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ROOM FOR SUSTAINABLE AGRICULTURE

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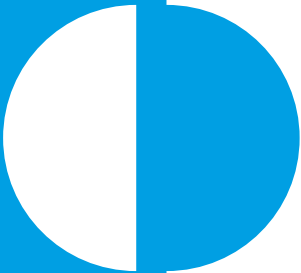
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A short film accompanies this advisory report and is available at www.rli.nl.

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PART 1 | ADVICE



BACKGROUND TO THE REPORT

1

1.1 Introduction

Dutch agriculture and horticulture is in a state of tension. On one side is the competitive landscape of the world market, characterised by price volatility; on the other, society making ever-greater demands. Political and economic changes, nationally as well as internationally, raise fundamental questions concerning the future place of agriculture and horticulture in Dutch society (Part 2, Chapter 1). These changes are driven by the public debate on agriculture, but also by the shrinking number of agricultural enterprises and the expected shift in the nature and size of the demand for food. In its scope, the debate extends from the allocation of profit margins in the chain, to the health and welfare of animals, and from risks of large herds, to the necessary transition from fossil fuels to renewable energy. The demand for food is changing under the influence of rising prosperity in various parts of the world. There are shifts in favour of animal and processed products and fresh produce, including fruit and vegetables. Another motivation for the creation of this advisory report by the Council for the Environment and Infrastructure (referred to subsequently in this report as the “Council”) is the shift towards a more enabling role for the Dutch government, which gives more scope to local and regional authorities, the market and society at large.

Lately, various advisory reports concerning agriculture and horticulture in the Netherlands¹ have fed the political and public debate² (see Part 2, Chapter 1). Characteristic of this debate is the fervour with which positions are defended, the mutual lack of understanding between supporters and opponents of specific development directions, and the paralysing effect this lack of understanding has on the debate. The ethical dimension and different conceptions of food quality and health risks largely determine the ferocity infusing the conduct of the debate. Clarity and direction are required at this point, combined with the need for room to explore alternatives and for constant alertness to possibilities for further development in order to break the deadlock.

1 Such as *Topsector Agro & Food* (2011), *Topsector Tuinbouw en Uitgangsmaterialen* (2011), Ministry of Economic Affairs, Agriculture and Innovation (2011), and Van Doorn Commission (2011).

2 See for example Dijkhuizen (2012), Fresco (2012) and Dutch parliamentary debates.

1.2 Request for advice

The Council believes it can provide the necessary clarity and direction for the public debate. To this end, it has formulated the following core question:

Is it desirable or even necessary to give agriculture and horticulture in the Netherlands the scope in the future to develop further, and if so, what form should the development take?

To answer this question, the following aspects have been analysed:

- The importance of agriculture and horticulture to the Netherlands
- The impact of agriculture and horticulture on society
- The necessity of continuing sustainable development³
- The sustainability tasks for agriculture and horticulture
- Continuing sustainable development as a governance issue, and the corresponding role of the Dutch government
- The obstacles to continuing sustainable development.

The Council has taken a broad approach in responding to the question. Agriculture and horticulture are considered from the social, economic and ecological perspectives, with the focus on the medium and long term. The time horizon, 2025-2040, has been chosen for realisation of the Netherlands that we wish to make possible for our children and grandchildren.

³ In this advisory report, The Council uses the term “sustainable development” to express the process-like nature of the steadily ongoing integration of the three P’s (People, Planet and Profit) in the activities of companies, organisations and individuals, and the creation of the corresponding conditions that take into account the needs of future generations (Brundtland, 1987; Elkington, 1994).

SIGNIFICANCE OF AGRICULTURE AND HORTICULTURE

2

To assess the desirability of future development freedom for Dutch agriculture and horticulture, it is necessary to understand the importance of the sector for the Netherlands. The extent of the importance can be determinant for the desirability or the need. This section sets out the opinion of the Council on this point and outlines the challenges.

2.1 Dutch agriculture and horticulture of national importance

After analysing the aspects referred to in section 1.2, the Council concludes that Dutch agriculture and horticulture as the basis for the agri-food complex represents a major national and international economic and innovative interest, as well as a major environmental interest for Dutch society. The response to the first part of the recommendation request is therefore affirmative. The Council bases this on the following:

Although agriculture and horticulture's contribution to the economy and employment is limited and steadily shrinking (Part 2, section 3.1), the sector is nevertheless an important link in the agri-food chain, i.e. the entire chain of suppliers, processors, wholesalers and distributors. Without agriculture and horticulture, there would be no basis for part of the Dutch food and drink industry. Our trade balance would also change radically due to rising imports of food and raw materials, and the disappearance of agricultural exports based on domestic production. Moreover, the influence of the Netherlands on quality assurance, food safety and public health aspects of the food system in the EU and beyond would shrink; a key incentive for learning and innovation would disappear; and management of two-thirds of the country's surface area would have to be reorganised. As a final point, it would no longer be possible to establish new value chains based on the biomass of primary agriculture and horticulture, thus slowing down the development of a *biobased* economy.

Agricultural and horticultural enterprises contribute in many ways. They produce high-quality raw materials, drive trade and logistics, apply knowledge and innovation, and develop them as well. These companies serve as a home market for suppliers of, for example, seed stock, equipment and livestock-building systems, and for providers of services to agriculture such as banks, insurance companies, veterinarians and consultants. In addition to being a source of

products, the agricultural sector has an important function as a breeding ground for innovations and new applications, such as integrated and organic production methods, quality assurance systems, prevention of animal diseases, reduction in the use of antibiotics, and the recycling of residue streams. As a result, it is a key part of the main Dutch manufacturing sector, i.e. the food and drink industry. The sector also has a strong international orientation. In 2009, 65% of the added value and 68% of employment in the entire agri-food complex was attributable to exports (Part 2, section 2.1.3).

Thanks to the necessary transition from a fossil fuel-based economy to an energy-producing circular and biobased economy, the development possibilities and opportunities for agriculture and horticulture increase as well. Agriculture and horticulture have created a strong culture of professionalism and entrepreneurship, traditionally embedded in extensive networks and collaborative structures. The organising ability is strong, as evidenced by the development of cooperatives, management of water by water boards, and the extensive collaboration with knowledge centres.

Soil-tied agriculture occupies two-thirds of Dutch land, making it a major partner for soil and water management, as well as the preservation of biodiversity and air quality. In addition, agriculture and horticulture are bound up with the identity of rural areas of the Netherlands and the character of its landscape. As such, they are factors in determining the quality of the environment.

Thanks to its food production, technological know-how and innovative strength in the field of agri-food, the Netherlands has established a global position that, given the world food issue, entails a number of responsibilities. World population is expected to grow from seven billion people in 2012 to nine billion in 2050, leading to an increase in the demand for food. However, the growing purchasing power and further urbanisation produce new eating habits throughout the world. The Netherlands is the world's third largest agricultural exporter (Part 2, section 2.1.3). The responsibilities and opportunities that go hand in hand with this position are not only economic in nature, but also specifically concern the transfer of knowledge, innovation and quality assurance for the global food supply in the next few decades.

The next question is how the development should take shape. In this advisory report, the Council justifies the proposition that the development urgently requires ongoing innovation and accelerated sustainable development that is continuous. Industry and civil society organisations (NGOs) should continue to take the lead, stimulated at the same time by a lively public debate (see section 2.2). The central government must continue to concentrate on defining the national playing field, at the same time focusing more on fulfilling the role of bridge builder and facilitator.

2.2 Social requirements increasingly decisive

Although the Council considers the development opportunities for agriculture and horticulture to be of major importance, the analysis presented in this advisory report shows that these opportunities can only come to fruition if social requirements are the deciding factors for the development. Further development of the Dutch agri-food sector has to be subject to these ever-tightening economic, ecological and social demands. Accordingly, the expected greater economies of scale and specialisation have to be utilised for deploying products with a higher value more efficiently in response to increasingly dynamic markets and stricter societal requirements, that is, with less consumption of production resources.

Since the 1950s, the number of enterprises in the Netherlands' agriculture and horticulture sector has shrunk dramatically, from 410,000 in 1950 to 178,000 in 1970 and subsequently to 70,390 in 2011. The trend is expected to continue, with the number falling to below 50,000 in 2020. For soil-tied sectors such as arable farming and dairy farming, this means an increasing surface area per enterprise, with fewer but larger buildings. In the case of building-tied sectors such as greenhouse horticulture and intensive livestock farming, the development results in larger premises (e.g. glasshouse complexes), and factory farms with a large number of animals per operation. A number of enterprises that will not or cannot take part in the process are widening their business base to develop products and services for local and regional markets, such as local wares, farm camping sites, day-care centres and conference facilities. A larger number go out of business, either by choice or owing to lack of a successor (Part 2, section 2.2).

On international markets, emerging economies demand a place, leading to increased competition for raw materials as well as for customers. Raw materials become scarcer as a result and prices remain permanently higher than in the past. On top of this, climate change effects (drought, poor harvests, etc.) combined with variations in demand produce greater price volatility on the world market.

High-tech innovations in production, processing, logistics and transport are radically changing the appearance of the chain. Examples at agricultural and horticultural enterprises include precision farming, plant tissue culture, robotics, and the combination of feeding methods and animal health monitoring. Further along the chain, high-tech innovation might relate to the development of products with health-enhancing properties or with a smaller carbon footprint. These innovations cause alterations to chains and new links between agriculture and other sectors. There are signs of new joint ventures that present primary operations with fundamental choices: more interconnections within the chain and/or with other parties in the region, or downsize or go out of business.

Technological developments also reveal differences in the respective meanings that producers and consumers attach to their views on continuing sustainable development. This regularly gives rise to complex ethical dilemmas concerning the intrinsic value of animals, genetic modification, fair trade and ecological footprints.

Consumers assign increasing importance to the composition, quality and source of food, with ever-greater emphasis placed on the right nutrients. In addition, there is the social concern about declining biodiversity and changing landscapes. The conditions society applies to agricultural products and production methods are growing in number. To cover the related costs, agricultural entrepreneurs will have to compete even more than today on factors other than just price. They need new market strategies, new types of risk management, and additional funding.

Knowledge and dialogue grow steadily more important as ways of breaking the deadlock between supporters and opponents of increasing the scale of operations, new technological applications, and urban facilities in rural areas. Knowledge about the potential effects of technological developments and participation in innovation processes; dialogue about underlying values and attitudes. In their role as consumers, local residents or recreational visitors, people do not always feel they are being taken seriously regarding their concerns about developments involving food, agriculture and horticulture.

NGOs and the industry are collaborating and increasingly acting in unison to bring about continuing sustainable development in the chain and increase the quality of food. This can be seen at the global level for instance in the form of the Round Table on Responsible Soy (RTRS) creating a certification system for soy that is more sustainable, while Dierenbescherming, the Netherlands' animal protection organisation, together with the livestock sector have established the "Beter Leven" labelling system. Regionally, new joint ventures have sprung up to develop a thriving countryside, an example being Groene Woud National Landscape in the municipality of Boxtel.

CONTINUING SUSTAINABLE DEVELOPMENT

3

Given the importance of the sector and the growing social requirements, this section explains the necessity for extending and accelerating the process of making agriculture and horticulture more sustainable. As part of the explanation, consideration is given to the three dimensions for defining continuing sustainable development: ecological, economic and social; and to the changing framework for them: challenges more complex than previously, different players and a new role for government.

3.1 Extension and acceleration of continuing sustainable development

Agriculture and horticulture are facing their greatest ever challenges: to manage fertile land, fresh water and nutrients more efficiently than before; to reduce emissions; to clear up existing pollution (phosphate saturation and heavy metals); to fight pests and livestock diseases more effectively with new methods; to improve animal welfare; to safeguard public health (against zoonoses and ESBL⁴); to promote safe and healthy working conditions; to share benefits fairly; and to operate transparently for society. The challenges are not only different in nature, but also more complex than before. New players have emerged to voice the desires of consumers and social groups, and thus to exert influence on the methods of production and their impact. At the same time, the role of the central government as decision-maker and orchestrator has become smaller, partly in favour of these other players.

For the Council, it is unquestionable that virtually every agricultural enterprise can and will eventually have to become more sustainable. Continuing sustainable development is the response to the above challenges that will allow the agriculture and horticulture sector to retain both its licence to operate and its competitive position. This is an ongoing process, because the different dimensions of continuing sustainable development are not always in agreement, and sometimes even in conflict. It is not unusual for the removal of one bottleneck to create new ones. Working on one dimension of continuing sustainable development can cause an adverse reaction in another. Continuing

4 The ESBL enzyme is created by some intestinal bacteria and reduces or nullifies the effect of antibiotics.

sustainable development demands constant concern and attention for unintended consequences and for the prevention of conflicts and diversions.

Stricter requirements ensuing from international and national regulations have to be incorporated in business practices and chain arrangements. Dutch companies have already come far in terms of emission reductions and the use of crop protection products and antibiotics. However, there is still a long way to go before the specified goals are met (see Part 2, section 3.2.4). At the same, the demands and desires of consumers who have become more critical, in the Netherlands and elsewhere, have to be addressed. Civil society organisations and industry make global chain agreements to advance continuing sustainable development in stages. At the local level, grassroots initiatives⁵ express concern over the environment and the impact of production methods. Dutch agricultural and horticultural production is carried out at enterprises that are a permanent feature of the agrarian cultural landscape, in the backyard of Dutch citizens as it were. Farmers and urbanites will have to reach a *modus vivendi* based on the mutual recognition of each other's significance and importance. This assigns an additional function to continuing sustainable development, powering an ongoing innovation process that ensures the Netherlands can retain its leadership. Continuing sustainable development enables agricultural and horticultural enterprises to make an optimum contribution to various societal functions including nature and the environment, health, prosperity and welfare, subject to the condition that this also promises opportunities in business economic terms.

While the urgency of continuing sustainable development is great, the opportunities are many. In the Dutch agri-food sector, the possibilities include combining high-tech innovations with ecological and social innovations. As an example, joint efforts with other parties in the chain or in the region could turn residues into economically valuable products or lead to the launching of entirely new products on the market. The cycles and the links between sectors that arise from this lend support to a circular and biobased economy that runs on renewable resources. It also increases the importance of knowledge about continuing sustainable development as an export product of Dutch agri-business and the research involved. Clearly, the issues surrounding agricultural production in and for an urbanising and prosperous society will also emerge elsewhere in the world.

In this context, collaboration is necessary, not only between chain parties, but also with non-agricultural knowledge and innovation centres, civil society organisations and government bodies. One area of concern is the tendency to guard knowledge closely, particularly if it has been obtained with the use of public funds. Directing the process from a research base and monitoring the impact of

⁵ See for example the citizens' initiative "No to Mega Farms!" ("Megastallen Nee!"), which opposes the establishment of very large livestock buildings in the province of North Brabant.

solutions are also important. It is justified to expect from the government that it acts as a facilitator regarding these aspects, and removes as many obstacles as possible to the sustainable development process. Mechanisms are needed to register early warnings of anything going amiss.

The decision about the method (the “how” aspect) results from a search process. One thing is clear, though, according to the Council: If the government guides continuing sustainable development energetically, Dutch agriculture and horticulture can in the long run, by 2040 say, capture a solid position at the heart of society and of a thriving, circular and biobased economy. For this to happen, the Council sees a need for the following qualitative objectives.

Visions for socially valued agriculture and horticulture (2040)

- Connections within and between chains and in the local environment have driven sustainable development forward and created a thriving circular and biobased economy
 - External costs are internalised and waste (including manure) has become a raw material. Agricultural enterprises have become producers of energy. Cycles are closed
 - Urbanites and farmers are in harmony as regards their respect for the intrinsic value of plants and animals. The dialogue between them is spirited and mutually enriching
 - Soil, water and air are clean, so the environment is healthy. The landscape is functional and attractive. The countryside is economically vital and diverse. Nature flourishes and preservation of biodiversity is guaranteed
 - The government has effectively eliminated the free-rider behaviour of companies that fail to keep to chain commitments or do not participate
 - As a final point, the wellbeing and health of humans and animals are paramount, while the Netherlands (remains) a test bed and development laboratory for agriculture and horticulture that is more sustainable and has an international spin-off
-

3.2 Sustainability tasks in three dimensions

All agricultural enterprises in the Netherlands face sustainability tasks, ranging from permanent pressure to compete and increasing dependence on commodity flows, to controlling emissions and waste flows, the promotion of animal welfare and the prevention of risks to human health. At the same time, and perhaps because of this, agricultural entrepreneurs are the driving force behind the transition towards a more sustainable form of agriculture and horticulture, which is clearly being increasingly encouraged and drawn along by the dialogue between these entrepreneurs and civil society. Leaders pull followers with them. As the pressure from the market and the chain partners grows, the stragglers stir into motion or go out of business. Organic farming is one of the examples of this transition. This EU-certified type of farming takes into account animal welfare, the environment and natural cycles, and rejects the use of chemical fertilisers and pesticides. Organic farming is therefore more than just a reaction to conventional farming, based on the use of chemical products. It is also a source of new knowledge for the farming sector as a whole, something evident in the areas of seed cultivation, crop protection, soil management and similar activities. Owing to the demands placed on agricultural and horticultural enterprises to become more sustainable, the tendency to think in agri-centric terms disappears. Continuing sustainable development is underway at these enterprises, throughout the chain as well as at local level. This means that the economic, social and ecological dimensions of continuing sustainable development are recognised as tasks and included with due regard to their nature in revenue models, chain agreements and local partnerships.

