substantial progress has been made by way of self-regulation by the food industry. Daily consumption of trans-fats has fallen by 20 percent (Downs et al. 2013).

The National Agreement to Improve Product Composition (Salt, Saturated Fat, Sugar) concluded in January 2014 follows this example (TK 32 793, no. 130). In each product category, the Dutch food industry has agreed to lower salt, fat and calorie density. The Health Minister has set up a scientific committee to examine the designated targets and the National Institute for Public Health and the Environment (RIVM) will monitor progress. The specific ambitions that have been set for salt, fat and sugar are:

- To reduce the salt content in the range of products so that it is easier for consumers to consume a maximum of 6 grams of salt per day. Consumers who eat good food in accordance with the National Dietary Guidelines can comply with the consumption of a maximum of 6 grams per day by 2020 at the latest;
- To reduce the saturated fat content in the range of products so that it is easier for consumers to consume a maximum of 10 energy percent of saturated fats per day. To achieve this by 2020;
- To make it easier for consumers to consume less energy. To achieve this by 2020 by, wherever possible, reducing both the energy density of products via a reduction in sugar and/or (saturated) fat and/or reducing portion sizes as well as continuing to promote fruit and vegetables.

Like earlier initiatives targeting lower sugar, salt and unhealthy fat content, this approach relies on businesses taking the initiative. There are two major differences, however: specific targets have been set for salt and saturated fat, and a committee has been established that will monitor the progress.

## 7.5 ROBUSTNESS

The robustness of the food net – the ability to cope with shocks and to continue functioning under various scenarios – has made a modest appearance on the agenda of policymakers.

### 7.5.1 EXPLORATORY PHASE

Efforts to improve the robustness or resilience of the food net are mostly still in an exploratory phase. A study conducted by the Technology Assessment Steering Committee (Bindraban et al. 2008) into the resilience of the European food system has revealed the EU's vulnerability, in particular regarding soy.

One issue that is bound to test the resilience of the food net is the growing scarcity of certain resources. Policy in this area is still evolving. The potential scarcity of resources was not on the Dutch policy agenda until 2008, when an inter-ministerial working group on 'Scarcity and Transition' was set up to discuss the potential scarcity of resources (Platform Landbouw, Innovatie en Samenleving 2014: 4). In 2011, the Dutch Government issued a policy paper acknowledging that agricultural raw materials markets might come under pressure if governments were to

prioritise their own supply of resources (addendum to TK 32 852, no. 1). The Government has also taken notice of the report published by Rabobank (2011) concerning the anticipated battle for resources (TK 31 532, no. 74).

In the above-mentioned policy paper, the Dutch Government stresses the responsibility borne by businesses and points to the economic opportunities that resource scarcity offers: 'Resource scarcity can also be viewed as an explicit opportunity (...). The Netherlands can play a leading role when it comes to innovation, recycling and substitution' (addendum to TK 32 852, no. 1). In its 2012 coalition agreement, the Dutch cabinet announced its intention to encourage a circular and bio-based economy; specific steps in that direction were not identified, though. The 'From Waste to Raw Materials' programme – the Dutch version of the EU's 'Roadmap to a Resource Efficient Europe' – addresses the approach taken in specific chains, including the food chain, and refers in this context to (unspecified) market incentives. 'Green growth' is regarded as a primary theme (PLIS 2014).

For now, the Netherlands is counting on free trade, but on a global and even European scale protectionism is on the rise (PLIS 2014:4). These geopolitical trends could have important negative consequences for the international market for resources, and therefore for the Netherlands.

Promoting resilience obviously involves more than ensuring access to resources, the topic that currently receives a lot of attention. It also requires the broader approach of risk analysis and related strategies. Businesses believe that the government bears the responsibility for developing long-term risk strategies (PLIS 2010). The Social and Economic Council of the Netherlands (SER 2008) has advised the Dutch government to regard food security as a 'system responsibility'. It is unclear to what extent the advice has led to policy-initiatives.

### 7.5.2 LEARNING CAPACITY

The robustness of the food net can be enhanced by investing in learning capacity. The Dutch government has played an active role in agriculture in this respect. Historically speaking, knowledge generation through research, education and training has been one of the drivers behind the economic growth of the Dutch agri-food sector (Poppe 2008; De Haas 2013). Government was heavily involved in knowledge development in agriculture; its role went beyond the incentives that the state awarded to other sectors. Until 1990, a publicly funded triangle of research, training and education was firmly in place. Government researchers and trainers in civil service were given a lot of latitude to work with the sector to facilitate innovations targeted at productivity gains (Leeuwis 2003). After 1990, knowledge development became more privatised (Klerkx and Leeuwis 2008), although government still supplied a large part of the funds. The close relationship between government, the leading research institutes (especially Wageningen Uni-

versity), and the sector has served as a model for the Dutch government's current economic 'top sectors' innovation policy. It is meant to encourage a form of co-financing; the business sector joins the government in subsidising research and in deciding on its focus points. To what extent societal challenges play a role in the 'top sectors' programme is unclear (WRR 2013).

At this moment, intellectual property issues related to seeds are topics of debate. The EU has proposed regulation restricting the sale and use of any seeds which it has not registered and approved. According to environmental organisations, the new regulation would lead to further concentration in the seed market and pose a threat to biodiversity. They would curtail the choice of seed-varieties that farmers can sow, even though the robustness of the ecosystem would benefit from more variety. The proposed regulation is still subject to legislative procedures and negotiation. The European Parliament has already submitted thousands of amendments to the proposal.

## 7.6 CONCLUSIONS

The Netherlands does not have an institutionally embedded food policy that takes a comprehensive approach to the various policy objectives. Its food-related policies are a patchwork of objectives, measures and institutions that has developed over time and is derived from a range of policy domains: agriculture, trade, food safety, public health, environmental protection, and knowledge and innovation. This chapter has outlined the main characteristics of these policies and the diverse initiatives related to ecological sustainability, public health, and robustness. In addition to its national dimension, much of this policy is developed at the international level. The EU and the WTO play particularly prominent roles. Private regulation is also becoming more important.

The Netherlands is right to be proud of the prominence of its agri-food sector in the international arena. The agricultural policy of successive Dutch governments has made an important contribution to attaining that position. Policy that brought success in the past will not necessarily do so in the future, however. Major new challenges are on the horizon with regard to ecological sustainability, public health, and the robustness of the food supply system. They entail vulnerabilities, responsibilities and opportunities for the Netherlands (Chapters 3 and 4). They have been given due attention in policy papers in recent years. So far, however, the attention has received only modest follow-up. The Dutch government and the European Union are relying heavily on initiatives taken by the business sector and consumers. However, policymakers have given less thought to the question what opportunities are actually open to these parties and what limitations they have to come up against.

A vast array of food-related laws and rules have been implemented in recent decades. There are policies that address production (agricultural policy), policies that address the network of flows (trade policy), and policies that address consumption (public education on healthy diets). Food-related policies are divided between different policy portfolios; the interconnectedness of production, trade and consumption has so far received limited attention. In addition, policymakers are, as yet, little concerned about the robustness of the food net as a whole.

Time has come for an *explicit* and *specific* food policy, one that takes the various emerging trends seriously into account. Our next chapter will expand on this conclusion and will provide our recommendations.

## NOTE

- 1 As mentioned in the preface, this is the translation of a report originally published in 2014. Therefore it does not address subsequent developments in Dutch, European and international policies related to food.

## **8 CONCLUSIONS AND RECOMMENDATIONS**

### **8.1 INTRODUCTION**

The Netherlands is well positioned when it comes to food. For Dutch consumers, food is available in abundance, and historically low prices have made it more affordable than ever. Dutch agriculture is known for its high productivity. The Dutch agri-food sector has a number of prominent companies that operate internationally, and it has the support of renowned knowledge-based institutions. The Netherlands is an important player in the international world of food.

At the same time, food has increasingly become the subject of public debate. There are concerns about the effects of food production on the environment and the landscape, on human health, and on animal welfare. These concerns are leading to fierce public discussions. The food issues that the Netherlands will be facing in the years ahead are for a large part the result of trends and problems unfolding at the global level. These trends and their consequences for the Netherlands were the subjects of the previous chapters.

In this final chapter, we briefly review the global trends and challenges that the Netherlands is facing (sections 8.2 and 8.3) and conclude with policy recommendations to government (sections 8.4 and 8.5).

### **8.2 CHANGING CONTEXT AND CHALLENGES**

The nature of the global food supply has changed remarkably in recent decades. Four trends have been important for this transformation. First, agriculture and fishery are industrialised, intensified, and have become larger in scale. Second, the food supply system has further globalised. Trade and direct foreign investment by agri-food companies have both increased. Raw materials, food and intermediate products transgress national borders and are shipped between continents, production chains have become more international. Third, there has been a major increase in the role of non-agricultural players. Producers of seed, fertilisers and animal feed, the processing and food industries, and the supermarkets have become more powerful relative to agricultural producers. There has also been a strong concentration in these sectors, with some markets being dominated by only a small number of enterprises. Fourth, there have also been significant changes in consumption patterns, with a sharp increase in the consumption of meat and other animal products and of processed food.

These trends have led to changes in where, how and by whom food is produced, but also in *what* is being produced and consumed. Increasingly, food production, food processing and food distribution are separate activities, sometimes at great geographical distances. They are linked by a complex network of flows of materials and information. We refer to this network of flows as the 'food net'. The activities that contribute to this food net have become both more dispersed and more interconnected. In companies, various flows converge, and are turned into new (intermediate) products. In processed food products, flows of dozens of ingredients may converge. This global interconnectedness has been reinforced by the introduction of supply chain management and of production and product standards whose impact is often worldwide.

### **Changing challenges**

The nature of global food issues has also changed. Food is still unequally distributed around the world. One out of every eight of the earth's inhabitants is malnourished. Conversely, overweight and obesity have become widespread. Anticipated population growth, urbanisation and the associated changes in dietary patterns are expected to drive up the demand for food and to put more pressure on the global food supply system. At the same time, major challenges are on the horizon with regard to ecological sustainability, public health risks, and the robustness of the food supply system.

Firstly, *ecological sustainability*. Food production claims a high share of land, water and resources, and it is responsible for a significant share of greenhouse gas emissions and biodiversity decline. It is also often responsible for considerable local environmental pollution. Conversely, these ecological problems have a negative impact on the food supply system. Due to a potential scarcity of raw materials (such as phosphate) and natural resources (such as fresh water), as well as the effects of climate change, biodiversity decline and local environmental pollution, the world's ability to meet the rising demand for food is anything but certain.

Secondly, *public health*. The widespread use of antibiotics in intensive livestock farming increases the risk of multi-resistant bacteria. Outbreaks of zoonoses are another potential threat. Globalisation complicates efforts to oversee food safety. Finally, changing consumption patterns are likely to lead to more overweight and obesity and to a greater incidence of the related diseases.

Thirdly, the *robustness* of the food system as a whole. Can the food net withstand shocks sufficiently well? Due to the globalisation of the food supply system, regional shocks may have worldwide effects. There are several reasons to expect a more volatile environment. Climate change is leading to more extreme weather, increasing the risk of major regional crop failures. Declining crop and breed diversity in agriculture raises the risk of major outbreaks of plant and animal

diseases. Geopolitical events and the way in which countries and businesses respond to and, in many cases, anticipate these shocks, aggravate the risk of disruptions.

### ***The Dutch hub***

The Netherlands is closely interconnected with other countries when it comes to food. Its position in the food net entails vulnerabilities, opportunities and responsibilities.

The various global challenges we have discussed also concern the Netherlands. Its production and consumption contribute to the world's ecological problems. Conversely, the country is also facing the consequences of these ecological problems, such as the rising level of soil salinisation, the effects of climate change, and biodiversity decline. It will have to cope with a growing scarcity of resources and also face up to specific local environmental problems associated with agriculture. Moreover, the Netherlands also faces the public health issues seen elsewhere. The Netherlands too has a growing population of overweight and obese people, and diseases related to unhealthy dietary habits have become a substantial problem. There are concerns about zoonoses, multi-resistant bacteria and food safety. The robustness of the food net also impacts the Netherlands directly. As a prosperous country, it has the necessary leeway to absorb temporary shocks, but it too has to prepare for what is expected to be a more volatile environment.

The new situation also offers opportunities, however. The Netherlands will not be alone in facing these issues. If Dutch companies succeed in finding innovative solutions that lead to more sustainably produced and healthier food, new opportunities will emerge to export both products and production systems. The renowned Dutch knowledge infrastructure offers solid foundations in that regard. Moreover, the Netherlands also has a responsibility to contribute to the worldwide food supply.