For the agricultural and horticultural sector, the three dimensions can be described as follows:

Economic (P of Profit): embedding the agricultural and horticultural sector in its various forms and guises as a robust and resilient economic source of income, entrepreneurship and innovation in the Netherlands. A well-educated workforce, sensible logistic conditions, knowledge, education and consumer information, and the tying in of other social interests, ecosystem services among them, are necessary for continuing sustainable development in the economic dimension.

Social (P of People): ensuring that agriculture and horticulture earn back the respect and trust of citizens, consumers, local residents and recreational visitors, by taking their concerns seriously, engaging in dialogue and offering solutions for applying continuing sustainable development to the chain and the surroundings. Whereas these concerns in previous decades were mainly related to the impact on the environment and animal welfare, today they also extend to animal health and public health (bacterial infections such as EHEC, ESBL contamination, zoonoses, preventive antibiotic use), and to healthy and high-quality food.

The family farm is often seen in the local community as a guarantee for the embedding of agriculture and horticulture in society. For society, fair sharing of benefits, transparency of food quality and attention to ethical issues surrounding animals and plants are necessary for realising sustainable development in the social dimension.

Ecological (P of Planet): contributing to a circular and biobased economy by establishing cycles, the re-use of waste and the conversion of manure into economically valuable products, supplying energy, efficient use of raw materials and water, reduction of emissions, carbon sequestration, preservation of biodiversity (in the Netherlands and elsewhere), and ecological resilience. By collaborating with other sectors and value-adding chains (energy, chemical, water, nature and other sectors), agriculture and horticulture will help promote continuing sustainable development in the ecological dimension. Adequate spatial and logistical conditions support this.

SUSTAINABILITY TASKS DIFFER BY BUSINESS MODEL

4

Dutch agriculture and horticulture has a wide variety of business types, production directions, orientations, scale sizes and degrees of specialisation. From the perspective of the sustainability tasks, there are broadly speaking three distinct business models, each with its own way of focusing on an economic, ecological and social vision for the future. These business models are described in Part 2 (Chapter 4) as the specialised rural enterprise, the quasi-industrial enterprise and the urban-oriented enterprise. Numerous combinations and hybrids of these three models are possible in practice.

4.1 Three business models

The three distinct business models have arisen from entrepreneurship under various economic, spatial and political conditions. Each model has its own values, as well as strengths and weaknesses as regards continuing sustainable development. In the public debate on the subject, these values play an important role in the positions of different parties, which often champion this or that business model as the one with the most promise. The three business models not only have their individual sets of values⁶, but also their individual combinations of networks and knowledge development, as well as different, not always explicitly stated, weightings for the three dimensions of continuing sustainable development (*People, Planet, Profit*). This aspect is expanded on in the next sections.

4.1.1 The specialised rural enterprise

In the Netherlands, this is generally a dairy farm, sometimes with other grazing animals as well, or a farm growing arable and/or horticultural crops on open ground. This type of business utilises predominantly family labour and family capital. Although the size of the operation matches the model, this has never stood in the way of a rapid increase in scale. A greater scale can also go hand in hand with specialisation. This means that whenever a dairy farmer, crop farmer or market gardener concentrates on one product or sector, the scale of production

⁶ The classification shows similarities with the discussions in the works of Frouws (1998), Termeer (2006), Hermans (2011) and Hinssen & Smulders (2011). These sociologists and management experts described in analytical discussions how reality takes on a completely different significance for people depending on the way they experience that reality.

can be increased without needing to increase the size of the business. Those who expect a more sustainable future with this business model regard agriculture and horticulture as an integral part of the countryside, and the family farm as an integral part of the local community. The farmer is both a professional and a guardian of the agricultural landscape and nature. Autonomy, careful treatment of animals, plants and soil, and continuity from generation to generation are core values. As a small or medium-sized enterprise (SME) integrated in the production chain, this type of farm has an appropriate legal form, such as the commonly found partnership (Part 2, section 3.2.6), but owners also opt where necessary for new legal forms and financing methods.

The pressure to specialise and to produce on a larger scale is at odds with the scale and values of the traditional agricultural landscape. Cows are increasingly stabled throughout the year. Yet the family farm model provides some guarantee that the increase will conform to the traditional scale and values.

Partly due to a long process of small farms ceasing to operate, family farms have proven they have economic resilience and the potential to provide those who work in them with a good living (Part 2, section 3.2.1). The respect and trust of civil society are also largely safeguarded (Part 2, section 3.2.7.5). Ecosystem services can ensure that social desires regarding areas such as nature, landscape, water management and recreation are factored into business operations. To enhance the quality and accessibility of an area, a cost-covering charge for these services is one option.

4.1.2 The quasi-industrial enterprise

This business model is found almost only in the building-tied sectors: greenhouse horticulture and intensive livestock farming. The enterprises in question often expand their production off-land under controlled conditions and far above the level of the family farm, utilising non-family workers as well as loan capital, as in horticulture. With intensive livestock farming, the use of non-family labour occurs less. In horticulture, growing plants under controlled conditions is fully established, substrate cultivation, which is completely off-soil, being an extreme example. In livestock farming, the dependence on fodder and the selling channels for manure both tie the enterprises to the land. In the case of building-tied businesses, the bond is already more indirect, however, owing to the use of fodder made from food waste, spent grain, pulp and waste from the potato industry, and to the conversion of manure into marketable products and/or energy.

On these farms, considerable trust is placed in a technological-scientific approach to making agriculture and horticulture more sustainable, which harmonises with the circular and biobased economy. Further scale increases, greater efficiency, tight chain integration and the creation of cycles are core aspects. The scale of production and greater financial capacity of quasi-industrial enterprises make it feasible to invest in technological- industrial applications for creating value

from residue streams. In this situation, business units can be added yet again: in intensive livestock farming, to convert residues into products with more value; in horticulture, processing and packaging for specific market segments.

Under controlled conditions, animal health and animal welfare can both be safeguarded. The development of systems that support solutions in these areas is underway. Opportunities to cluster activities are being sought, including inter-sectoral hubs at suitable locations, in terms of logistics as well. Such systems slot into a circular and biobased economy.

4.1.3 The urban-oriented enterprise

This business concept incorporates a revenue model that aims to safeguard prospects not primarily through scale of production and specialisation, but rather through the combination of various agricultural and non-agricultural activities. It therefore applies to enterprises that have added lines of business, focus largely on non-agricultural or urban needs such as child day care, sell their own products directly to customers, or operate in the field of recreation or nature management. Rural areas together with agriculture and horticulture are viewed from an urban perspective, which reveals the potential for a wide variety of new types of agriculture and horticulture. An orientation towards activities outside agriculture and horticulture is paramount, with the countryside becoming a services landscape. Time, identity and small-scale operation are more important than efficiency, volume and scale. As a green entrepreneur, the farmer looks to connect with urbanites, offering services and products that in many ways enhance the experience of rural areas, from food to care and recreation. Expansion is at the farm level, as well as through combinations with new economic activities in the countryside (hospitality, consultancy, spirituality, art and culture, care, business services, etc.). Many enterprises are already able to merge parts of the agricultural and service branches in a highly professional and market-orientated way.

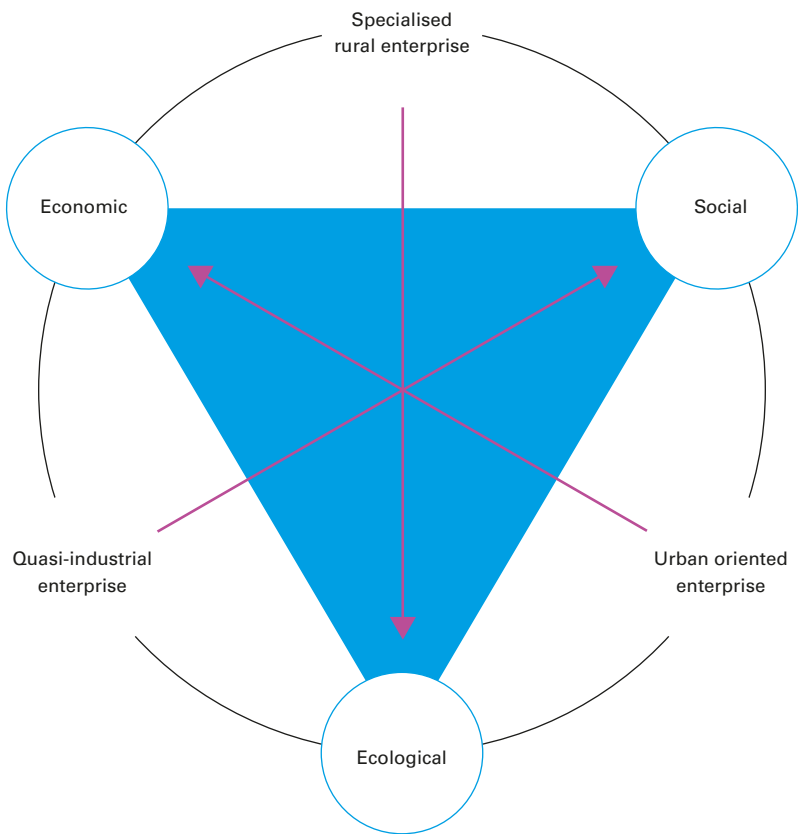
Of significance is the greater closeness of urbanites to the production of food and the countryside, certainly when they buy directly from farms (local for local in other words). This closeness expresses itself through active social organisations, and attention from the media (social and otherwise). The mixed activities that suit the urban-oriented enterprise also lend themselves well to the recycling of products and waste, thus supporting the circular economy. Small-scale technological innovations, ICT solutions and urban distribution are in development and spur on the professionalism of these enterprises.

Local governments respond to the evolution of these types of business by developing local food strategies. As an example, some gear their local procurement policies to regionally produced food that is more sustainable, provide space for local markets, and encourage various forms of urban agriculture.

4.2 Challenges

Each of the business models described above has its own values and strengths as regards continuing sustainable development. Against this, each one also faces specific challenges regarding the process. The figure below presents the situation in the form of a graphic. Subsequent sections describe the challenges for each of the three broadly distinct business models.

Continuing sustainable development challenges facing the three business models



The figure shows three business models used in agriculture and horticulture in their relationship to the three dimensions of continuing sustainable development: economic, ecological and social. The green lines represent strengths; the red arrows represent challenges. The specialised rural enterprise optimises its economic and social dimensions and faces a challenge from ecology; the quasi-industrial enterprise optimises its economic and ecological dimensions and faces a challenge in the social dimension; the urban-oriented enterprise optimises its social and environmental dimensions and faces a challenge in the economic dimension.

4.2.1 Challenges for the specialised rural enterprise

It is mainly the ecological dimension (the P of Planet) that represents a challenge for the specialised rural enterprise. The soil-tied nature of such operations makes it difficult to sufficiently control the impact of production. To implement careful management of soil, biodiversity and water, as well as to reduce emissions, there is a need for innovations such as precision agriculture, new types of mixed farming, and the embedding of agri-biodiversity in the enterprise's practices. The scale of production and financial capacity are limited, however, when it comes to initiating technological and industrial processes for establishing a closed production cycle. A comprehensive chain approach is necessary in order to reap the benefits of a closed cycle in the operations of farmers. Moreover, livestock farms spread over a large area bring the risk of outbreaks of animal diseases, particularly if other types of activities are undertaken at the same time. To mitigate such risks, solutions will have to be found.

4.2.2 Challenges for the quasi-industrial enterprise

Of the three business models, especially in livestock-related production, this one encounters the most opposition from society, particularly in the areas of public health, ethics and animal welfare. This results in plans for large non-soil-tied companies that want to keep animals on an industrial scale remaining on the shelf. The consumption of animal protein and thus the dependency on soy as fodder leads to questions about the relationships between humans, animals and plants. Accordingly, the social aspects (the P of People) form the greatest challenge for this business model: to make it credible that this mode of production can be animal-friendly and healthy, and gain society's support for it. Parties who can voice the concerns of civil society will have to be drawn into the debate at an early stage, so that attention is focused not only on the technical design requirements, but also on the ethical issues, institutional embedding and quality assurance throughout the chain.

If the Dutch government supports this approach with research and resources, technical knowledge and systems can be developed in a socially responsible manner. In other words, devote attention at an early stage of development to animal welfare, ethical questions concerning the application of technology and the quality of the countryside.

The intensification of agriculture will continue in every part of the world. Precisely because of this, the Netherlands is taking a leading role in making intensive livestock farming more sustainable can give a tremendous boost to this country's export position and to the process of making agriculture more sustainable on a global scale.

4.2.3 Challenges for the urban-oriented enterprise

Combining activities, something natural for the urban-oriented enterprise, benefits the experience economy. It can also entail inconvenience, risks and friction, however. Prevention of environmental damage and of the spreading of animal diseases is just as essential for small-scale operations and those spread over a wide area, as it is for large-scale and specialised enterprises. Investments have to produce a return in the meantime, which applies to all business undertakings, and this is often at odds with the size of these enterprises. It is therefore precisely profitability (the P of Profit) that presents the greatest challenge for activities based on this business model, which is more likely to evolve in the case of small enterprises than large ones (Part 2, section 3.2.7.4).

4.3 Strengths-weaknesses analysis

All three business models have strengths as well as weaknesses relative to their respective sustainability prospects. The table below shows a simplified strengths-weaknesses analysis for the three business models. This is followed by an overview of the problem owners in government bodies and potential obstacles for the models. Subdivided by theme, these are 1) space and logistics, 2) knowledge and innovation, 3) financial, legal and fiscal scope, and 4) society. The obstacles are explained briefly in the lower half of the table and in detail in Chapter 5.

4.4 Different strategies and challenges parallel and interacting

Each of the business models in line with which the types of enterprises have evolved has strengths as well as weaknesses as regards how they can become more sustainable. Accordingly, the discussion on which business model is the best has no worth when it comes to initiating continuing sustainable development. Quite the opposite: such a discussion inhibits a fruitful cross-fertilisation between the different models. In the Council's view, it is precisely this interaction that is useful, promising and even indispensable, in the same way that the interaction between organic and conventional agriculture has led to progress in both systems. Organic farming is possible with all business models discussed here, notwithstanding that the demand for nature-friendliness will lead to forms in building-tied livestock farming that are different from those in soil-tied agriculture. The Council also envisages the existence of new variants and combinations, with new sustainability tasks. Part-time agriculture, already being practiced on arable farms of varying size, might also be possible on large dairy farms with the use of robotic milking systems. Because of their greater financial flexibility, part-time enterprises also have the scope to develop further in the social and ecological dimensions of sustainability, which cannot always be said

Strengths-weaknesses analysis of the three business models

	Specialised rural	Quasi-industrial	Urban-oriented
Analyse			
Current agricultural features	Specialised Soil-tied 75%-80% of enterprises Economically sound/ reasonable Family farms Spread over wide area	Specialised Building-tied 7%-10% of enterprises Economically strong Outside labour and loan capital Regional clustering	Wide range (products and/or services) 10%-15% of enterprises Economic prospects uncertain Family farms Regional differences
Strengths	Resilient and/or adaptable Family farm	Closed systems <i>Reduce, Reuse, Recycle</i>	Town and country connection <i>Local for local</i> / shorter chains
Weaknesses	Closing of cycles (water, soil, nature) Biodiversity preservation	Ethical dilemmas and/ or social resistance	Profitability Closing of cycles Risks from mixing activities (animal disease prevention)
Problem owner in government	Regional or central government	Regional or central government	Regional or urban government
Initial interpretation by theme			
Space and logistics	Scale of company at odds with scale of landscape	Specific locations necessary	Last mile / small scale Mixed activities
Knowledge and innovation	Insufficient application of knowledge about agri-ecology and technology (GPS, no-tillage, etc.)	Strongly science-based, plans remain on the shelf	Knowledge networks adapted to niche development
Financial, legal and fiscal	New legal forms (partnerships, franchise ties), financing forms and greener tax system	Flexible public-private management structures (such as port companies) and financing methods (revolving funds)	Group / local arrangements
Society	Scale of operations versus scale of landscape	Insufficient ethical and educational guidance	Conflicting activities

of full-time family farms. A further point is that the combination of agricultural and non-agricultural activities does not always require the setting of a small farm or have to result from deliberately aiming to satisfy the needs of urbanites. Generation of energy, possibly combined with manure processing on the farm, as well as management of large natural areas can easily be part of the activities of a specialised rural enterprise for example. Forms of vertical integration in the chain also appear particularly in poultry farming and greenhouse horticulture, with products being processed and packaged on the farm, before they are delivered to wholesalers or retailers.