## **8.3 GOVERNANCE CHALLENGE**

The global food supply system is thus facing new challenges in the areas of ecological sustainability, public health, and the robustness of food systems. There is no magic bullet that will solve all these problems simultaneously. What functioned as such in the past – increasing production by scaling up and intensifying agriculture – can no longer be the *only* answer. The ecological sustainability of this approach has been called into question, and it does not address the challenges of public health and the robustness of the food supply system.

The transition to a more robust food net that produces healthier food more sustainably will to a large extent have to come about through changes in the business sector and in the behaviour of individual consumers. Given the significance of these challenges for society, however, also government has a role to play.

More than ever, government policy will have to take into account the diverse values associated with food production and consumption. It will have to allow for the changes that have taken place in the food supply system and, as a result, the interdependencies between food production, processing, distribution and consumption. Policies that treat production, trade, and consumption as completely separate are inadequate. Policy makers must also consider the shifting power relations in the chains. In short, it is time to move from the traditional agricultural policy towards a comprehensive food policy.

Government will also have to review its own position. All of the parties in the food net – governments included – face information issues. Moreover, policy questions arise at very different orders of scale. In many cases, the issues transcend national borders and national jurisdictions and their solutions will often need to be sought in international agreements.

Food policy will furthermore need to allow for an increasingly volatile environment and for developments that are difficult, if not impossible, to predict. Alongside specific ecological and public health targets, an environment of this kind requires another policy target: to bolster the resilience of the food net, i.e. to improve its ability to absorb shocks and to adapt – under a variety of scenarios – to changing circumstances.

The Dutch government can rise to these challenges in a variety of ways. In the sections below, ‘from agricultural policy towards food policy’ and ‘towards a resilient food net’, we will present the related policy recommendations.

## **8.4 FROM AN AGRICULTURAL POLICY TOWARDS A FOOD POLICY**

The challenges that the food supply system is facing and the changes that have taken place in recent decades require a reorientation of policy. It is time for an explicit food policy. That is, a policy that takes into account:

- Different values;
- The interdependence of food production, processing, distribution and consumption;
- Changing power relations.

This reorientation does not mean that less value should be attached to agriculture. The primary sector remains a crucial part of the food net. What it does mean is that in addressing ecological, public health and robustness issues, government policy also needs to look beyond agriculture to the other important areas and parties in the food net.

#### **8.4.1 DIFFERENT VALUES**

Food touches on a wide range of values and interests, economic ones, public health, sustainability, animal welfare, and spatial planning. A food policy takes all these different interests into account and acknowledges the significance of public health, ecological sustainability, and the robustness of the food net. Bringing about the necessary policy shift will take time, discussion and investment. A long-term view and the institutionalisation of food policy, at both national and international level, are therefore required.

##### ***A clear strategy***

Food policy requires a long-term strategic appraisal of the various values and interests involved. The formulation of an explicit strategy will enhance the political and public debate about the choices that have to be made. Government can derive support from the growing awareness among businesses, citizens, lower tiers of government, the European Union and numerous civil society organisations that we need a more sustainable, healthier, and more robust food supply.

A clear strategy means being explicit about the choices that have to be made. It is not uncommon in the agri-food sector to seek out ‘win-win situations’ and to refer to ‘doing more with less’. Because so many different interests are involved, however, choices will always have to be made. The key is to be honest about those choices. Instead of ‘doing more with less’, for a number of product groups the parole will have to be ‘do less’. A substantial shift from animal to vegetable products would benefit both the ecology and public health, but will have an economic impact on parts of the sector. Difficult choices such as these are inherent to a food policy.

An comprehensive food strategy would provide a clear and reliable long-term perspective for the agri-food sector. Businesses that develop innovative solutions in the form of high-value, sustainably produced, healthy products for the domestic market, can also profit from these solutions in export markets.

##### ***Checks and balances***

A strategy alone is not enough to improve ecological sustainability, public health and robustness. These matters also need institutional anchoring. Food policy touches on policy issues that are divided between different Dutch ministries, specifically: the Ministry of Economic Affairs; the Ministry of Health, Welfare and

Sport; the Ministry of Infrastructure and the Environment; and the Ministry of Foreign Affairs. The vital public interests involved in food and the importance of carefully weighing up the relevant values and interests require better inter-ministerial coordination.

In addition to coordination, however, checks and balances are needed. There are strong historical ties between the former Ministry of Agriculture – now part of the Ministry of Economic Affairs – R&D institutions and the agri-food sector. Their close cooperation has resulted in a dominant focus on productivity gains and exports, with other values and interests and other ideas about food gaining very little foothold within the policy. To ensure that health and ecological considerations are more deeply rooted in food policy, it is important to organise more institutional checks and balances. Conducting a broad evaluation of government food policy at regular intervals could contribute to this. That evaluation should preferably be carried out by an independent body. It would provide input for political and public debate, keeping all the relevant parties attentive.

### ***International arena***

An important part of (the currently implicit) food policy takes shape within the context of the European Union and in international agreements. Food policy requires diplomacy that extends beyond purely economic concerns. The Dutch Government should convey its vision and underlying considerations at the international level, e.g. by advocating a broad food strategy for the European Union and stronger institutional anchoring of ecological sustainability, public health and robustness. The EU has already taken first steps in its new common agricultural policy by integrating ecological considerations into that policy, but further steps are needed. Considerations of health and robustness should also play a role in the common agricultural policy.

In order to broaden the balance of interests, ecological sustainability and public health should also be more firmly enshrined in global and bilateral free trade agreements. The WTO's current free trade agreements allow governments to take protective measures against threats to public health or the environment. However, they can only put down requirements that concern *product* features for which scientific evidence has been found. They cannot do so for production processes. However, making production more sustainable will require formulating demands for production processes. As to the requirement of scientific evidence, questions arise about the role of uncertainty and the precautionary principle (WRR 2008). Negotiations on bilateral trade agreements – for example the Transatlantic Trade and Investment Partnership (TTIP) between the EU and the USA – provide an opportunity to anchor the concepts of ecological sustainability and public health more firmly at the international level.

#### 8.4.2 INTERDEPENDENCE BETWEEN CONSUMPTION AND PRODUCTION

A future-proof food policy will have to regard food production, processing, distribution and consumption as interdependent activities. This will require broadening of the available policy information. In addition, policies focusing on ecological sustainability will have to look beyond primary production and also consider retail and consumption. In the case of public health – where the current focus is largely on consumer choices – precisely the opposite applies. In that domain, more attention should be given to production, processing and the range of products available.

##### ***Broad policy information***

The information currently available to policymakers and the public reflects the traditionally dominant focus on agriculture and export. Economic data on agricultural production is abundantly available in the Netherlands, but reliable information on the processing, distribution and consumption of food is much harder to come by. Since 1988, there have been only a few official surveys of food consumption in the Netherlands. And although data is collected on the use of raw materials and natural resources and on environmental, climate and biodiversity effects, this occurs much less frequently and in much less detail than the economic data on agriculture.

In order to arrive at a comprehensive food policy that accounts for interdependencies between food production, processing, distribution and consumption, more insight is needed into the main flows of materials. In addition to financial and economic data, information on essential material flows is vital, also from non-agrarian enterprises.

Broader policy information is also recommended at the international level. That international trends in the food supply system require adjustments to the existing information systems, is widely acknowledged. For example, the G20 initiated the establishment of the Agricultural Market Information System (AMIS), which collects and publicises data on important raw materials markets. While the emphasis is on financial and economic data, it would be beneficial to also cover data on the ecological and health-related aspects of the global food trade.

##### ***Ecologically sustainable production and consumption***

Many of the policies related to sustainability focuses on the primary sector. That is of course where most of the problems occur, and further measures will be needed to mitigate the impact on the environment, greenhouse gas emissions, and the effect on biodiversity. However, policymakers need to look at subsequent links in the production chains too. Buyers' explicit or implicit demands concerning minimum volumes to be supplied, product and processing standards, product ingredients, and packaging and handling methods, reverberate throughout the chain. Policies aimed at ecological sustainability will therefore also need to focus on these

links. They should consider consumption too. Specifically the consumption of meat and dairy will require attention, as its production has a disproportionately high ecological impact. Policies will have to focus on the product range and the way in which consumption is stimulated. Policies aiming to achieving sustainability will also have to address consumer behaviour.

### **Healthy production**

The interdependencies between production and consumption must also be considered with regard to public health. Public health issues require a broad food-related public health policy, which includes food safety policy.

History has created a disciplinary and institutional dividing line between food safety policy and food-related public health policy. Food safety policy focuses on food production and food trade and has the aim to limit physical, toxicological and microbiological contamination. Public health policy that relates to food, concentrates primarily on the consumer. Given the present challenges, this institutional separation is no longer adequate. After all, health risks are not limited to physical, toxicological and microbiological contamination. Excessive consumption of processed products that contain plenty of sugar, salt and unhealthy fats is no less a threat to public health than many other substances for which – for food safety reasons – maximum allowances have been formulated.

The public health questions related to food require the Ministry of Health to play a more vigorous role and a policy that recognizes the role of the entire food chain. For example, it is no longer possible to regard explicit or implicit government support for food production as unrelated to public health issues. Stimulating the production of certain foods – either through financial or other incentives – while simultaneously advising citizens, either directly or indirectly, to reduce their consumption of those foods should be avoided.

The greater complexity of the flows of raw materials and (intermediate) products complicates private and public efforts to monitor food safety. The volumes of food and sums of money in circulation are considerable, and it is often difficult for private and public parties alike to maintain an overview. Oversight is in many cases limited to inspecting samples and checking the information provided. Fraud is difficult to track down. The possible emergence of organised crime in the food industry requires vigilance. Fraud and crime increase the risk of contaminated or unhealthy products being sold and therefore also pose a threat to food safety. In addition, the integrity of the supply chain is a major factor in maintaining consumer trust.

A broad-based approach is needed when it comes to health problems related to poor nutrition. Research into individual measures – for example public education or labels listing calories and amounts of salt, fat or sugar – reveals that their effects

are limited. Successful approaches elsewhere show that a combination of measures is required, and not one specific intervention. A broad and coordinated package of measures is needed that targets education and public information as well as the products themselves and the consumption environment. Government can encourage healthy product changes by entering into agreements with the food industry, retailers and the food service sector and by being willing to take further steps if self-regulation fails. The Dutch Agreement to Improve Product Composition (Salt, Saturated Fat, Sugar) concluded in January 2014 is a welcome step in this direction (TK 32 793, no. 130). Further steps are needed, however. The agreement that has been concluded has the ambition to reduce salt, saturated fats and calories in processed food to make it easier for consumers to comply with the National Dietary Guidelines, but that does not prevent the food industry, retailers and the foodservice sector from offering unhealthy products alongside the healthier ones. Moreover, government and public institutions can also wield their purchasing power to encourage healthier products.

#### **8.4.3 CHANGING POWER RELATIONS**

The power relations within the food supply system have changed. Where previously agriculture, national government, and knowledge institutes jointly drove national developments to a large extent, today non-agricultural players (seed and animal feed companies, food industry, banks, supermarkets), consumers, NGOs, and international organisations play important roles. That has implications both for the choice of the parties that a government can address to effectuate its policy and for the role of government itself.

The societal challenge of promoting ecologically sustainable food production and healthier food products requires efforts on the part of businesses and citizens. Both have already embarked on a range of different initiatives. Government can support and encourage these initiatives by ensuring that parties are equipped with the right information, by stimulating corporate social responsibility, and by removing any barriers that may exist.

##### ***Stimulating corporate social responsibility***

Healthier and more sustainably produced food will require changes in the business sector. Various enterprises are already taking the initiative. Increasingly their stakeholders, ranging from financial institutions and shareholders to citizens and NGOs, require them to do so. Businesses can sometimes make an important difference on their own, but in many cases they will need to cooperate, either vertically throughout the chain or horizontally across a sector.

Such cooperation does not happen by chance. It requires the parties to trust one another and for one of them to take the lead. There are many different ways that government can encourage collaboration. In the past, for example, an equalisation

fund (set up by the Dutch government in consultation with the business sector) made an important contribution to environmental protection policy (Winsemius 1989: 98 ff.). It involved imposing a surcharge on leaded fuel that was then used to lower the price of unleaded petrol. It was a budget-neutral measure (for government) and turned out to be strikingly effective. A similar fund could be used to promote more sustainably produced, healthier food. Sector organisations could take the initiative, with the government potentially making their agreement binding throughout the sector to prevent free riders.