To summarise, making all types of agriculture in the Netherlands more sustainable is essential for safeguarding the future of the sector and for fully utilising the potential of the different types of enterprise. In the opinion of the Council, encouraging continuing sustainable development in three dimensions is therefore the only way to bring about the necessary changes. For each of the three business models, as well as for all variants of them, fulfilling the respective tasks is a prerequisite for further progress.

With the recognition of the different business models, including their corresponding strengths and weaknesses, the way is clear to complete the necessary process of making all the Netherlands' agricultural enterprises more sustainable. Before dealing with the possible ways to achieve this, the obstacles ahead are discussed first.

4.5 Response to request for advice

The request for advice set out in Chapter 1 can now receive a full response. In Chapter 2, it was established that agriculture and horticulture as the basis for the agri-food complex represent such a large economic, environmental and innovative interest for Dutch society, that further development of these sectors in the future must be made possible. The second part of the request concerns how this has to be achieved. The response has to be that there is just one way, namely following the route of more sustainability. Only by accelerating and intensifying sustainable development that is continuous can the prospect be created of a vital and socially acceptable agricultural and horticultural sector in the distant future. The next chapter considers the way in which continuing sustainable development can be speeded up, and contains concrete recommendations on the subject. The Council outlines the overall strategy in sections 5.1 and 5.2, and fleshes this out in section 5.3.

SPEED UP SUSTAINABLE DEVELOPMENT

5

If proactive measures are taken to speed up the multi-level transition to more sustainability, the Dutch agricultural and horticultural sector can thrive and remain socially accepted in the long term (2025 - 2040), while continuing to make an important contribution to a diverse, attractive and healthy living environment, and to a circular economy in which raw materials are used efficiently.

The government has an important, though not always leading, role to play in implementing the aforementioned proactive measures. The government does not have to be solely responsible for taking the lead, as industry is increasingly motivated to satisfy the requirements of the market and society at large⁷ with respect to production methods and conditions. However, the government is tasked with facilitating and promoting continuing sustainable development by creating sufficient scope and removing obstacles. The central government also bears final responsibility for the overall outcome, providing support to regional government authorities if wanted and exercising control where necessary.

5.1 Changing role of the central government

The role of the central government in the agriculture and horticulture sector has changed. The precise nature of these changes over the past few years is not fully clear to all parties involved. A number of tasks have been devolved to regional governments, including spatial planning, land planning and nature policy. In addition, European and other international legislation is playing an increasingly prominent role in many other important domains that bear on agriculture and horticulture. The public debate is concerned with continually shifting issues (e.g. the EHEC outbreak, megafarms, Q-fever, particulate matter), sometimes to a paralysing extent. Although the central government takes action in the event of a crisis, it no longer provides sufficient direction in defining the scope available for agricultural and horticultural development. Nevertheless, clarity in this area is needed to provide entrepreneurs with the certainty they need to invest in taking sustainable development further.

⁷ See for instance Solidaridad Annual Report 2011, p. 17.

If the Netherlands is to remain a leading agricultural nation in the decades to come, the central government will have to decide as quickly as possible which roles it wishes to play, and it will need to do so based on the interests of the sector. Government's possible roles include:

- Negotiating and implementing international agreements
- Regulating trade with EU member states and international trading partners
- Supervising and co-financing knowledge centres and assessment agencies
- Defining frameworks and supervising industry and social institutions
- Facilitating and promoting continuing sustainable development
- Leading the public debate on ethical issues
- Developing strategies on topics of national importance.

By deploying these roles strategically, the central government can fulfil its overall system responsibility. From the point of view of sustainability, it is important to look beyond the electoral cycle and short-term market interests to consider the interests of other players in the national and international field: the regions, knowledge centres, industry and society at large.⁸

Although the roles listed above are not new in themselves, they must be taken up with renewed vigour to address the current challenges, with a view to the long term and the national importance of the agricultural and horticultural sector. It is precisely for these reasons that the central government must remain approachable, even during a time when industry, civil-society organisations and citizens' initiatives are increasingly taking the lead in sustainable development. The central government can build bridges and act as facilitator in this process, as well as promoting a widening of the playing field to include, for example, alternative value chains and ecosystem services. For this purpose, the central government has a number of tools at its disposal, including the use of Common Agricultural Policy (CAP) funds, spatial planning policy, environmental policy, levies, innovation subsidies, legislation aimed at the hotel and catering industry, and permits to establish businesses. In this way, the central government can provide additional incentives in order to achieve effects that benefit society.

Section 2.2 provided a number of examples of how national and international collaboration between industry and civil-society organisations can result in certification systems and regional initiatives to revitalise the countryside. There is a growing realisation that certain regional, national and international issues require a solution based on collective action. Ostrom (2004) has studied the prerequisites for getting such action off the ground, concluding that the parties involved must share a conviction that finding a solution is very much in their collective interest. The parties must also possess a degree of autonomy and must have confidence in each other and in their common future.

8 For instance, the national importance of agriculture is not mentioned in the Vision Document on Infrastructure and Spatial Planning ("Structuurvisie Infrastructuur en Ruimte"), 2012.

The intended strategy therefore requires the commitment of all relevant parties right from the start. Defining and safeguarding clear rights and obligations is one way to create such commitment. Capitalising on the experience gained through previous successful collective actions can create increased confidence that a joint strategy can be devised and implemented. This requires a substantial investment in the start-up phase to broaden the support base and avoid legal problems later in the process. Considerable experience in applying this approach has been gained in spatial and infrastructure planning, and in other areas.

This advisory report was prepared during a period of fluctuating and sometimes serious differences of opinion concerning the desirability of new developments in agriculture and horticulture, particularly in the building-tied livestock farming sector. Partly at the behest of the central government, the public debate has been conducted in the social media, in various committees and forums, and through surveys and inquiries by the Lower House of the Dutch Parliament. The Council believes that the debate must be conducted in a more systematic and constructive manner at this point. The function of the public debate will change if the government chooses to assign priority to the impact of agricultural and horticultural activities on society, while allowing the sector to implement continuing sustainable development in concrete terms. In that case, the impact on society will guide the process rather than ensuing from the process. Consequently, the government should develop its role as facilitator of the public debate on agriculture and horticulture in the Netherlands, and strengthen the dialogue with its citizens.

5.2 Scope for diversity

Many regional governments are currently pursuing an implicit or explicit policy of blocking, in particular, the further development of building-tied agriculture in particular, as well as some types of soil-tied agriculture. Local authorities wishing to provide agricultural businesses with scope for taking sustainable development further are running up against the limitations imposed by environmental and other legislation. Using instruments like the programme-based approach to nitrogen emissions (Programmatiese Aanpak Stikstof, PAS, currently under development), authorities aim to provide scope for the development of farming activities. Many cities are facing complex management issues as they develop local food strategies. What is lacking here is a set of comprehensive assessment frameworks: tools to support decision-making based on all three dimensions of continuing sustainable development.

The Netherlands is a small, densely populated and fertile delta region, with a strong knowledge-driven and trade-driven agricultural and horticultural sector. As such, it must make full use of the opportunities offered by a circular and biobased economy. These considerations all argue in favour of a clear decision by the central government to provide scope for each of the previously described types of agricultural businesses, as well as their corresponding sustainability tasks. Consequently, sufficient scope and potential must be created for specialised rural businesses, as well as quasi-industrial businesses and businesses with an urban orientation.

In addition, the Council considers it necessary that the development of clustered agricultural and non-agricultural activities at agri-science parks is encouraged and made easier. Such clusters are particularly suitable as incubators for the development of systems that can be subsequently applied in the other sustainability variants, and exported to other countries. Careful development of building-tied animal husbandry combined with non-agricultural activities (e.g. energy recovery, recycling of raw materials) at designated locations will create room for other, more soil-tied activities in rural areas. The Council would like to see the government use these agri-science parks as a means to inject new dynamism into the agricultural and horticultural sector. The spin-off of such a choice would have positive effects in all three dimensions of continuing sustainable development (People, Planet and Profit). The knowledge economy and trade balance of the Netherlands would benefit, the burden on the environment would be reduced, biodiversity and distinctive landscapes would be preserved, animal welfare would be improved, and urbanites would have more opportunities to gain direct experience of food production. Furthermore, the transition to a circular and biobased economy can be accelerated if the government provides effective guidance.

There is a rapid decline in the number of agricultural and horticultural enterprises. In some areas, this contributes to a growing volume of unoccupied agricultural buildings. Little demand exists for these buildings within the sector. The available financial resources are usually invested in new, efficient and large-scale buildings, thus further increasing the number of vacant buildings. There is little demand for these buildings outside the agricultural sector, as long as they are still designated for agricultural use. This situation can lead to dilapidation and impoverishment, and consequently to a loss of economic and cultural-historical value. Reuse of these buildings for non-agricultural purposes may help to preserve their value and re-energise the rural economy, if sufficient scope is created to support making agriculture and horticulture more sustainable. This calls for a tailor-made approach. It is therefore important for the government to remove legislative obstacles to modernising the Dutch agricultural and horticultural sector and making it more sustainable, in such a way that objectives are defined rather than the manner in which they must be achieved.

5.3 Identifying and removing obstacles

Applying continuing sustainable development to Dutch agriculture and horticulture in all three dimensions is both necessary and possible. Precisely how this aim will be achieved largely depends on the emphasis placed on the three types of agricultural business models and their specific sustainability tasks. Tension exists between the various interests at play: how can a balance be achieved between animal welfare, landscape preservation, health, profitability, ecological footprint, and the Netherlands' international competitive position? The government can help to speed up continuing sustainable development by identifying and removing obstacles that interfere with it.

5.3.1 Lack of a common vision

In order to bring about change, the Council's vision as outlined in this document must be developed further by the central government and the relevant partners, with due attention devoted to the three types of agricultural businesses and their sustainability tasks. The resultant vision must provide sufficient scope for the dynamism and diversity that are so characteristic of the agricultural and horticultural sector in our prosperous and densely populated country. Recognising the present and future national importance of agriculture and horticulture is a key first step. Failure to fully recognise this aspect will constitute an obstacle to achieving a common vision. The Netherlands has gained innovative expertise in making the food supply more sustainable, and the Council considers it a matter of national and international importance that this knowledge be used to contribute to resolving similar issues that have arisen or will arise in other countries. The Netherlands has strong leaders in each of the three types of agricultural businesses, and their expertise is very valuable as an export product.

Recommendation no. 1: Develop a practical strategy

- Develop within one year's time a practical strategy based on this advisory report, setting out the preconditions for making Dutch agriculture and horticulture more sustainable in three dimensions, thus creating scope for agriculture and horticulture in the future.
- Include in this strategy specific sustainability objectives for existing and new agricultural and horticultural businesses, for the periods up to 2025 and 2040.
- Modify legislation so that existing and new businesses are provided with incentives to engage in continuing sustainable development.

5.3.2 Lack of spatial and logistical opportunities

The development of the agricultural and horticultural sector depends on the spatial and logistical opportunities that exist. Building-tied agricultural businesses, in particular, are often enclosed in rural areas that are not intended to support further development of this type of agriculture. In many regional-government vision documents and regulations, no space is reserved for

building-tied agricultural and horticultural businesses. The same applies to many local-government land-use plans. Local communities frequently oppose the development of more industrial types of production, based on considerations such as public health, odour nuisance, deterioration of the landscape, animal suffering, and traffic safety on narrow country roads (see Part 2, section 3.2.7.5). There is a mismatch between the sustainability strategy pursued and the social and spatial environment.

Recommendation no. 2: Provide scope for the different types of business models and the associated sustainability tasks

- Encourage the inclusion in regional spatial plans and/or local land-use plans of possibilities for a tailor-made approach for all the three business models.
- Designate, in consultation with all stakeholders, a location for the development of a new agri-science park, in order to provide an example of continuing sustainable development and of innovation, and to demonstrate nationally and internationally how Dutch agriculture and horticulture can support building-tied farming in plant and livestock sectors that is broadly accepted by society.
- Encourage the development of similar pilot projects in the specialised soil-tied sectors, with an integrated approach to the various sustainability tasks. Such projects could focus, for example, on combining local energy generation, CO₂ emissions reduction, and a smart approach to water, soil and biodiversity using a future-proof revenue model.
- Consult with cities to resolve administrative issues around local food strategies, with the aim of involving more city dwellers in the process of making their food supply and living environment more sustainable.

5.3.3 Inadequate transfer of knowledge

The national and international standing of the Dutch agricultural and horticultural sector is largely based on high-quality expertise, excellent education and effective extension service provisions. The Dutch government's top-sectors policy for the agri-food sector has built on this solid foundation. It is now up to industry to make further contributions to this policy. The Dutch agricultural and horticultural sector is dominated by small and medium-sized enterprises. Moreover, the present challenges exceed the limitations of a sector-based knowledge and innovation agenda. This means that we need to widen our horizon. We must start from a more broadly based point of departure, one which assigns priority to the impact of the agricultural and horticultural sector on society and which results in a knowledge and innovation system that supports the necessary application of continuing sustainable development to this sector.

New knowledge and innovation is usually the result of collaboration between the scientific community, industry, and other actors. Continuing sustainable development is hindered if the available knowledge is not fully utilised or if specific questions do not lead to research. Continuing sustainable development in the agricultural and horticultural sector demands a new exchange of knowledge

and innovative solutions, not just within the sector but also with other sectors and fields of knowledge, which is the case with a biobased economy.

The impact of developments related to a circular and biobased economy have to be carefully monitored therefore to identify in good time any new problems that may arise, and prevent them. For example, the introduction of the biofuel blending obligation has led to increased global demand for land and has put pressure on food prices. In addition, basic research is needed to find ways of dealing with the combination of a range of difficult sustainability tasks. The question is how this can be organised effectively. The familiar “golden triangle” comprising government, industry and research centres is becoming a “golden quadrangle” as NGOs take their obvious place at the table. The Council expects a great deal from the combination and integration of knowledge and experience from the agricultural and non-agricultural sectors.

Recommendation no. 3: Make full use of knowledge and innovation as drivers of continuing sustainable development

- Create a knowledge and innovation agenda at central government level to meet the challenges facing the agricultural and horticultural sector, paying due attention to the SME-dominated character of this sector. Flesh out this agenda to address the different types of agricultural businesses and their specific sustainability tasks, and ensure that all stakeholders (including civil-society organisations) are involved in its implementation.
- Improve the connection between the top-sector’s policy and the different types of agricultural enterprises and their specific sustainability tasks.
- Promote and facilitate the transfer of knowledge on best agricultural practices between agricultural and non-agricultural entrepreneurs in the Netherlands, and between Dutch (agricultural) entrepreneurs and entrepreneurs in other countries, particularly developing countries.