The authorities can stimulate, support and secure private partnerships also in other ways. They can, for example, encourage codes of conduct, certification and public accountability, set requirements for dispute resolution, and set up private and public-private partnerships. There are many different gradations between private initiative and self-regulation at one end of the spectrum and government regulation at the other end (Ostrom 1990; WRR 2012; De Hoon 2013; WRR 2013).

Such private initiatives require government to reflect on their intent to serve societal interests. Is a branch of industry or a chain organisation that opts for self-regulation actually unified and powerful enough to guarantee self-regulation and to monitor compliance? If not, then government will have to facilitate some or all of the coordinating tasks. Government should also bear vulnerable interests in mind, and perhaps promote the presence of relevant civil society parties at the table when chain agreements and private standards are being negotiated.

### **Information**

Access to relevant information is an important prerequisite for business-, consumer- and NGO-led initiatives. Government can assist them by making data which it has available for policy purposes public, and by requiring businesses to publish certain data. For example, transparency concerning companies' waste streams can encourage private initiatives to valorise such streams more effectively and can stimulate companies to amend their strategy. The debate about public health would take on a different dynamic if the food industry and food service sector were required to report the quantity of sugar, salt and unhealthy fat contained in their products every year.

Creating more transparency in an opaque sector can make new business opportunities visible and concrete. With relevant information at hand, the public (individuals, the media or NGOs) can compel businesses that have close ties with the consumer market to change. Listed companies are sensitive to matters that affect their reputation. A heightened level of transparency gives companies also the opportunity to distinguish themselves in a positive sense. It may make them more attractive, not only to customers but also to potential employees.

Product information and logos can be important drivers for change. They can spur consumers to make different product choices and motivate businesses to anticipate those choices. Existing consumer information – logos, certification marks and lists of ingredients and country of origin on packaging – is too complex, however. The (statutory) information is formulated in technical terms and country of origin information is often confusing. The list of logos and certification marks is so long that consumers are at a loss as to their precise content and meaning. Alongside (semi-)public logos and certification marks, companies also resort to all sorts of symbols to create the impression that their products are healthy or sustainable, although the basis for their claims is not always clear. Government should take responsibility in this situation. It should encourage clear-cut, unambiguous information on health and sustainability on product packaging, by negotiating the relevant agreements, or by making mandatory requirements where necessary. This might include the introduction of two separate ‘traffic light’ rating systems, one for sustainability and one for health, both using simple symbols to provide reliable information. Another option would be to use the barcodes to provide detailed information via an app or an in-shop scanning device.

#### ***Remove unnecessary barriers***

The government should also reconsider existing (statutory) barriers that prevent the business sector from improving the health and sustainability of the food supply. The fact that sustainability agreements may be at odds with existing competition law is a case in point. In addition to consumer welfare, competition law should also take other public interests into account. The Minister of Economic Affairs has already announced a broadening of the policy rules adhered to by the Netherlands Authority for Consumers and Markets (ACM) (Staatscourant 2014, no. 13375). The ruling has identified a number of sustainability-specific aspects that the ACM must consider when reviewing possible exemptions from the ban on cartel agreements. This is a step in the right direction, but the new rules are still subject to restrictions. Their scope is narrowed by the provision that stipulates that the ACM may only consider the long-term advantages accruing to users. The European Commission has objected to greater leniency that would have allowed the advantages for society as a whole to be considered. It is unclear whether this also applies for the advantages accruing to later generations. A more fundamental reconsideration of the role of competition law and its criteria is recommended. Competition law should also take the resilience of the food net as a whole into account (see section 8.5).

## **8.5 TOWARDS A RESILIENT FOOD NET**

To address the ecological and public health challenges the food system faces, concrete targets and policy measures that would further these interests can be identified, both at the national and EU level. At the same time, food supply system will

have to allow for a more volatile environment and ongoing uncertainties. Policy will therefore *also* need to focus on the conditions that enable the food net to cope with a variety of developments and shocks.

In recent decades, many governments have put their trust in international markets to provide their countries with sufficient food, if sudden shocks brought on by natural disasters or political emergencies would have disrupted the normal food supply. However, given the anticipated market trends, the wisdom to exclusively rely on this strategy in the long term can be questioned. The present situation requires a new policy, namely the strengthening of the resilience of the food net by fostering:

- Variety;
- Sustainable management of resources;
- Learning capacity.

The benefits of a policy that promotes resilience are usually dispersed and only become clear in due course. In addition, measures that promote resilience are often at odds with short-term efficiency targets. Nevertheless, a system that fails because it is not resilient enough will not be able to achieve any of its other targets.

Government can foster the resilience of the food net through a variety of different measures.

#### **8.5.1 PROMOTE VARIETY**

To ensure that alternatives are available if parts of the food net fail and that local shocks will not reverberate and threaten the system as a whole, variety is needed. Policymakers should focus on encouraging variety among both parties and flows of materials.

A variety of players means spreading dependencies over both countries and businesses. Competition policy can stimulate variety across businesses, but it does so by looking at the effects on consumer welfare, and not at the effects on resilience. Pluralism among businesses will not guarantee diversity on the level of plant varieties and animal breeds used for production of food. The standardisation of raw materials and intermediate products and the limited number of plant varieties and animal breeds now used in food production may mean that on markets made up of a wide variety of companies and with a satisfactory level of competition, a far-reaching uniformity at the level of raw materials can still exist, a situation that may put the resilience of the food net at risk.

Variety in plant varieties requires a dedicated knowledge and innovation policy and diversification of knowledge. The current policy that aims to develop alternative sources of protein, should be intensified. Intellectual property law deserves explicit attention too. The system of intellectual property rights promotes private

investment in research and innovation. Where legal barriers discourage further crop refinement or result in major monopolies, however, these advantages quickly turn into disadvantages as they may reduce the resilience of the food net.

Innovation policy will have to devote more attention to supporting challengers who address societal interests in an innovative way. That support is needed not only during the research phase, however, but also when activities are being scaled up. Many potentially interesting developments run aground at that stage because they have financing problems and because buyers upstream in the chain are unwilling to share the risks. Scaling up demands long-term connections between producers and buyers. Government can help by mediating or supporting the establishing of such connections.

Product and processing standards also require an even-handed appraisal. Standards that are introduced by private parties, imposed by public institutions, or emerge gradually in practice, can serve important societal aims (such as food safety and sustainability), but they can also lead to an undesirable level of uniformity and to the exclusion of alternatives.

#### **8.5.2 PROMOTE A MORE SUSTAINABLE MANAGEMENT OF RESOURCES**

Ensuring the long-term functioning of food systems requires prudent use of raw materials and natural resources. This means managing resources sustainably, using such resources efficiently, recovering important resources where possible, and valorising waste streams.

Let us look first at sustainable management. Discussions addressing the rational management of natural resources often assume that there are only two options for managing ‘common pool resources’ sustainably, namely either under the direction of government or by leaving it to the market. That is a too simplified depiction of the situation, however. Apart from these two options, there are many (collective) institutional arrangements to manage natural resources sustainably (Ostrom 1990). Examples can be found also in food production, with businesses, NGOs and public authorities all taking part. In an earlier report, the WRR (2012) pointed out the importance of institutional conditions that, as Ostrom has shown, make such arrangements viable in the longer term. Undeniably, this will often require complex, lengthy international consultation and setting up the necessary checks and balances. More support and effort should be given to developing and refining such institutions.

Besides the efficient use of resources, policy should also be concerned with more efficient recovery of resources. Phosphate calls for special attention. Policy should be focused on phosphate recovery and closed-loop recycling. This will require searching for the right scale of operations and might imply that chains need to be shortened.

Another aim worth promoting is to valorise waste streams in the most sustainable way possible. Innovation policy could be focused on encouraging repurposing of waste streams for animal feed rather than biofuel production. For example, by using waste streams on insect farms for the production of proteins for animal feed.

### **8.5.3 IMPROVE THE LEARNING CAPACITY OF FOOD SYSTEMS**

In addition to the above, resilience requires policy that fosters the learning capacity of the food system. First and foremost, that means adequate information management. It also requires government to take the necessary action and to develop its own learning capacity (WRR 2006).

Learning how to deal with new circumstances requires practices of variation and selection based on results; it thus entails room for experimentation. That means supporting ‘challengers’ and, at times, permitting temporary exemptions from the rules and even ‘rule-free zones’. A ‘learning government’ will also be interested in the design and the monitoring of the effects of the requested experiments. It therefore requires paying attention to evaluation. This may include demands on the various disciplinary perspectives that play a role in evaluation, as well as on the involvement of stakeholders.

Another obvious point of attention is the dissemination of results, not only by publishing and teaching best practices, but also by taking steps to successfully scale up the best practices. Information is a necessary prerequisite for learning capacity, but it is not the only one. Without adequate feedback mechanisms, information will not lead to changes in behaviour. That is why it is important not only to acquire information but to circulate it as well – a conclusion that the WRR emphasised in a previous publication (WRR 2013). Information should be tailored to intended users, whether they are consumers, NGOs, businesses, or the authorities.

In complex systems such as the food net, no one party can claim to have the ultimate wisdom – not businesses, not the government, and not NGOs. Learning involves discussion between differing parties. Government could consider it as one of its tasks to get the various parties to work together on initiatives and to support them where necessary. Businesses are increasingly realising that their reputation is a valuable commodity. This allows NGOs to play an important role as a watchdog, also in the food domain. They fulfil this role by the way in which they frame food issues, compel transparency, and get businesses and countries to pay

attention. Government can work with these NGOs and support them in their role. By offering countervailing power, NGOs help to maintain a system of checks and balances that has to be in place to secure societal interests adequately. Government can lay down explicit demands on agreements in this respect, and on consultations regarding process and product standards.

## **8.6 THE ROAD AHEAD**

The Dutch government's policies related to food have long focused primarily on agriculture and on guaranteeing food safety. Over time, those policies became entwined with a variety of other policy domains and ancillary objectives.

Following calls from international research and advisory organisations and the business sector, in this report the WRR has emphasized that the global food supply system is facing now and will certainly face in the near future substantial problems that will also affect the Netherlands.

The time has come for an explicit *food policy*.



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## APPENDIX: LIST OF INTERVIEWEES

Positions as held at the time of interview

- K. Aarts**, Founder, Protix Biosystems, Den Bosch
- H. Aiking**, Researcher, Faculty of Earth and Life Sciences, Free University, Amsterdam
- S. Akkerman**, Head, Agriculture and Economy, Netherlands Society for Nature and the Environment, Utrecht
- D. Andrew**, Head of Environment Division, Trade and Agriculture Directorate, OECD, Paris
- J. Anton**, Senior Economist, Trade and Agriculture Directorate, OECD, Paris
- K. Bakker**, Managing Director, Estafette Odin, Geldermalsen
- M. Bassett**, Senior Research Associate, The Conference Board of Canada, Ottawa
- P. van Bentum**, Agricultural Counsellor, Permanent Representative of the Netherlands at OECD, Paris
- B. van den Berg**, Livestock Policy Officer, Dutch Society for the Protection of Animals, The Hague
- H. Blokhuis**, Project Manager, Animal Sciences Group, Wageningen University & Research Centre, Wageningen
- M. Blom Andersen**, Head of Office, Green Development Programme, The Danish Agri-Fish Agency, Copenhagen
- M. Bloom**, Vice President, Organizational Effectiveness And Learning, The Conference Board of Canada, Ottawa
- M.A.J.S. van Boekel**, Professor, Wageningen University & Research Centre, Wageningen
- J. de Boer**, Professor and Head of Institute for Environmental Issues, Free University, Amsterdam
- S. Bökkerink**, Senior Policy Adviser, Oxfam Novib, The Hague
- E.A.M. Bokkers**, Lecturer, Wageningen University & Research Centre, Wageningen
- J.L.M. Boogerd**, Senior Policy Officer, Directorate-General for Agriculture, Ministry of Economic Affairs, The Hague
- B. Boon**, Managing Director, Ecofields, Biological Veal Farmer, Lunteren
- G. Boumeester**, Global Head, Food and Agri Coverage, Rabobank, Utrecht
- J. Brand**, Veterinary Surgeon, Owner of Animal Clinic, Nunspeet
- P.J. Brandsma**, Managing Director, Landwinkel Coöperatie, Veenendaal
- G.E. Breeman**, Lecturer in Public Administration, Wageningen University & Research Centre, Wageningen
- H. Bruggeman**, Managing Director, Agri-ProFocus, Arnhem
- M. Burt**, Director, Industrial Economic Trends, The Conference Board of Canada, Ottawa
- J. Candel**, PhD Candidate in Public Administration, Wageningen University & Research Centre, Wageningen
- C. Carrière**, Associate Deputy Minister, Agriculture and Agri-Food Canada, Ottawa