5.3.4 Financial, legal and tax obstacles

The activities of the agricultural and horticultural sector are regulated by a complex network of laws and regulations. The current right of appeal creates certainty, but also slows things down. The density and level of detail of the applicable laws and regulations is considerable. Mandatory measures (*middelvoorschriften*) act as a curb on both innovation and sustainable development. For that reason, industry increasingly prefers mandatory targets (*doelvoorschriften*). Creating scope for continuing sustainable development, innovation and modernisation in this complex network of legislation can sometimes present a puzzle. Consequently, growing calls are heard in support of a stable financial, legal and fiscal framework that permits and even encourages⁹ flexibility and dynamic development. Government authorities at all levels should heed these arguments and ensure adequate financial, legal and fiscal scope. Agricultural entrepreneurs need space for development and experimentation;

⁹ Refer to Hazeu and Silvis (2011), among others.

their neighbours want safeguards against nuisance, risks and loss of value. Future generations will want to take ownership of a clean and fertile country. Appropriate legislation must be in place to ensure that the various interests are weighed up in an effective and transparent manner. This means not only that antiquated laws and regulations need to be modernised and abolished if necessary, but also that new laws and regulations need to be drafted to prevent free-rider behaviour¹⁰ and pass the costs on to the party making them necessary. In short, clear frameworks must be in place to define the scope available for development.

Recommendation no. 4: Provide sufficient financial, legal and fiscal scope

- Systematically check existing laws and regulations for provisions that hinder sustainable development, innovation and modernisation in the agricultural and horticultural sector, and eliminate these obstacles. Pay attention as well to European, regional and local laws and regulations, and opt for mandatory targets rather than mandatory measures.
- Encourage the development of modes of management that support flexibility and innovation, and introduce revolving funds to facilitate the cycle of innovation and investment. Consider using Common Agricultural Policy funds for this purpose.
- Use the national scope provided by the new Common Agricultural Policy and the associated European monetary flows to promote continuing sustainable development, innovation and modernisation in accordance with the three perspectives of the process (see the advisory report “European agriculture policy as a transition instrument for agriculture and horticulture”, Council for the Environment and Infrastructure, 2011).

5.3.5 Societal involvement

The Netherlands has a well-developed network in and around the agricultural and horticultural sector. This is one of our country's strong points. It is for good reason that we refer to the “golden triangle” comprising industry, knowledge centres and the government. The danger of this strong network lies in a decreased orientation towards the outside world. Signals issued by society are slow to be picked up. This leads to resistance from society, resistance that is currently focused on public health risks and the associated cost transfer mechanisms, for example with respect to bacterial resistance and the high costs of animal disease outbreaks (see Part 2, section 3.2.7.5). Ethical dilemmas are not recognised quickly enough or explored sufficiently in a transparent public dialogue to reduce resistance in society.

Dutch agricultural and horticultural sector has long enjoyed a self-evident strong position. That position is gradually eroding, and the Council believes there are positive aspects to this development. Only by taking into account its own position and diversity and the corresponding sustainability tasks can the agricultural and

¹⁰ The expression “free-rider behaviour” refers to a situation in which an individual or organisation makes use of a particular system without contributing to it.

horticultural sector be part of the new circular economy and redefine its position in society. The splendid isolation of the agricultural and horticultural sector must therefore be permanently relegated to the past. The challenges outlined in this advisory document call for a sector that takes the societal impact of its activities into consideration before they occur, and focuses appropriately. As the sector increasingly succeeds in achieving this aim, there will be less and less interference with the manner in which it does so. The “how” aspect can then be left largely to industry to organise in the form of supply chain agreements and local collaborative arrangements.

Recommendation no. 5: Ensure broad public support

- Develop central government’s role as a facilitator of the public debate on agriculture and horticulture in the Netherlands, and strengthen the dialogue with citizens.
- Implement the practical strategy referred to in recommendation no. 1 by means of a structured approach based on broad societal involvement. Involve industry, regional and local government, consumers, environmental organisations and animal welfare organisations in the strategy debate from the very beginning.

PART 2 | ANALYSIS



OUTLINE OF THE CONTEXT

1

The Dutch agri-food sector is currently feeling the impact of turbulence on global markets and of a heated public debate. This does not make it easy to create a vision for the future of agriculture. In this introductory chapter, a simplified picture is outlined of the national and international developments that dominate the sector and form the background to this advisory report.

1.1 Changing agri-food sector

At home as well as abroad, the Dutch agri-food sector has established a leading position for itself. That was certainly not easy in the past, and will be even less so in the future. Global markets are changing quickly, partly owing to the impact of emerging economies such as those of China and Brazil. Scarcity of raw materials, water and land leads to new rules to play by. The role of government is changing and society as a whole is becoming more complex. The agri-food sector is caught in a state of tension between the highly competitive landscape of the world market, characterised by volatile prices, and increasingly stricter demands imposed by society. Escaping this dilemma requires embarking on a process of continuing sustainable development¹ that will strengthen the sector's competitive position, not just by reducing procurement costs, but also by integrating the demands of society.

Consumers as well as government impose new requirements on products (in the area of food quantity, quality and safety), production methods (animal disease prevention, animal welfare, genetic modification) and environmental protection (nature, landscape, water and climate). As a result of these increasingly stringent social demands, agricultural entrepreneurs are required to produce more and to do so more efficiently, while also supplying higher-quality products. This requires investment, with the relevant investment decisions having to be made under complex and turbulent conditions (KPMG, 2012a).

Apart from knowledge and technology, agricultural entrepreneurs deploy the production factors of labour, capital and land in order to generate sufficient returns to keep the enterprise going, given the demands imposed by the environment. Simply put, doing more with less is the guiding principle, and an

¹ In this advisory report, the Council uses the term 'sustainable development' to describe the process of the integration of the three P's (People, Planet and Profit) in the activities of companies, organisations and individuals, and the creation of the corresponding conditions that take into account the needs of future generations (World Commission on Environment and Development, 1987; Elkington, 1997). The need for a green, biobased and circular economy, as well as a suitable regulatory system, is high on the international agenda (Rio 20+ Earth Summit). Sustainable development is the driver of a green, biobased and circular economy.

increase in scale the result. The general public in its role of consumer observes this development and often rejects it, as in the case of very large livestock farms. Farmers who cannot or will not follow the upscaling trend either give up farming altogether, earn additional income outside the sector, or seek alternative strategies in multifunctional agriculture. Although the last form of agriculture seems to present great potential, it is still of limited importance for the Dutch economy and the income of farmers. The possibilities for utilising social functions (nature management, recreation, care) to create financial value remain limited, and the sale of regional products is largely confined to local niche markets. Moreover, most consumers still prefer buying their food as cheaply as possible, i.e. at the supermarket.

Opposing this trend in favour of expansion, the past few years have witnessed a debate on 'sustainable intensification' (Garnett & Godfray, 2012), i.e. the further intensification of agriculture as a way to help solve the global food problem. In the Netherlands, contributions to the debate have recently come from Dr Aalt Dijkhuizen (2012), President and Chairman of Wageningen University; from the Netherlands Environmental Assessment Agency (PBL); and from Professor Louise Fresco. Dijkhuizen advocates an intensification of agriculture subject to environmental criteria. In its report entitled 'Assessment of the Human Environment 2012' (PBL, 2012a), the aforementioned Agency shows how creating a sustainable food system can be tackled from various angles: producing more efficiently (more from less), producing more carefully and/or consuming differently. Fresco (2012) points out that our thinking about nature, agriculture and food is influenced by the metaphor of the 'Garden of Eden': an impossibly stable, diverse and productive ecosystem that does not exist and never has existed. Fresco argues for correcting the deficiencies of the existing system step by step. According to her, the difficulty with this approach does not arise from ecological limits, but rather from the limits of our faith in scientific and technological solutions.

Selection of recent advisory reports

Agro & Food Top Team (June 2011). Agro & Food Top Sector Report: Agro & Food: *De Nederlandse groeidiamant*. The Hague: Ministry of Economic Affairs, Agriculture and Innovation.

The Agro & Food Top Sector Report argues for a sector that in 2020 produces sustainably, delivers more high-value products, and occupies a leading position internationally. To achieve this, the report advocates economic diplomacy, a level playing field, knowledge and innovation, sustainability, and support for the sector in society.

continued on the next page

Horticulture & Source Materials Top Team (June 2011). *Bron voor Groene Economie; Wereldoplossingen voor werelduitdagingen*. Greenport Holland.

The Horticulture & Source Materials Top Team Report advocates the development of knowledge and innovation at a high international level, a leading position on the global market, and continuing sustainable development. This necessitates doubling the added value produced by the sector, freeing up public as well as private finance, and creating a knowledge infrastructure together with a decisive and responsible sector organisation.

Van Doorn Commission (September 2011). *Al het vlees duurzaam: De doorbraak naar een gezonde, veilige en gewaardeerde veehouderij in 2020*. Den Bosch: Van Doorn Commission.

In response to the growing social pressure confronting the pig farming industry, the Van Doorn Commission has outlined a roadmap to fully sustainable meat production in 2020. To achieve this, the Commission recommends a chain-wide approach in which retailers take a leading role, free-rider behaviour no longer pays, and a permanent dialogue between all stakeholders helps ensure sustainable meat production.

H. Alders (September 2011). *Van mega naar beter: rapportage van de maatschappelijke dialoog over schaalgrootte en toekomst van de veehouderij*. The Hague: Lower House of the Dutch Parliament.

Citizens' panels, scientists and entrepreneurs outlined their vision on the future development and scale of livestock farming in the Netherlands. Alders concludes that clear objectives, agendas and binding agreements will have to contribute to social acceptance of livestock farming and realisation of an acceptable scale of production.

Scientific Council for Integral Sustainable Agriculture and Nutrition (RIDL&V) (December 2011). *Naar een integrale benadering van duurzame landbouw en gezonde voeding*. Utrecht: Scientific Council for Integral Sustainable Agriculture and Nutrition.

This advisory report calls for restoring the links between consumers and food by means of a circular food chain that promotes social, ecological and economic sustainability. The report includes a knowledge agenda based on eco-agrarian, social and informal relationships.

Many commissions and research institutes have devoted serious attention to these dynamics, the resulting tensions and the solutions that present themselves (see text box).

1.2 The challenges in a global, European and national perspective

The world population is estimated to rise to 7.6 billion by 2020, and to 9 billion by 2050. This growing population will need more food than is currently produced. Owing to greater prosperity and urbanisation, the demand for food is also changing in qualitative terms: more animal products, more fruit and vegetables, and more processed products. As a result, the world will have an even greater need for efficient, knowledge-intensive, and sustainable food production and processing (Organization for Economic Cooperation and Development, 2012). The primary agriculture and horticulture sector is steadily being integrated in global chains. Multinationals are the driving force behind high-tech developments, tighter chain integration and a more efficient approach to the use of raw materials. New value chains based on residue streams continue to emerge (biobased economies and circular economies). The use of plant protection products and chemical fertilisers is decreasing, partly thanks to the introduction of GPS systems and new crop varieties.

The agri-food sector still uses mainly fossil fuels, although increasing use is being made of biomass, which is heavily dependent on the price of petroleum and alternative raw materials, energy policy and demand for new types of cosmetics, medicines and detergents. This creates ever-tighter interweaving with other sectors such as the pharmaceutical industry and producers of packaging materials, cosmetics, etc.

Various parties are calling for a new 'green revolution' as a way to meet the demand for agricultural produce. In the first instance, this requires higher output per hectare, greater efficiency, and, possibly, more land for farming. To protect biodiversity, however, the expansion of farmland would have to be restrained. Other considerations such as climate and the need for land for non-agricultural purposes also provide reasons to limit the worldwide expansion of farmland as much as possible (see for example Westhoek et al., 2010). Secondly, and in view of the foregoing, there is an argument for limiting the substantial losses of food in the chain, combating the depletion of good agricultural land, and new eating habits with less emphasis on animal protein (Westhoek et al., 2011; PBL, 2012c). Transparency in the chain and distribution issues are also subjects requiring attention in connection with the growing demand for agricultural products.

New developments in ICT, logistics, and the organisation of the production process bring new obstacles and new opportunities to international trade. The classic solution to trade barriers in the form of the World Trade Organisation (WTO) agreeing to reduce tariffs no longer seems adequate. Moreover, the outcome of the Doha Round is far from certain (Baldwin, 2012). The goal of securing the supply of raw materials creates new dependencies between countries and leads to disputes at the WTO. A recent example was when the

United States, Japan and the European Union criticised China for its trade policy on essential metals and raw materials (World Trade Organisation, 2012). Trade agreements between groups of countries (Foreign Trade Associations) have become more important. Moreover, the drive for sustainability is increasingly being taken over by leading private organisations such as the World Wildlife Fund in collaboration with industry, and translated into extra-statutory standard setting. The WTO will have to respond to these developments if it wants to achieve the goal of freer global trade.

Food security is not a problem in Europe, although the European Union does need to import oilseeds, protein crops, essential raw materials such as phosphate and other micro-nutrients (Udo de Haes et al., 2009; Smit et al., 2009), and energy of course. Europe is likely to become increasingly self-sufficient in its food supply due to further growth in productivity and stagnating demand. This stagnation is attributable to the fact that Europe's population has stopped increasing but is still aging, and to saturation, including with respect to animal products. In parallel, demand is shifting in favour of higher-quality products, with sustainability and health as the major challenges. Moreover, the quality of the human environment is an ongoing concern at both the European and national levels.

All in all, the quality of the Netherlands' human environment has been improving over the past few years, with achievement of the Kyoto target looking probable. If this does not happen, additional emission reductions will be necessary. The decline of biodiversity in the Netherlands has certainly slowed down, but has not yet come to a halt. Flora, fauna and ecosystems susceptible to fragmentation and pressure on the environment are still under threat. Less pressure on the environment and an effective nature conservation policy are both essential to prevent further degradation of biodiversity (PBL, 2010a).

The Dutch agriculture and horticulture sector will therefore have to establish its position in a country where competition for space is increasing and the conditions imposed on production methods are becoming increasingly restrictive. Meanwhile, economic balances and relationships are shifting rapidly on the world stage, with food consumption and production becoming increasingly integrated into a global system dominated by global chains. At the same time, the demand for food is growing just as fast as the need to reduce the ecological footprint of production.

The next part of this report will set out the analytical foundations for the recommendations on the scope for sustainable agriculture. Its purpose is to:

- Outline the historical and institutional context of the highly productive and knowledge-intensive agriculture and horticulture sector in the Netherlands
- Outline the status of the Dutch agriculture and horticulture sector and agri-food sector, both internationally and domestically as part of the Dutch economy, and as part of the country's rural area
- Describe the directions of development in agriculture and horticulture, and the roles played by government, industry and civil-society organisations in shaping these directions
- Provide insight into the roles played by Dutch and European government authorities in the development of agriculture and horticulture in the Netherlands, particularly the changing role of government, industry and civil-society organisations
- Summarise key trends affecting the potential of Dutch agriculture and horticulture to develop further.

IN RETROSPECT

2

To provide a better understanding of present-day agriculture and horticulture in the Netherlands, this chapter summarises developments in the sector since the Second World War. This period can be characterised by a continual rise in labour productivity, largely thanks to an increase in scale which in turn over the past few decades contributed to a growing appreciation for sustainability as a feature of the production process. These three factors are considered separately in the next sections.

2.1 Increasing labour productivity

Constantly rising labour productivity was the common denominator in the development of agriculture and horticulture in the post-war period. The driving factors and the different forms this development took are described in this section.

2.1.1 Favourable conditions

After the Second World War, the family farm² became even more dominant as the business model in Dutch agriculture and horticulture. This had already been the case before the war, but then many farms, mainly in the coastal provinces, took on a few farm workers to supplement family labour. Arable farming in these provinces in the nineteenth and first half of the twentieth century was characterised by gentleman farmers ('herenboeren') employing five to twenty workers. The first blow to this type of farm was the major agricultural crisis of 1880, when prolonged low grain prices made life difficult for many of the larger farms. The smaller, often mixed family farms were able to tighten their belts and had smaller financial commitments. During this period they already demonstrated greater resilience than the larger enterprises (Bieleman, 2008).

In this period of crisis, the foundation was also laid for the development of a competitive and internationally oriented agriculture and horticulture sector later in the twentieth century. The previous centuries had witnessed the rise of a highly productive form of agriculture near the cities and the river delta. This

² The term 'family farm' generally refers to a farm that employs mainly family labour and family capital, thus using a broad definition of 'family'. Wageningen University and Research Centre includes a few more elements in its definition (see section 3.5), one of them being the kitchen table as the place where decisions are made. For empirical reasons, the criterion used for 'family farm' in this analysis is a business where more than half the labour is provided by family members and relatives who are not on the payroll.

in turn enabled the urban population to increase. The water-rich nature of the Netherlands contributed to the right conditions for agriculture, but also naturally formed a threat. To keep the water in check, self-regulation arrangements came into being as early as the Middle Ages, in the form of water boards (Van de Ven, 1993). In combination with the Dutch merchant tradition and the early development of banking, trade, ports and other types of infrastructure, as well as shipping to the colonies and other parts of the world, it was possible for the agricultural sector in the coastal provinces to gear its activities towards other countries, for instance by exporting butter, livestock and flower bulbs (Bieleman, 2008; Renes, 2011).

2.1.2 Knowledge-intensive agriculture

It was precisely because of this trading orientation that the Dutch government made a choice at variance with the norm for continental Europe, when cheap American grain caused European grain prices to collapse in the 1880s. Instead of protectionism, the government opted to upgrade the competitive strength of Dutch agriculture and horticulture by investing in education, information provision and research. Section 3.1.7 looks at how this trio helped to maintain and develop the knowledge-intensive character of Dutch agriculture and horticulture, in line with a long tradition of distributing knowledge and information that began with the first journeyman teachers who walked as travelling instructors from farm to farm at the end of the nineteenth century (Meer et al., 1991).

These investments in knowledge and knowledge transfer were combined with land reclamation, in which land-development association *Heidemaatschappij* and other organisations with ‘enlightened’ aims played an important role. Land consolidation (also known as ‘reparceling’) came on the scene later as way of improving the organisation of agriculture (Van den Bergh, 2004). Private initiatives and government action went hand in hand. Significant trading interests were a factor in the collaboration, which was also the basis for the competitive strength and export orientation that characterised the sector throughout the twentieth century.

Although the recession of the 1930s did not start in agriculture, it quickly took hold of the sector. The low prices in this period led to more targeted government policy, mainly with the aim of helping small farms. However, this was a restrained form of protectionist compared with other countries. Once again, the family farms proved to have the most stamina. Moreover, many people continued to work on farms because the industrial sector, which was plagued by the recession, offered them no prospect of employment (Van Bruchem, 2009).

2.1.3 Agricultural policy

After the war, the family farm gained an even more dominant position in the agriculture and horticulture sector. Although a few farms were still run by gentlemen farmers, the number of workers on them rapidly declined owing to stagnating profitability, mechanisation, and growing opportunities for

employment in the city. The same fate overtook the large dairy farms in the northern and western parts of the country, where the presence of one or two farm workers had been a completely normal sight up to then.³ Most farm workers gradually disappeared from the scene, so that the large dairy farms shrank to the size of the family farm, too.

Starting in the 1960s, the number of farms declined as well. The constant rise in production volume and value implies a simultaneous steep increase in labour productivity. From the end of the war, this was also an explicit objective of government policy (De Groot & Bauwens, 1990), which regarded relatively low food prices as a prerequisite for the desired economic growth. Upscaling was therefore not simply a route that farmers and market gardeners were forced to follow for business reasons. It was also expressly included in the goals of a government policy that before, during and long after the war sought, among other aims, to create more room for modern and efficient agriculture through active measures for land reclamation. Modern-thinking farmers could move from existing land, where space was often in short supply, to reclaimed land in the Wieringermeer, Noordoostpolder, and Flevoland polders to set up efficient new farms.

Prices in the agriculture and horticulture sector are essentially based on forces operating in the world market and the European market. Immediately after World War Two, the Dutch government was able to moderate the influence of the world market on prices in the key land-tied sectors. In the initial post-war years, the world market influence led in particular to steep price increases, while government policy was aimed at keeping food prices in check. This also allowed wages to remain at a moderate level, an important factor in the country's post-war reconstruction process. At the same time, the then Minister of Agriculture Sicco Mansholt guaranteed 'remunerative prices' so that farmers were able to rapidly increase production. The population's inexpensive diet and rising agricultural productivity at prices well below the Western European average were both desirable for boosting exports. This was in turn urgently needed to obtain foreign currency, as memorably expressed in the motto of then Minister of Finance Piet Liefstinck: "Export or die" (Van Merriënboer, 2006).

However, after only a few years, prices on the world market began to fall and Dutch government policy changed course to protect domestic prices against the downward pressure from the world market. From the 1960s onward, the European Union⁴ assumed that task with a policy initially based on the so-called Common Organisations of the Market (COMs). The purpose of these market regulations was to apply measures within the market and at the EU's external borders as a way of keeping the prices of certain key products – grain, sugar, beef, dairy produce, wine and olive oil – at a specified target level. Prices were maintained at this level

³ See for example Maris et al. (1954), p. 13 et seq.

⁴ After the Treaty of Rome came into force in 1958, existing national intervention mechanisms were replaced by intervention mechanisms of the European Community, later the European Union.

relative to those on the world market by a system of export subsidies and import tariffs, and internally by intervening in the market. This resulted in acceptable price levels during the first few years, but it also created the proverbial ‘butter and milk powder mountains’. During the 1970s and 1980s, it became clear that the system was so ‘effective’ that agricultural production in the European Economic Community had developed beyond the limits of self-sufficiency for certain key products (Meester et al., 1985). This also meant that the costs kept going up, not only for European agricultural policy, but also from the standpoint of environment, nature, landscape and public health. The expenditure on export subsidies was no longer compensated by revenue from import tariffs, and the costs of interventions to protect internal market prices rose and threatened to rise even higher.

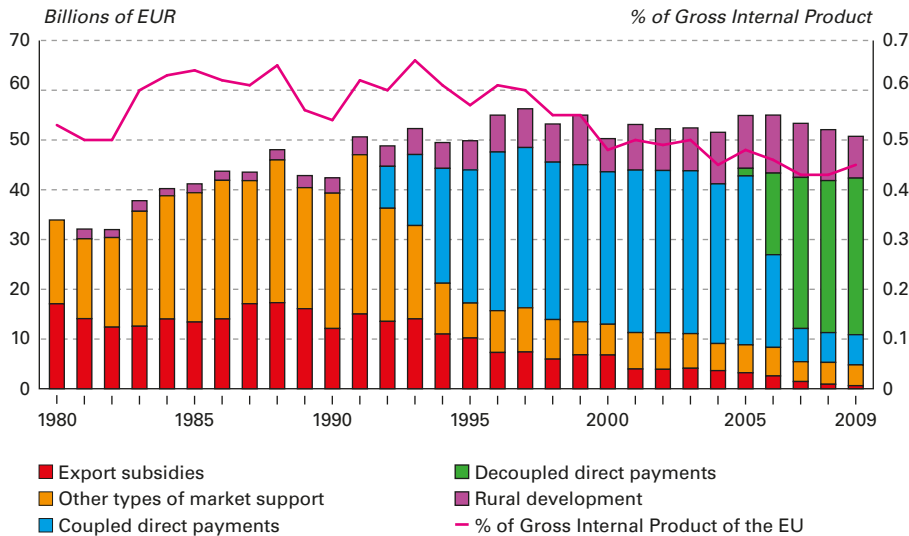
2.1.4 Limits of agricultural policy

Society’s concerns about the external impact of agricultural and horticultural production grew under the influence of the mounting international debate⁵ and national initiatives (Bleumink et al., 2011).⁶ In 1972, the Ministry of Health and Environmental Protection was established. One of its actions was to issue a Priority Memorandum on the problems relating to surplus manure. A year later, in 1973, the Ministry of Agriculture and Fisheries banned the use of DDT and hexachlorobenzene because of their risks to public health. During this period, the central government was expected to place limits on agriculture. Environmental policy has also been driven by the EU since its establishment. Laws and regulations compelled market parties in the chain to reduce or prevent external impact, or face the imposition of sanctions. It was only in recent decades under the heading of Corporate Social Responsibility (CSR) that market parties started seeing it as their own responsibility to factor external impact and public concerns into their business operations. For this to happen, a certain scale and level of efficiency is necessary, as well as mutual trust within the chain. Although the wave of mergers and the accompanying increase in scale started in the 1970s, chain integration and internal quality assurance systems are more recent phenomena. Measures to limit production and standards for food safety were introduced in the 1980s.

Commencing in the early 1990s, the EU’s market and price policy has been undergoing further incremental adjustment. Supporting environmental measures were introduced and in 2000 these were merged with other policy instruments for rural development (the second pillar of policy, accompanying the first pillar, i.e. market and price policy). Support was no longer linked to specific products, but to surface area or specific farms. The intention was to strip the policy of its production-increasing effect, and link production to social requirements (‘cross-compliance’).

5 In 1962, Rachel Carson’s ‘Silent Spring’ was published (Carson, 1962). In 1972, the UN held an environmental conference in Stockholm, and the Club of Rome published its report ‘The Limits to Growth’ (Meadows et al., 1972).

6 In 1971 Friends of the Earth Netherlands (Milieudefensie) was founded, and in 1972, Stichting Natuur & Milieu. The latter organisation immediately went on the offensive against the biotech industry.

Figure 1: Expenditure relating to Common Agricultural Policy

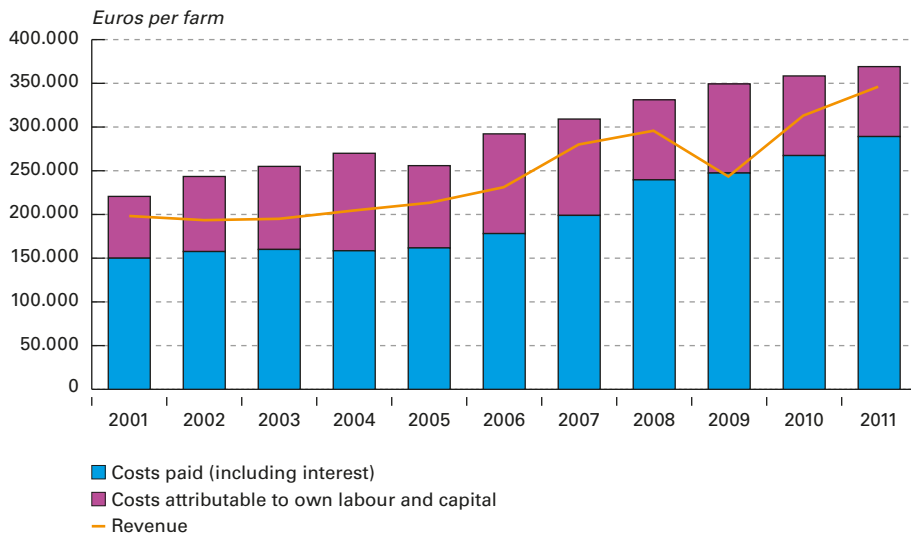
Changes in different types of expenditure relating to Common Agricultural Policy for 1980-2009; the replacement of export subsidies and market-support measures by direct payments. Source: European Commission – Directorate-General for Agriculture and Rural Development.

On balance, market support measures (including export subsidies) were steadily replaced by direct payments, as Figure 1 shows. Over the course of the 2000s, these payments were rapidly decoupled from the actual production per farm, and increasingly linked to social requirements. The possible development of European agricultural policy after 2013 is the subject of section 5.10.

2.2 Scaling up

2.2.1 Institutional environment

Rising labour productivity remained a constant factor. First, farm workers left the scene as more could be earned outside agriculture. After the Second World War, farmers and market gardeners tried to reduce the need for manpower and natural horsepower through mechanisation. The tractor rapidly took over the Dutch countryside, with a host of other machinery in tow, among them the milking machine and the combine harvester. This process continued after the farm worker had become a rare phenomenon. There were more cows per farmer, more hectares per farm, more pigs per pig farmer, larger farms, heavier machines, more efficient milking sheds, and, of course, increased production per are, hectare and animal. Segregation of activities enabled the upscaling of specific operations and was also

Figure 2: Revenue and expenses of dairy farms

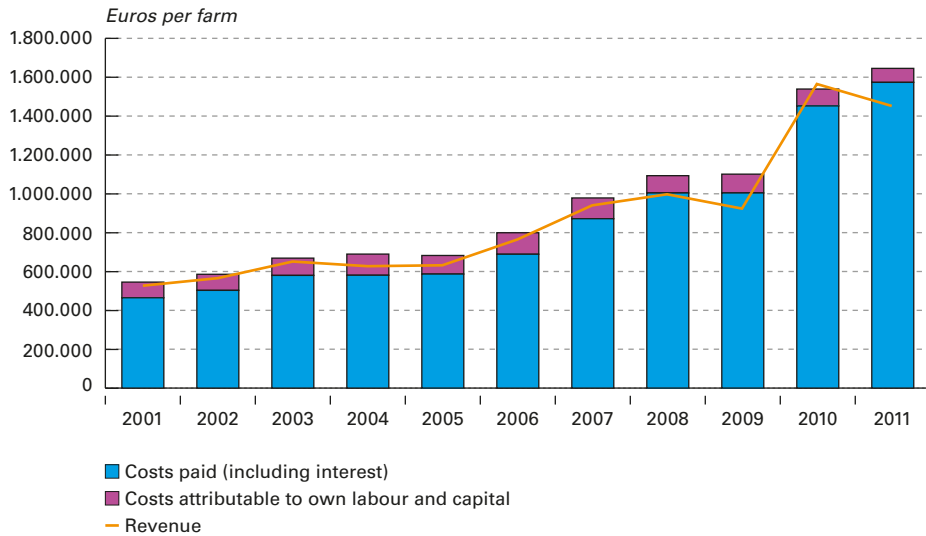
Revenue and operating expenses of dairy farms, 2001-2011; actual revenue was not sufficient in any year to cover the costs if these include rewarding family labour and capital in line with market prices. Increases in scale based on rewarding additional labour and loan capital at market rates is not a feasible option. Source: Agricultural Economics Research Institute, 2012.

a key element in the process of raising labour productivity.

The use of cubicle stalls in dairy farming was symbolic of this development.

From the end of the 1960s, these stalls enabled more cows to be milked on-farm and at one location by the same number of workers. The interest rate subsidies introduced by the EU and, somewhat later, the WIR investment premiums⁷ paid by the Dutch government, helped many entrepreneurs overcome their hesitation concerning the required investments. Until then, this reluctance was a significant feature of the culture in many rural areas, where getting into debt was seen as something to be avoided. The growth of modern agricultural entrepreneurship was promoted not only by subsidies, but particularly by the institutional framework in the form of information centres set up by the farmers' own agricultural and horticultural organisations and by the government, and, of course, the farmers' banks. Farmers' cooperatives also encouraged their members to increase the scale of operations by introducing volume discounts or bonuses and mandatory on-farm milk tanks.

⁷ Incentive payments under the Investment Accounts Act 1988 (*Wet op de Investeringsrekening, WIR*).

Figure 3: Revenue and operating costs of greenhouse horticultural enterprises

Revenue and operating costs of greenhouse horticultural enterprises, 2001-2011. The turnover per enterprise is significantly higher (which is essential given the lower margins) than at dairy farms because additional labour and capital is rewarded at market rates. Accordingly, the share of such labour and capital is significantly higher than at dairy farms. There are only a few years in which revenue covers family and outside labour and the costs of family and loan capital. Source: Agricultural Economics Research Institute, 2012.

Small farms unable or unwilling to invest in this form of mechanisation gradually disappeared or were restructured, again with help from the farmers' and market gardeners' information organisations and various government schemes aimed at influencing farmers' social and economic behaviour.

2.2.2 Differentiation between sectors

In 1970, there were about 200,000 agricultural and horticultural enterprises in the Netherlands. Today, the number is around 70,000. In the land-tied sectors, land belonging to 'leavers' was often purchased by 'stayers'. A similar process occurred in sectors dominated by indoor farming, mainly intensive livestock farming. Although the availability of land did not play a significant role in any expansion of these land-tied farms (it did play a role in the disposal of manure, however), production capacity gravitated increasingly to a smaller number of larger enterprises. The size of farms grew steadily, and continues to do so. The situation differed from most other subsectors in that the upscaling process regularly resulted in extremely large farms. Such farms could afford to make a jump in scale, thus growing beyond the magnitude of the family farm.

The average profitability of these companies was sufficient to raise their scale of operations above that of the family farm, with the help of outside labour (which has to be remunerated in accordance with collective labour agreements and market requirements) and loan capital (which is not available on easy terms, unlike borrowing from family members). Commencing in the 1970s, the same process of scaling up to a level above that of the family farm occurred in the greenhouse horticulture sector, where the classic family farm model is now in the minority. Investment in the land-tied sectors is aimed at attaining the highest possible level of production within the limits of the available family labour, and using relatively large amounts of their own capital. As regards the upscaling frequently seen in the building-tied sectors, it is precisely the additional outside labour that helps to achieve a production level where investments (made with borrowed capital) can be recouped. This is only possible, however, if the profitability of the sector is sufficient to remunerate both outside labour and loan capital in line with market standards. Such was the case mainly in the building-tied sectors. The limited availability of land will certainly have influenced the difference between land-tied sectors and building-tied sectors when it came to increases in scale.