- M. Chisholm**, Director, Assurance Systems Policy, Agriculture and Agri-Food Canada, Ottawa
- B. Cook**, Research Consultant, Toronto Public Health, Toronto
- F. Courleux**, Chef du bureau de l'évaluation et de l'analyse économique, Ministère de l'Agriculture, de l'Alimentation, de la Pêche, de la Ruralité et de l'Aménagement du Territoire, Paris
- M. Damkjaer Nielsen**, Chief Consultant Food Policy, Danish Agriculture and Food Council, Copenhagen
- D. Diakosavvas**, Senior Agricultural Policy Analyst, Trade and Agriculture Directorate, OECD, Paris
- R. Dinnissen**, Project Assistant, Clingendael, The Hague
- H. Docters van Leeuwen**, Project Manager, Agro/Food, Stichting Milieukeur, The Hague
- J. Eelman**, Senior Advisor, Assistant Deputy Minister's Office, Agriculture and Agri-Food Canada, Ottawa
- B. Emanuel**, Manager, Food Strategy, Toronto Public Health, Toronto
- J.W. Erisman**, Director, Louis Bolk Instituut, Driebergen
- A. Fenger**, Deputy Director General, Danish Veterinary and Food Administration, Glostrup
- L.O. Fresco**, Professor, University of Amsterdam, Amsterdam
- L. Fulponi**, Senior Economist, Trade and Agriculture Directorate, OECD, Paris
- E. Geday**, Policy Analyst, Agriculture and Agri-Food Canada, Ottawa
- A. Gerbrandy**, Associate Professor, University of Utrecht, Utrecht
- M. Hamell**, Head, Agriculture, Forests and Soils, Directorate-General for the Environment, Brussels
- C. van der Hamsvoort**, Global Head, Food & Agribusiness Research and Advisory, Rabobank International, Rabobank, Utrecht
- T. Haniotis**, Director, Directorate for Economic Analysis Perspectives and Evaluations, Directorate-General for Agriculture and Rural Development, European Commission, Brussels
- C. 't Hart**, CEO, FrieslandCampina, Amersfoort
- A.H. Havelaar**, Senior Researcher, Centre for Zoonoses and Environmental Microbiology, National Institute for Public Health and the Environment (RIVM), Bilthoven
- J.J.M. Hemel**, Director, Spatial Planning Department, Amsterdam
- S. Hertzberger**, Head of Quality and Product Integrity, Albert Heijn, Zaandam
- R. Hillebrand**, General Secretary, Council for the Environment and Infrastructure, RLI, The Hague
- L. Hoedemakers**, Director, Royal Dutch Hunters Association, Amersfoort.
- F. ten Hoopen**, Head of Sections, InnovationsFonden, Copenhagen
- R. Hoste**, Economist, Wageningen Economic Research (LEI), Wageningen UR, The Hague
- H. Huijbers**, Chair, ZLTO, 's-Hertogenbosch
- M. van Huik**, Policy Officer, Product Board for Livestock and Meat and Product Board for Poultry and Eggs, Zoetermeer
- P.J.M Jansen**, Director, Public Affairs, VION Food group, Boxtel

- B. Jeffery**, National Coordinator, Centre for Science in the Public Interest, Ottawa
- J. Jensen**, Manager, Policy Research Division, Agri-Environment Services Branch, Agriculture and Agri-Food Canada, Ottawa
- W. Jones**, Head of Division, Agro-Food Trade and Markets, Trade and Agriculture Directorate, OECD, Paris
- S. Juul**, Founder, Stop Wasting Food Movement Denmark, Copenhagen
- M.S.E. van Keep**, Managing Partner, De Issue makers, Amstelveen
- B. Kettlitz**, Director, Food Policy, Science and R&D, FoodDrinkEurope, Brussels
- M. Kosinska**, Secretary-General, European Public Health Alliance, Brussels
- D. Kromhout**, Vice-Chair, Health Council of the Netherlands and Professor in Public Health Research, Wageningen University & Research Centre, Wageningen
- H.C. van Latesteijn**, Managing Partner, Value Mediation Partners, Rotterdam
- J.-Ch. Le Vallee**, Senior Research Associate, The Conference Board of Canada, Ottawa
- M.G.A. van Leeuwen**, DLO Researcher, Wageningen Economic Research (LEI), Wageningen UR, Wageningen
- R. MacRae**, Associate Professor, Faculty of Environmental Studies, York University, Toronto
- M. Marcotte**, Science Director, Food and Health, Eastern Cereal and Oilseed Research Centre, Ottawa
- A. Martin**, Analyste bureau de la Prospective, de la stratégie et de l'intelligence économique, Ministère de l'Agriculture, de l'Alimentation, de la Pêche, de la Ruralité et de l'Aménagement du Territoire, Paris
- G. Meester**, Member of the Council, Council for the Environment and Infrastructure (RLi), The Hague
- A. Menidiatis**, Economic Advisor, Directorate-General for Health and Consumers, Brussels
- L. Molsted Jensen**, Head of Office, Food Team, Ministry of Food, Agriculture and Fisheries, Copenhagen
- E. Moore**, Special Advisor, Food Safety and Traceability, Agriculture and Agri-Food Canada, Ottawa
- L. Munksgaard**, Senior Consultant, Aalborg University, Copenhagen
- D. Munro**, Principal Research Associate, The Conference Board of Canada, Ottawa
- D. Nearing**, Deputy Director, Policy and Multilateral Relations Division, Market and Industry Branch, Agriculture and Agri-Food Canada, Ottawa
- S.L.M. Neve**, Senior Policy Adviser, Ministry of Economic Affairs, The Hague
- R. Nijland**, Senior Policy Officer for Economic Affairs, Netherlands Embassy in Copenhagen, Copenhagen
- P.J.M. Oosterveer**, Associate Professor, Wageningen University & Research Centre, Wageningen
- J. Pfeiffer**, Senior Policy Advisor to the Associate Deputy Minister's Office, Agriculture and Agri-Food Canada, Ottawa
- A. Pijpers**, Dean, Faculty of Veterinary Medicine, University of Utrecht, Utrecht