The effect of upscaling in non-land-tied sectors was different from that in dairy farming and arable farming. Enterprises engaged in greenhouse horticulture and intensive livestock farming often grew both in terms of production and size of workforce. They also increasingly considered setting up new operations in other countries as a way to benefit from the closeness of the export market, lower labour costs and conditions more friendly for entrepreneurs. This process of partial emigration ('semigration'), characterised by the duplication of industrial production at several locations under the control of a single holding company, is hardly known in the land-tied sectors, if at all. Full emigration is more often the case there, mostly as a family farm. Emigration is also the norm for arable and livestock farms established by Dutch farmers abroad, mainly in Eastern Europe. In these cases, the business connections to family members or service providers sometimes remain intact.

In land-tied sectors, intensification and upscaling were carried out at family farms, possibly with the help of a few paid employees. More and more large enterprises appeared on the scene, displacing increasing numbers of smaller ones. However, the size of the largest, whether measured in animals or hectares, never grew to exceed that of the record holders from the 1960s and 1970s. The dairy farms of that period, known for their herds of around a thousand head, no longer exist. According to figures from Statistics Netherlands and from Wageningen University and Research Centre (2012), in 2010 there were six dairy farms with over 500 head, and in 2011, eleven farms.

The very largest arable farms, those with productive areas of 650 to 1200 hectares, have not increased in number during the past 50 years. Some of them (De Bathpolders N.V. in Rilland, and Ambachtsheerlijkheid in Cromstrijen, for example) have even decreased in size. Following the initial stringent reforms of agricultural

policy under European Agriculture Commissioner Raymond MacSharry early in the 1990s, the emphasis in the arable farming sector was placed on intensification. This took the form of an increase in the size of cultivated area for intensive crops, more use of family labour, and a higher net yield per hectare than from traditional arable crops, for example, from onions, field scale vegetables, sprouts, or flower bulbs. In dairy farming, the increase in scale as expressed in animals or hectares per farm continued after the introduction of milk quota in the first half of the 1980s. Initially, new types of milking sheds like the milking carousel made it possible for the larger farms to achieve even higher production with a comparable amount of labour. Later, at the beginning of the 21st century, robot milking systems appeared on the market. This resulted in more milk produced per cow, and again even less labour per litre of milk. All these investments in innovation not only opened up the possibility of increasing the scale of production, they also needed this increase to break even. Nevertheless, the introduction of innovations was always possible with a family farm of unchanged size.

2.3 Closer to society, yet further away

2.3.1 Urban involvement

Since the 1970s, another factor had a growing influence on agriculture and horticulture, partly driven by the very process of upscaling. This was the changing relationship between the agriculture and horticulture sector and society. On the one hand, the urban population became increasingly distanced from agricultural production. Due to greater prosperity, the importance of food and food exports for the economy decreased or was forgotten altogether. Industrial processing of agricultural products led to a longer shelf life and more diversity of products. One effect of this was to increase the perceived distance between primary production and the urban consumer. The shrinking agrarian population and decreasing economic importance of the primary sector (see Chapter 3) both contributed to this process. On the other hand, society became increasingly involved in the countryside and its products. The countryside was increasingly seen as a place for recreation and a second home. Precisely because of this, interest in the quality, health aspects and origin of food increased.

The urban population, in which the proportion of children and grandchildren of farmers became steadily smaller, no longer ignored the dark sides of agricultural production, often side effects of the process of upscaling. They actively identified those dark sides as aspects of the quality of the food they found in shops. Outside the agriculture and horticulture sector, large-scale production was no longer automatically seen as a sign of progress. The principle 'small is beautiful', which caught on in the 1970s, is evidence of this (Schumacher, 1973). Equally significant in this context is the Club of Rome's 'limits to growth', revolutionary for the time and hence to become immortal (Meadows et al., 1972). Thus, the landscape was

no longer regarded as something that only farmers could make decisions about. And correspondingly, alteration of this landscape to suit the efficiency demands of agricultural production was increasingly regarded as unacceptable or undesirable. The environmental impact of manure from livestock production, as well as that of plant protection products in the vegetable growing sectors, is no longer passively tolerated. Livestock farmers have to accept that citizens will become involved in debates about water levels in 'their' polders, and will oppose the conditions in which farmers keep their animals.

2.3.2 New relationship between agriculture and society

In the 1970s, this changing relationship first became manifest in government policy in the form of increased attention to environmental protection and the manure surplus. A manure limitation policy only came into force in the 1980s, with increasingly effective legislation appearing step by step, also in the form of EU regulations. On the one hand, manure was no longer viewed as a productive growth enhancer, but rather as a source of pollution; on the other, more attention was devoted to the rapid growth in the number of animals used for livestock farming, responsible for a continual weakening of the link between manure production and surface area. Animal diseases and the consequent culling of animals led to a reduction in stocks and hence to a smaller manure surplus.

A debate began on the relationship between agriculture on the one hand, and nature and landscape on the other. "Potatoes are important, but the Wadden Sea is even more important," said Prime Minister Van Agt when in 1979 his government nixed the plans to reclaim a coastal strip of the Wadden Sea (Oosterveld, 2011). Four years previously, the Policy Document on Agriculture and Nature Conservation had been issued. It represented the first official recognition of the significance of nature and landscape for society. "Increasingly, the aim was to achieve a synthesis between the interests of agriculture and those of nature and landscape conservation," writes agricultural historian Jan Bieleman (2008). This was also influential in changing the land consolidation system from the 1970s onward. As the Land Consolidation Act at the time did not provide sufficient scope to designate large areas for non-agrarian purposes, special legal provisions were adopted for a number of regions that did make this possible, according to Bieleman. The Central Delfland Reconstruction Act (1977), also intended as a pilot project for the forthcoming new Land Use Act, and the East Groningen and Groningen-Drenthe Peat Districts Redevelopment Act (1979) are well-known examples. Eventually, the old Land Consolidation Act from 1954 was replaced by the Land Use Act, which came into force in 1985. This signified a move away from a powerful representation of agrarian interests to a more complete balance of all interests. The 1980s witnessed a 'policy explosion' (Bailey et al., 2011) in the field of spatial planning, environment, nature and landscape. "The government published countless policy documents, long-term plans, vision documents and action plans, often with lofty ambitions and enormous implications for agriculture. The crowning

glory of all that work was perhaps the National Environmental Policy Plan from 1989.” Since 1995, key powers applying to land use have been transferred to the provincial authorities. In 2006, all legislation relating to land reparceling and land use was consolidated in the Rural Areas Development Act.

The outbreak of swine fever in 1997 signalled a turning point in the attitude towards the locations of intensive livestock farms. It became clear that the quality of the countryside needed to undergo radical improvement, a reorganisation in other words. Such a change would involve not only finding a solution to the problems in the intensive livestock farming sector, but also simultaneously tackling the accumulation of the countryside’s problems as a whole. Central to the approach was a division into areas for extensive agriculture, areas with interlocking functions, and agricultural development areas. The policy focused on areas with sandy soil, where intensive livestock farming was traditionally concentrated. The five provinces undergoing change – Overijssel, Gelderland, Utrecht, Limburg and North Brabant – developed policy for a comprehensive reorganisation. This was followed by the adoption of the Reconstruction Act in 2000. A long and complicated process ensued, during which the original aim – zoning as a way of controlling outbreaks of disease – was extended to transforming the rural areas of the country. In the same period, the division of tasks between central, provincial and municipal government authorities altered, meaning that the decentralisation process already initiated continued going forward.

Apart from animal disease prevention, livestock farmers since the 1990s have had to contend with legislation and regulations for animal welfare. During the same period, the regulations applying to crop protection were tightened. It became more and more difficult to have pesticides approved, spray-free zones were designated, and a crop protection plan and accompanying logbook were made compulsory. Growing interest from consumers and policy-makers (including officials at the Ministry of Agriculture, Nature and Food Quality) in organic farming, lower public tolerance for the way animal diseases were dealt with, stricter standards for animal welfare, more attention to nature and the impact of agricultural production on nature – these were all signs of the changing relationship between agriculture and society.⁸

Affected by knowledge of the dark sides of intensive livestock farming and the increasing scale of operations, society increasingly equated ‘small-scale’ with ‘high quality’. Large-scale operations were regarded as likely to come into conflict with the quality of the landscape and sustainability in general. The intensive farming sector experienced the consequences in the form of growing opposition to the establishment of farms outside the traditional high-density areas such as Brabant, Limburg and Gelderland (popularly known as the ‘pink invasion’) and the establishment of mega-farms in traditional high-density areas. Conscientious

8 TNS-NIPO (2005) and Lower House of the Dutch Parliament (2007).

livestock farming attracted greater interest (with a dedicated taskforce established in 2010). Greenhouse horticulture also suffered some hard blows owing to the image crisis of the tomato in the 1990s. As a result, players on the German market (a key export market for Dutch horticulture) constantly emphasised the contrast between the Netherlands' 'industrial horticulture' and Germany's own 'traditional' form of production.

The larger arable and dairy farms, which had grown to the scale of the family farm or just above, have largely escaped this social criticism (Magris, 2012), although dairy farmers do have to contend with declining acceptance of keeping cows indoors all year round. They will have to face this criticism a step further along the chain. Consumers increasingly demand more sustainably produced items, and demand this with ever-greater directness (Lower House of the Dutch Parliament, 2007). They also want proof that these products are the output of a socially responsible chain process. Sustainability has become an important concept in agriculture and horticulture. In the early years of the 21st century, appreciation for principles such as cradle-to-cradle and local-for-local production became a noticeable trend among consumers, albeit not a dominant one.

2.3.3 Towards closed cycles

The trends described above are consistent with a debate that had been going on for some time concerning the desirability for Dutch agriculture and horticulture to move away from the large-scale and efficient production that is traditionally the country's forte, in the direction of special products, relative niche products, and special products with added value. In the long run, the costs under Dutch production conditions would be too high for the sector to continue competing with other countries, especially if the trend of less EU agricultural protectionism persists. On the plus side, the level of knowledge and technology in the Netherlands is sufficiently high to create relatively favourable conditions for the manufacture of special products. In 1989, an advisory committee chaired by former Minister Fons van der Stee (Van der Stee, 1989) initiated the first broad public debate about this vision. Considerations relating to nature and the environment were given less weight in this committee's report than they would be today.

In the current public debate, the creation of closed cycles – re-using waste to manufacture innovative products – is a major topic. The parallels with the philosophy of the Van der Stee Committee is striking. In the current debate, too, the original enthusiasm for some form of bulk production (biofuels in this case) has had to give way to the insight that the future of a biobased economy depends precisely on being able to manufacture high-quality special products. Bulk use in the form of fodder or fuel is only considered an acceptable solution at the end of the chain. This approach is a perfect example of the cascading principle (Scientific and Technological Committee on the Biobased Economy, 2011), is based on commercial as well as cycle-related considerations.

2.3.4 Society and central government

The Dutch Ministry of Agriculture, Nature Management and Fisheries (LNV) also underwent a series of radical changes in the last decades of the 20th century. It had long been recognised as a well-functioning government body. Radical changes were now announced, such as the introduction of an additional levy to curtail milk production and suddenly imposed restrictions on intensive livestock farming under the Interim Act of 1984. A further sign was the high-profile controversy concerning non-compliance with EU fishing quota regulations at the end of the 1980s. The Ministry had to make a fundamental shift of position. In 1992, the extensive 'Zwaluw Project' got underway. The Ministry had to become far more oriented towards society (Bekke et al., 1994).

This process of change is still continuing. In her inaugural speech 'Vital Differences' (2006), Professor Katrien Termeer argues that the machinery of government is not adequately equipped to deal with new values, new relationships, new aspects that are taken for granted, and new management philosophies. Government is gradually gaining more experience in dialogue with civil society and in undertaking interactive processes.⁹

While the Ministry of Agriculture, Nature Management and Fisheries was occupied with this far-reaching change in mindset, considerable attention was being given in other policy areas to speeding up large-scale projects (Scientific Council on Government Policy, 1994; Interim Committee on Infrastructure Projects, 2004). The delay in these projects remained a source of concern, despite modifications to the planning method. A Parliamentary inquiry was held into the 'real causes of delays in infrastructure projects'. In 2008, a commission was set up headed by former DSM CEO Peter Elverding to look into ways of speeding up the decision-making on infrastructure projects. This led to a new approach, based on the principle that broad-based participation during the exploratory phase will create support for faster execution of projects. Under this approach the exploratory phase ends with selection of a single preferred alternative, including sources of financing and an administrative agreement covering the choice. This method is applied today in a variety of formal and informal variants for carrying out large infrastructure and spatial projects.

2.3.5 Transparent innovation policy

The national and international standing of the Dutch agriculture and horticulture sector is largely based on a high level of knowledge. For a long period after the Second World War, assumptions on the future of agriculture were shared by all parties involved in agriculture, i.e. farmers, suppliers, customers, advisers, teachers, researchers and government officials (Rutten and Van Oosten, 1999). Production volumes had to be increased, cost prices had to be reduced, and product quality had to be improved. The Ministry of Agriculture outlined the

⁹ See the public debate conducted by Hans Alders, Lower House of the Dutch Parliament (2011).

policy and ensured the necessary support by promoting education, information provision and research, while farmers received clear guidance on how they could contribute.

This one-dimensional approach is now a thing of the past. There are now more conceivable answers to the many challenges and problems. They are also put into practice and defended by a range of parties. "Parties no longer all share the same basic assumptions," wrote Frouws in 1998. Termeer (2006) also points out that agriculture must be capable of dealing with new values and complexities. In the same vein, the Dutch Scientific Council on Government Policy called for a policy on open innovation (2008). Innovation emerges from collaboration across the borders of countries, sectors, technologies and regions. According to the Dutch Scientific Council on Government Policy, scope must be created for encounters and surprises, a 'third space' where representatives of industry and academia can meet and inspire one another. The European Union's Standing Committee on Agricultural Research distinguishes between science-driven and innovation-driven research. The latter type of innovation involves stakeholders and is for their benefit (Standing Committee on Agricultural Research and Collaborative Working Group on Agricultural Knowledge and Innovation Systems, 2012).

In the meantime, the Dutch government has introduced a new policy for industry. Instead of exerting control through rules and subsidies, the government now wants to give companies the scope to be entrepreneurs, to invest, to innovate and to export. This 'top sectors policy' was launched in 2011, after entrepreneurs and researchers from nine leading sectors had been asked to submit suggestions for increasing the Netherlands' competitive strength. The goal is to increase Dutch expenditure on research and development to 2.5% of GNP by 2020, and to propel the Netherlands into the top 5 of the world's knowledge economies by the same year. In 2015, government and the private sector must have stakes in leading knowledge and innovation consortia to the tune of over € 500 million, of which at least 40% is financed by the private sector.

Under this policy, it is now up to the private sector to advance innovation. Nine sectors have been selected as spearheads for the Dutch knowledge economy. The Agri-Food sector and the Horticulture & Source Materials sector are two of these 'top sectors'. The issue is whether there is enough scope on the horizon and whether all parties, including civil-society organisations, are able to provide enough input to ensure that the social effects of agriculture and horticulture can be integrated into the new knowledge and innovation regime.

2.3.6 Financial, legal and tax aspects

Over the past ten years, increasing attention has been devoted to the financial, legal and tax aspects and the associated opportunities and constraints for the agriculture and horticulture sector. The sector is embedded in a complex network of laws, regulations, subsidies and tax provisions. The current right of appeal creates certainty, but also slows things down. The density and level of detail of the applicable laws and regulations is considerable. Tax provisions often serve to maintain the status quo, instead of encouraging continuing sustainable development. Mandatory measures (*middelvoorschriften*) often act as a control, even a curb on sustainable development. For this reason, mandatory targets (*doelvoorschriften*) are increasingly coming into favour. Creating scope for continuing sustainable development, innovation and modernisation in this complex network of legislation can sometimes present a puzzle. Consequently, growing calls are heard in support of a stable financial, legal and fiscal framework that permits and even encourages flexibility and dynamic development.¹⁰

¹⁰ See, inter alia, Hazeu & Silvis (2011). Juridisering in de agrosector: *Verkenning van een veel-koppig fenomeen*. Wageningen University & Research Centre and Working Party on Obstacles to Entrepreneurship in Plant-Based Sectors (2005).

DUTCH AGRICULTURE AND HORTICULTURE

3

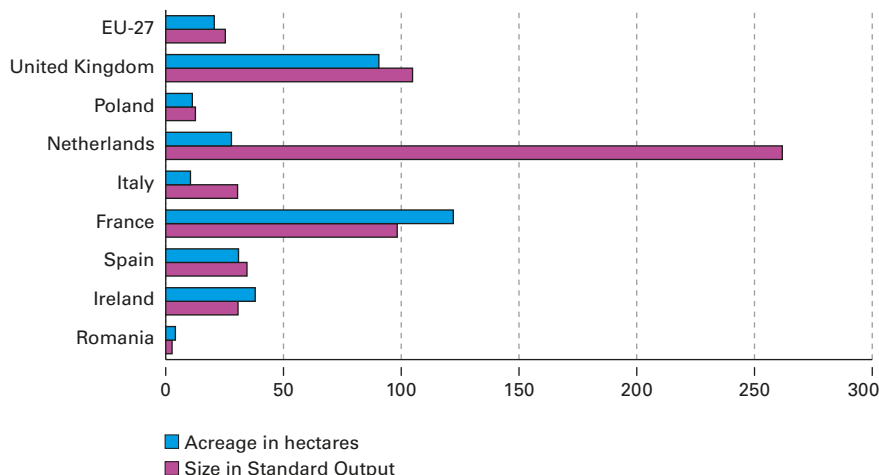
The Netherlands lies in the delta of two major European rivers, between the Ruhr area in Germany and the North Sea. It is strewn with cities, roads, ports, industrial zones and airports, the spaces between them comprising meadows, greenhouse areas and fields. The latter form a green patchwork quilt, with ditches and waterways resembling blue stitching. Every square metre of the country seems to be utilised. This is the homebase of one of the most productive agri-food sectors in the world. Here food and floriculture products are produced, distributed and processed, not only for the residents of the Netherlands, but especially for all of Northwest Europe and beyond.

Productivity and trade orientation are typical of the Dutch agri-food sector, thanks to the country's location in a fertile delta, extensive infrastructure network, and a centuries-long tradition of trade and transport.

Figure 4 provides an idea of the contrast between the modest acreage of the average Dutch farm and its economic significance, as compared with the situation in other member states of the European Union. This contrast is partly attributable to a very large greenhouse horticulture sector, in which small surface area and large economic size go hand in hand.

It is not only the Netherlands' primary sector¹¹ that has a reputation as modern, innovative and large in terms of output. Many areas of the processing industry, such as dairy cooperatives, the potato flour sector, marketing cooperatives for vegetables and flowers, and meat processing plants are often large, having in turn promoted production growth together with the necessary modernisation and innovation. The same applies to suppliers, such as suppliers of feedstuffs, mechanised equipment, livestock buildings and greenhouses, and refrigeration and air-conditioning technology. For these suppliers, the knowledge-intensive primary sector in the Netherlands also represents an operating base for developing and producing innovative technologies and systems that are marketed far beyond the borders of the country.

¹¹ 'Primary production' refers to the output of agricultural and horticultural enterprises (the primary sector). 'Associated trade and industry' (the secondary sector) refers to the economic activities that are based on the aforementioned primary production, i.e. processing, supply, trade, transport, etc.

Figure 4: Farm size in the European Union

Average area in hectares and average economic size in Standard Output (SO)¹² units, 2010.

Source: Agricultural Economics Research Institute, based on Eurostat data.

This symbiosis of primary production, on the one hand, and the processing and supply sectors, on the other, is responsible for the Dutch agri-food sector's prominent position in terms of technological achievement, as well as productivity and competitive strength. At the same time, this position, especially for a densely built-up and populated country like the Netherlands, is precisely the source of difficulties as regards pressure on space, nature, environment, animal welfare, and the prevention of animal diseases. Livestock farming, in particular, has come up against its limits in recent decades, while other subsectors are also facing major issues in the area of sustainable development.

3.1 Agriculture and horticulture as part of the agri-food sector

In the first part of this section, initial consideration is given to the significance of the agri-food sector, both as a whole, and as an ensemble of primary activities and associated trade and industry. The aim is to shed some light on this significance, and on the interconnections between primary production and other parts of the agri-food sector. This first section also considers which parts of the sector depend on these interconnections, and which do not or do so to a minor extent. The analysis will show that economic growth in the agri-food sector during recent

¹² Since 2010, Standard Output (SO) has been used within the European Union as the measure of company size for comparing different types of enterprise. It is the successor to the Dutch Size Unit (Nederlandse Grootte-Eenheid, NGE) used previously. For more information, see De Bont and Van Everdingen, 2010.

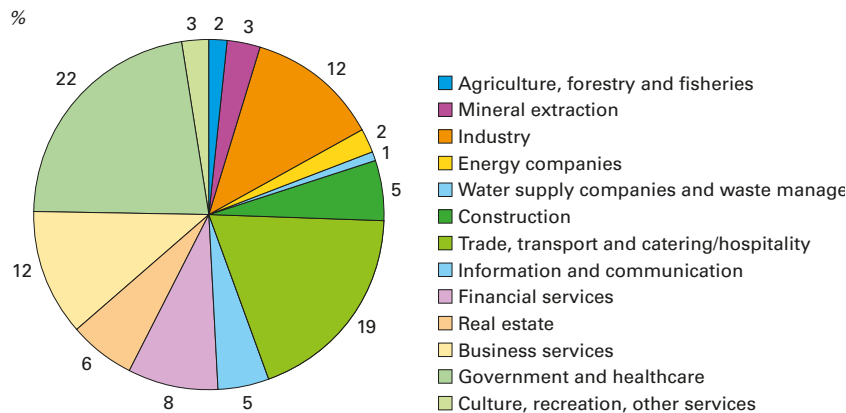
decades has mainly been driven by associated trade and industry, and more specifically by those trade and industry activities that do not depend for their existence on the Netherlands’ primary sector. Moreover, the part of the agri-food sector that is dependent continues to be of major importance for the national economy.

3.1.1 Agri-food sector as source of income

Although the agri-food sector (i.e. agriculture, horticulture and the related trade and industry) still occupies a leading position on many fronts, it has nevertheless seen its share in the Dutch economy steadily decline since the Second World War, the primary sector being mainly responsible for this decline. The continuous decrease in the size of the agri-food sector’s workforce reflects more than just upscaling and modernisation. Over the years, increasing numbers of people have sought a living outside agriculture and horticulture. This is to be expected in an economy that initially developed along industrial lines and where subsequently the service sector gained the upper hand.

Whereas the primary sector accounted for 10.6% of national income in 1960, the percentage had dropped to 6.2% by 1970, and to 4.1% by 1980. After a slight increase in the 1980s, the final decade of the twentieth century again witnessed a gradual decrease, albeit slower than in other European countries. As a result, by the end of 2010 the figure was around 2%. Figure 5 shows the national income in 2010 broken down by sector.

Figure 5: National income by sector



National income: added value as a percentage of Gross Domestic Product by sector, 2010.
Source: Agricultural Economics Research Institute / Statistics Netherlands, 2012.

Table 1: Added value including and excluding foreign raw materials

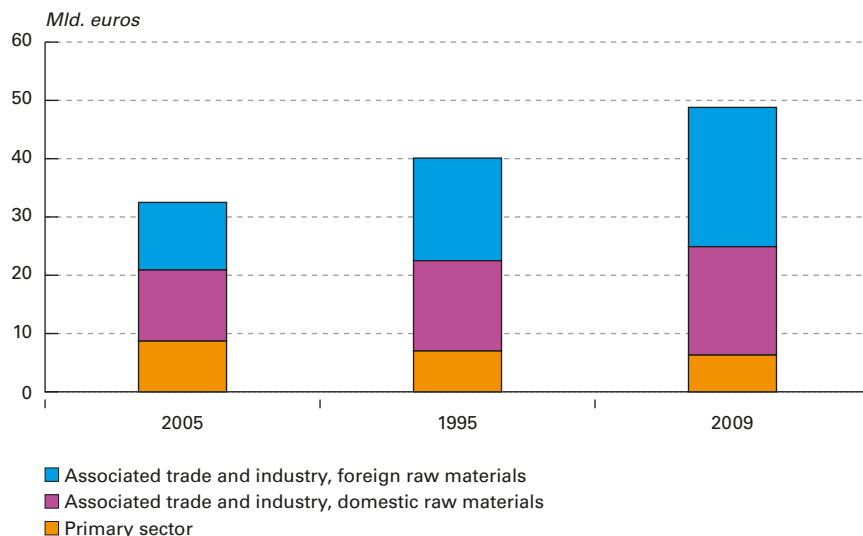
Sector	Change in gross added value of the Dutch agri-chain (factor costs), in billions of euros in 1995, 2004 and 2009					
	Agri-chain, total a)			Agri-chain, domestic agricultural raw materials		
	1995	2004	2009	1995	2004	2009
Agriculture and horticulture	9.5	9.0	8.9	8.7	7.0	6.3
- Arable farming				1.1	0.8	0.9
- Horticulture				3.6	4.4	3.9
- Livestock farming				3.4	1.7	1.3
- Fisheries				0.4	0.2	0.1
Processing industry	8.8	10.9	14.3	3.1	3.9	4.7
Supply industry	9.4	13.2	15.8	6.6	8.9	10.5
Distribution	5.7	9.1	12.4	2.4	2.7	3.3
Agri-chain	33.3	42.1	51.4	20.9	22.5	24.9
As % of national total	12.3	9.6	10.0	7.7	5.2	4.8
a) The 'agri-chain' includes fisheries, horticulture, agricultural services, forestry and food industries based on foreign agricultural raw materials (including cocoa, beverages and tobacco).						

Change in gross added value of the Dutch agri-chain (factor costs), in billions of euros in 1995, 2004 and 2009. Source: General and agricultural input-output table, adaptation by the Agricultural Economics Research Institute.

The picture changes if supply and processing are taken into account in addition to the primary sector. The agri-food sector is then the largest of the manufacturing-based sectors, or 'industrial sectors' as the Agro & Food Top Team (2012) calls them. Only financial services, healthcare, government, and trade and repair of personal and household goods generate a larger proportion of the national income than the agri-food sector does. Industry, transport, construction, energy and mineral extraction, for example, all generate a smaller proportion.¹³

Given the described decline in the share of primary agriculture and horticulture, major shifts must have taken place. That, in fact, was the case. The prices of primary products failed to keep in step with inflation to the same extent as prices in the supply and processing sectors. Moreover, it was specifically in the processing sector that greater added value was created in the form of product differentiation, special products, pre-packaging and all manner of extras aimed at consumers. Accordingly, the balance shifted at the expense of the primary sector and in favour of associated trade and industry. The relative size of the primary sector kept shrinking. The same

¹³ In its report, the Top Sector uses a separate and smaller category for forestry and horticulture.

Figure 6: Agriculture, horticulture and related activities

Changes in gross added value (factor costs) of primary agriculture and horticulture, the related trade and industry based on domestic raw materials, and the related trade and industry based on foreign raw materials. Source: Van Leeuwen et al., 2012.

applied to associated trade and industry, although to a lesser extent, enabling these sectors to still retain a substantial share of the Dutch economy as a whole.

Measured over the past decade, the agri-food sector's share of the national added value is approximately 10% if the sector includes the segment of the processing industry that utilises raw materials not grown in the Netherlands. If this segment (which includes production of coffee, beer, orange juice and margarine for example) is excluded, the percentage is roughly halved. In both cases, the proportion gradually decreased, while in absolute terms the added value increased, as Table 1 shows (Berkhout et al., 2012). Between 1995 and 2009, the added value for the entire 'agri-chain', as the Agricultural Economics Research Institute calls the agri-food sector, climbed by 50% to over EUR 51 billion, while the added value for the segment that processes domestic raw materials grew by approximately 20% to reach EUR 25 billion.

Hence, the balance also changed within trade and industry sectors associated with the primary sector. The size of the segment that processes Dutch primary products grew much slower than the segment that processes raw materials from abroad (see Figure 6). Whereas in 1995 the former still accounted for 63% of the agri-chain's total income, by 2009 this had fallen by a quarter to 48%.

In summary, the Dutch agri-food sector can be described as having substantial economic importance characterised by a corresponding growth rate. However, the lion's share of growth is attributable to associated trade and industry, and more specifically the segment that processes raw materials not grown in the Netherlands. Figure 6 illustrates this point.

3.1.2 Employment

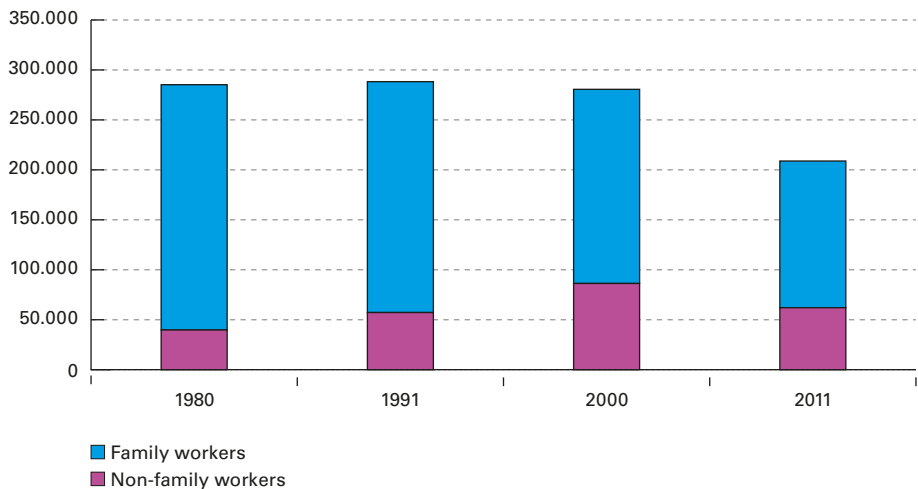
Just like its added value, the contribution of the agri-food sector to national employment is also considerable. According to the Agricultural Economics Research Institute, the figure for 2009 was 701,000 man-years (Van Leeuwen et al., 2012), assuming the calculation is for the entire sector, including the segment that mainly processes raw materials from abroad.¹⁴ This corresponds to 10.4% of total employment, a percentage that has remained fairly stable in the past decade. Here, too, it is mainly the associated trade and industry sectors (specifically the segment processing raw materials from abroad) that are responsible for maintaining the level of employment in absolute terms, while employment in the primary agriculture and horticulture sector was declining. After the mid-1990s, the primary sector's share of employment in the agri-food sector based on domestic raw materials declined from over 44% (447,000) to over 41% (388,000) in 2009. During the same period, by contrast, the agri-food sector as a whole recorded a slight increase in employment, from 685,000 in 1995 to the above-mentioned 701,000 in 2009.

The agri-food sector's share of total employment in the Netherlands is therefore considerable and increasingly based on the activities and growth of the supply and processing industry, including distribution, specifically the segment that processes raw materials not produced in the Netherlands.

If we examine the primary sector in isolation, what stands out is that the share of horticulture share grew, while that of livestock farming declined and the share of arable farming remained constant. This is related to the fact that upscaling to increase the workforce above that of a family farm could take place especially rapidly in greenhouse horticulture. By contrast, upscaling in the land-tied sectors occurred within the dimensions of the family farm, as explained also in Chapter 2.

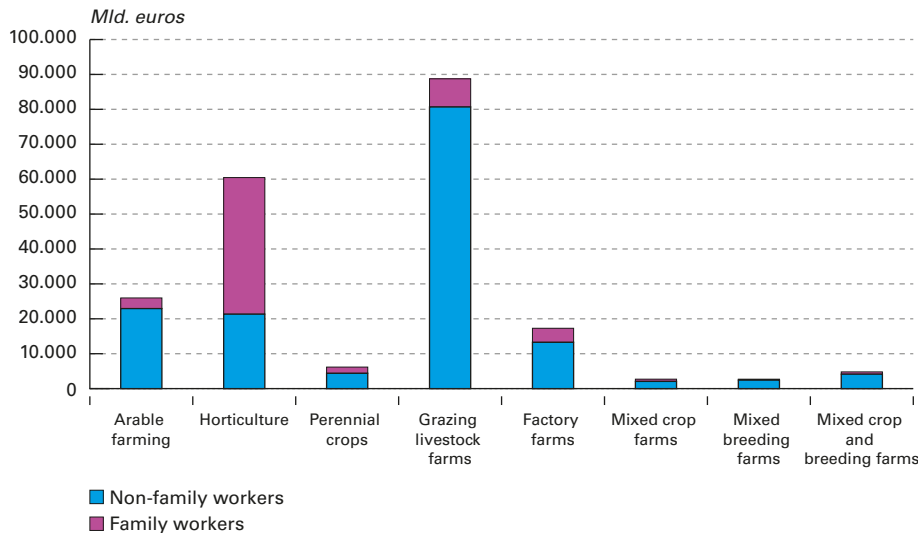
¹⁴ This includes the horticultural sector, agricultural services and forestry.