- J. D. van der Ploeg**, Professor of Rural Sociology, Wageningen University & Research Centre, Wageningen
- K.J. Poppe**, Senior Economist and Research Manager, Wageningen Economic Research (LEI), Wageningen UR, The Hague
- R. Rabbinge**, Emeritus Professor, Wageningen University & Research Centre, Wageningen
- K. Rainforth**, Researcher, Agriculture and Agri-Food Canada, Ottawa
- M.A. Reudink**, Senior Researcher, Netherlands Environmental Assessment Agency, Bilthoven
- H.M.J. van Rij**, Coordinating Policy Officer, Ethics, Ministry of Economic Affairs, The Hague
- A. Romano**, Executive Director, Policy Development and Analysis Directorate, Agriculture and Agri-Food Canada, Ottawa
- H. Rutten**, Project Manager, Dutch Nature Policy Vision, Ministry of Economic Affairs, The Hague
- L. van Schaik**, Researcher, Clingendael, The Hague
- S. Schat**, Board Member, Rabobank, Utrecht
- C.-Ch. Schmidt**, Head of Fisheries Policies Division, Trade and Agriculture Directorate, OECD, Paris
- J.C. Seidell**, Professor of Nutrition and Health, Free University of Amsterdam, Amsterdam
- A.R. Sjauw-Koen-Fa**, Senior Economist, Rabobank, Utrecht
- K. Soeters**, Director, Nicolaas G. Pierson Foundation, Amsterdam
- J. Staman**, Director, Rathenau Instituut, The Hague
- H.G. Stoelhorst**, Policy Coordinator, Ministry of Public Health, Welfare and Sport, The Hague
- H. Swinkels**, Managing Director, VanDrie Group, Mijdrecht
- C.J.A.M. Termeer**, Professor of Public Administration, Wageningen University & Research Centre, Wageningen
- F. Thissen**, Agricultural Counsellor, Netherlands Embassy in Brussels, Brussels
- M. Thomson**, Senior Research Associate, The Conference Board of Canada, Ottawa
- F. van Tongeren**, Head of Division Policies in Trade and Agriculture, Trade and Agriculture Directorate, OECD, Paris
- B. Urlings**, Professor, Wageningen University & Research Centre and Director, Quality Assurance, VION Food Group, Boxtel
- M. Vaes**, Head of Department, Public Health, Welfare and Sport, Permanent Mission of the Netherlands at the European Union, Brussels
- E. Valceschini**, Director of Research, INRA, Paris
- C.P. Veerman**, Extraordinary Professor of Sustainable Rural Development from a European Perspective, Wageningen University & Research Centre, Wageningen
- G. Verburg**, Ambassador, Permanent Mission of the Netherlands with the UN Organisations for Food and Agriculture in Rome, Rome
- J. Vereijken**, Researcher, Wageningen University & Research Centre, Wageningen
- B. Verheijen**, Former Marketing Director, C1000 supermarkets

- A.J.A.M. Vermeer**, Supervisory Board Member, Rabobank, Supervisory Board Member, Achmea, Haaren
- J.W. Vermeulen**, Senior Planning Officer, Spatial Planning Department Amsterdam, Amsterdam
- J. Vert**, Chef du bureau de l'évaluation et de l'analyse économique, Ministère de l'Agriculture, de l'Alimentation, de la Pêche, de la Ruralité et de l'Aménagement du Territoire, Paris
- E. Verwoert**, Veal Farmer, Opheusden
- A.-C. Vlaardingbroek**, Manager, Food Safety and Operations, Dutch Association of Food Trade Organisations, Leidschendam
- J.C. Vis**, Director of Sustainability, Unilever, Rotterdam
- F. Vollenbroek**, Policy Officer, Directorate-General for the Environment, Brussels
- S. Voogd**, Lobbyist and Climate Expert, Oxfam Novib, The Hague
- D. de Vries**, Markets Director, UTZ Certified, Amsterdam
- C.R. Vringer**, Scientific Officer, Netherlands Environmental Assessment Agency (PBL), Bilthoven
- B.F. van Waarden**, Professor, Faculty of Social Sciences, University of Utrecht, Utrecht
- C.P.V. van der Weg**, Director, Veal Calf Quality Guarantee Foundation, Zeist
- E.H. Wellenstein**, Ambassador, Permanent Representative of the Netherlands at OECD, Paris
- H. Westhoek**, Programme Leader, Agriculture and Food, Netherlands Environmental Assessment Agency (PBL), The Hague
- H.H.F. Wijffels**, Professor of Sustainability and Social Change, University of Utrecht, Utrecht
- A. Wouters**, Head of Veal Farming, VanDrie Group, Mijdrecht
- S. van de Wouw**, Campaign Manager, Wakker Dier, Amsterdam
- L. Wuisan**, Policy Officer, Directorate-General for the Environment, Brussels
- F.J. van Zadelhoff**, Senior Policy Officer, Ministry of Economic Affairs, The Hague
- F. van Zomerem**, Deputy Programme Manager, Sustainable Food Systems, Ministry of Economic Affairs, The Hague
- G. Zwart**, Senior Policy Adviser, Oxfam Novib, The Hague

# TOWARDS A FOOD POLICY

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The Netherlands has pursued a successful agricultural policy for decades. However, the world of food has changed and food has become the subject of intense public debate. The issues that are important in the Netherlands cannot be seen in isolation from global developments.

The challenges at global level relate to ecological sustainability, public health and the robustness of the food supply. In *Towards a Food Policy*, the Netherlands Scientific Council for Government Policy (WRR) explores the consequences of these challenges for the Netherlands and the specific vulnerabilities, opportunities and responsibilities they create for the Dutch government and Dutch society.

It is time for an explicit food policy; a policy that takes into account the diversity of values in relation to food, the relationship between production and consumption and the changing power relations in the food system. In this report, the Council also highlights the need to invest in the resilience of the food system.

The Netherlands Scientific Council for Government Policy (WRR) is an independent advisory body for government policy. The task of the WRR is to advise the government on issues that are of great importance for society. The reports of the WRR are not tied to one policy sector. Rather, its reports go beyond individual sectors; they are concerned with the direction of government policy for the longer term.

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