Figure 7: Family labour and outside labour



Changes in family labour and outside labour in agriculture and horticulture, 1980-2011. Source: Agricultural Economics Research Institute / Statistics Netherlands, 2012.

Figure 8: Family labour and outside labour by sector



Numbers of family and outside workers by sub-sector in 2009. Source: Agricultural Economics Research Institute / Statistics Netherlands, 2012.

Over the past 30 years, the number of family workers, both male and female, has steadily declined in the primary agriculture and horticulture sector, while during the greater part of this period the number of non-family workers has shown a continuous increase (see Figure 7).

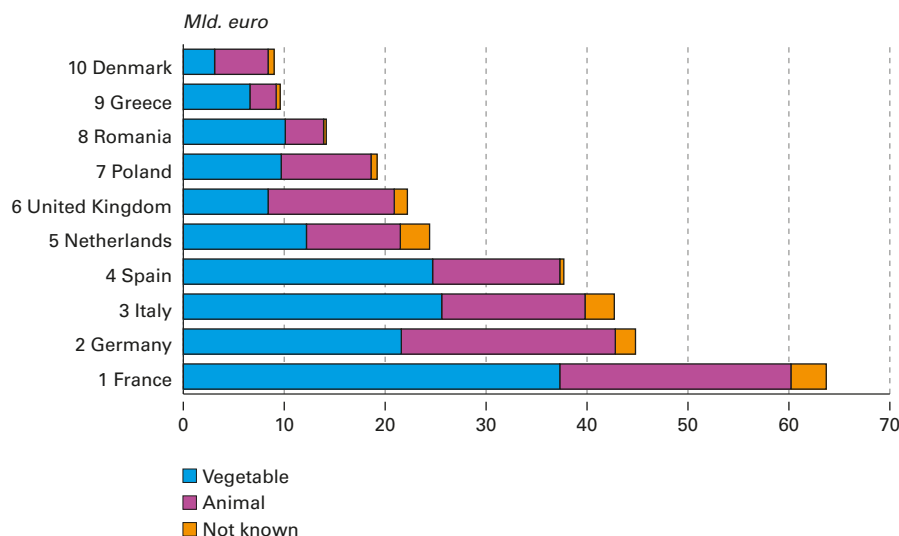
This increase in non-family workers was partly reversed over the last ten years, but was almost entirely attributable to greenhouse horticulture (see Figure 8). In this subsector, a large number of non-family workers retained their jobs, although the number of farms decreased, which indicates an increase in the size of the workforce per farm. In 2011, there were over 39,000 non-family workers in greenhouse horticulture, out of a total of more than 60,000 workers. Roughly speaking, this means the sector was then employing two non-family workers for every family worker. In 1993, the actual number of non-family workers was slightly higher. However, many more farms existed at the time, so that the ratio of family-workers to non-family workers in that year was 45/55.

The horticulture sector as a whole in 2009 accounted for 70,000 of the 161,000 man-years that the primary agriculture and horticulture sector offered in the way of employment (Agricultural Economics Research Institute, 2012). In its turn, the second figure represents less than half the employment in the entire agri-chain, which amounts to 388,000 man-years based on domestic agricultural raw materials. Table 2 provides a breakdown of this figure.

Table 2: Employment based on domestic raw materials

Sector	Working years x 1000
Agriculture and horticulture	161
- Arable farming	16
- Horticulture	70
- Livestock farming	73
- Fisheries	2
Processing industry	38
Supply industry	135
Distribution	54
Total agri-chain	388
As a percentage of national employment	5.7

Employment in the agri-chain based on domestic agricultural raw materials, in thousands of labour years, 2009. Source: Van Leeuwen et al., 2012.

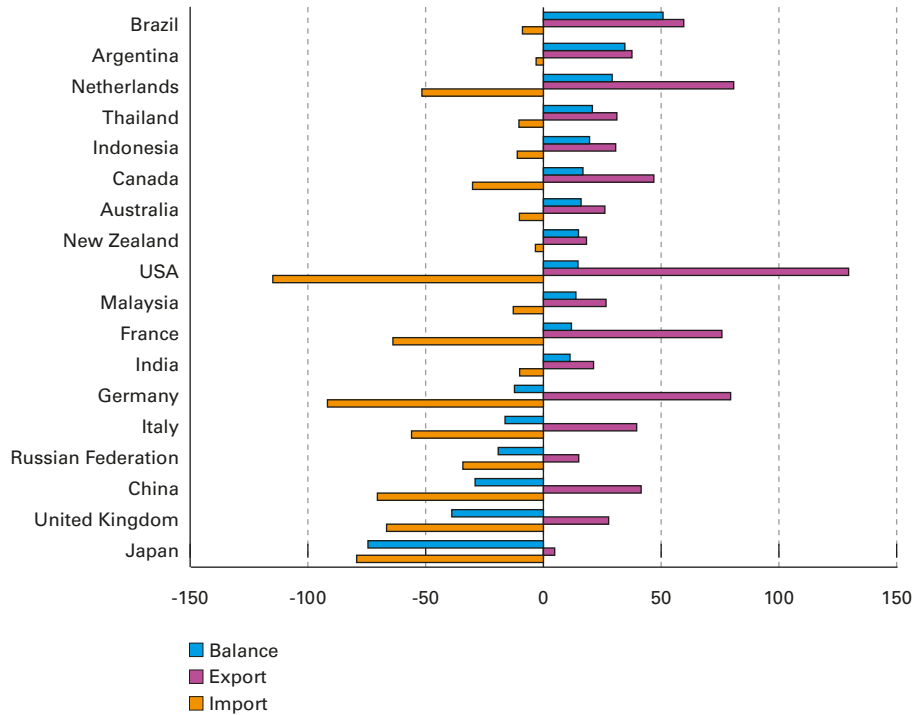
Figure 9: Largest agricultural producers in the EU

The ten largest agricultural producers in the EU, by production value of vegetable and animal products, in billions of euros, 2010.

3.1.3 Net contribution to exports

The Netherlands is one of the largest agricultural producers among the 27 member states of the EU. In the EU's top ten for 2010, the Netherlands was number five, behind the large producing countries of France, Germany, Italy and Spain. It was ahead, though, of member states such as the United Kingdom, Poland and Denmark.

If we focus exclusively on exports rather than total production value, then the Netherlands emerges as a leading agricultural producer in Europe and in the global market. The Netherlands has traditionally had a strong trade orientation, and for centuries the Dutch agricultural sector has been a major player in international markets, such as those for livestock, cheese and butter. The list has grown over time, specifically through the addition of meat, flowers and vegetables. Mainly thanks to the founding and expansion of the EU, Dutch agricultural exports were able to continue growing rapidly in the second half of the twentieth century, so that in the 1990s, around 68% of both added value and employment in the agri-chain could be attributed to export. These shares have contracted slightly since then, and in 2009 they were 65.1% and 67.6% respectively (Agricultural Economics Research Institute and Statistics Netherlands, 2012). The lion's share of Dutch agricultural exports, more than 80% to be precise, goes to EU countries. Receiving over a quarter, Germany is the leading importer. Looking at agricultural imports, the EU member

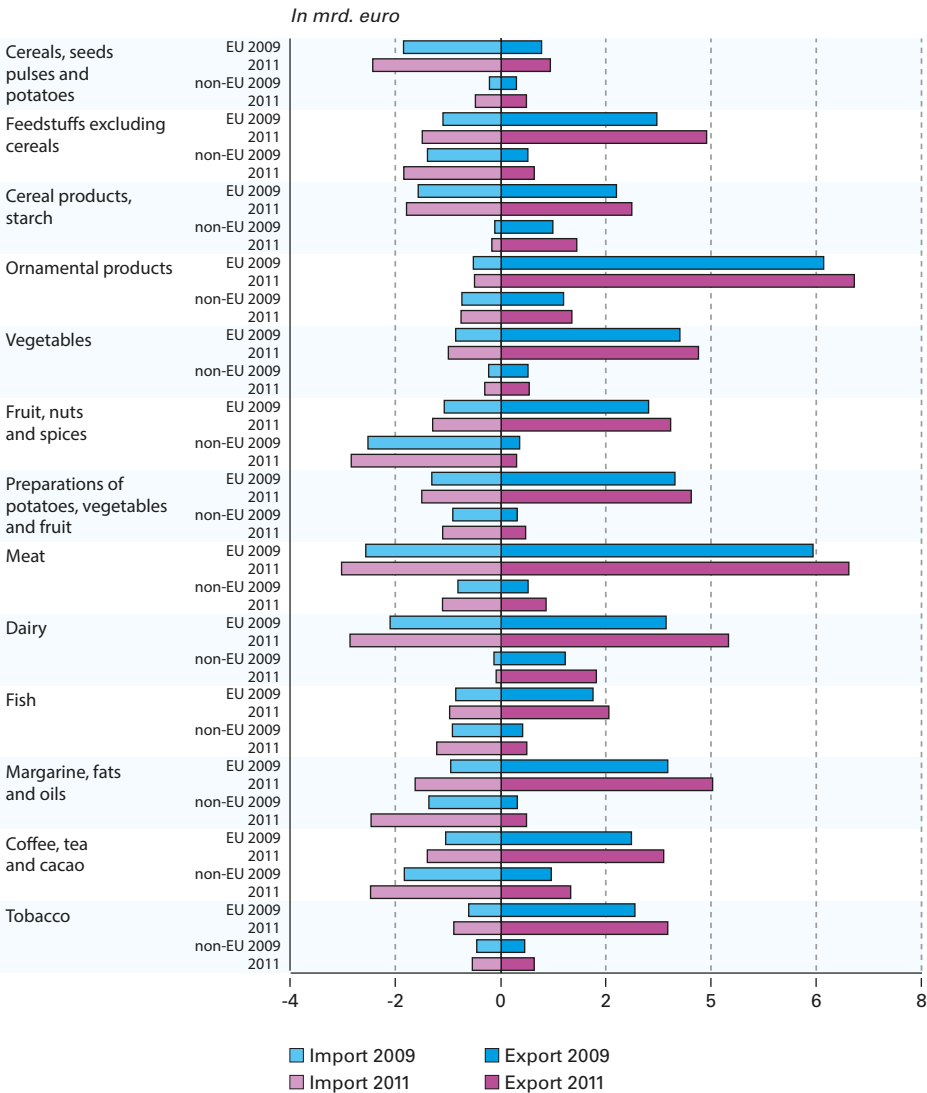
Figure 10: World's leading trading countries

Agricultural exports, imports and trade balance of the world's leading trading countries, in billions of US dollars in 2008. Source: Agricultural Economics Research Institute / Comtrade.

states combined still represent the Netherlands' most important trading partner, although their aggregate share is only approx. 60%. The difference is largely made up by suppliers of feedstuff raw materials from Brazil, Argentina and other South American countries.

In its turn, the agri-chain's share in total Dutch exports has been shrinking rapidly since the 1990s. In 1995 agricultural exports exceeded imports by EUR 11.6 billion, a quarter of the national balance of trade surplus. By 2009, the sector's trade surplus had risen slightly to EUR 12.6 billion. It continued to grow, and reached EUR 13.6 billion in 2012. At the same time, however, the national trade surplus had climbed to EUR 84.4 billion, partly attributable to the other major exporter, the chemical industry. This reduced the agri-chain's share to approx. one-seventh (Agricultural Economics Research Institute, 2012).

Figure 11: Agricultural trade



Breakdown of Dutch agricultural trade (imports and exports) with EU Member States and other countries, 2009-2011. Source: Agricultural Economics Research Institute / Comtrade.

However, this relative decline does not alter the fact, however, that a trade surplus of EUR 12.6 billion (EUR 38.2 billion in exports minus EUR 25.6 billion in imports) is still very substantial. This picture is further confirmed if we compare the volume of Dutch exports with those of other countries. Figure 10 shows that the trade balance of the Netherlands' agricultural sector is the world's third largest, following those of Brazil and Argentina.¹⁵ If exports alone are considered rather than the trade balance, the Netherlands is actually in second place, behind the United States but ahead of both Germany and France.

In the Netherlands, the agricultural sector is surpassed only by the chemical industry in terms of exports. Since 1999, the chemical industry has seen its exports climb from EUR 29 billion to EUR 71 billion, and its trade surplus grow from EUR 9 billion to almost EUR 24 billion (source: Association of the Dutch Chemical Industry, 2012).

Within the agri-chain, floriculture, vegetable cultivation and the meat sector stand out because of their focus on exports. Dairy produce and feedstuffs (excluding cereals) are high on the list, too. In these sectors, though, the substantial import volumes are also a factor in determining their trade balances, as shown in Figure 11. The high export figures, especially for floriculture and greenhouse vegetable cultivation, also reveal something about the shift in the economic balance within the primary agricultural sector. In the past 15 years livestock farming has been overtaken as the largest sector by greenhouse horticulture (see Table 1 in section 3.1.1).

3.1.4 Energy consumption

Agricultural production, even in the greenhouse horticulture sector, is heavily dependent on solar energy. This is because crop growth is to a large extent based on the conversion of solar energy into vegetable and subsequently animal products. As this type of energy is 'free', it does not appear in energy balance sheets or energy consumption overviews. However, it does explain why sectors such as livestock farming and arable farming use very little energy. Of course, this does not apply to greenhouse horticulture. Nevertheless, research has advanced a long way towards finding methods for this sector to utilise more solar energy and eventually developing greenhouses that supply energy.

As things stand now, greenhouse horticulture is a major consumer of energy for heating and lighting. In 2009 the entire agri-food sector consumed 271 petajoules (based on domestic raw materials), representing 9.7% of national consumption. Although these figures may lead to the conclusion that this sector is relatively energy-intensive, it must be remembered that the figures break down into widely varying components, as Table 3 confirms.

¹⁵ For years, the Netherlands has occupied third place and sometimes second place in this ranking. A new phenomenon of the past decade is the ousting of the United States and France from first and second place by the large South American exporters of raw materials for feedstuffs.

With a combined consumption of 20 petajoules in 2009, arable farming and livestock farming are low-energy sectors. This figure does not include the fuel consumption of tractors and other motorised equipment. This type of consumption hovers around 14.5 petajoules per annum, which breaks down into 10 petajoules for farms and a further 4.5 petajoules attributable to agricultural contractors. Utilising almost the entire area of productive land (see section 3.2.3), the land-tied sectors account for 0.6% of the country's annual energy consumption of 3,260 petajoules (NL Agency and the Agricultural Economics Research Institute at Wageningen University and Research Centre, 2011). By contrast, primary horticulture accounts for 3.75% of national energy consumption, making it a significant player.

Another picture emerges if the supply industry (e.g. for chemical fertilisers), processing industry and distribution are included. Insofar as the processing of domestic raw materials is concerned, these three sectors together in 2009 consumed as much energy as the greenhouse horticulture sector, i.e. 122 petajoules. The total consumption of the agri-chain as defined here therefore amounted to 271 petajoules in 2009. If we consider the associated trade and industry sectors, the supply industry accounted for the largest share of the

Table 3: Energy consumption

Sector	Energy consumption in the Dutch agri-chain (petajoules) 2004 and 2009			
	Agri-chain, total a)		Agri-chain, domestic agricultural raw materials	
	2004	2009	2004	2009
Agriculture and horticulture	159	151	167	149
- Arable farming			4	4
- Horticulture			137	122
- Livestock farming			15	16
- Fisheries			11	7
Processing industry	79	71	32	25
Supply industry	115	105	74	70
Distribution	69	86	25	27
Total agri-chain	422	413	298	271
As % of national consumption	14.7	14.8	10.3	9.7
a) The 'agri-chain' includes fisheries, horticulture, agricultural services, forestry and food industries based on foreign agricultural raw materials (including cocoa, beverages and tobacco). Source: General and agricultural input-output table, adaptation by Agricultural Economics Research Institute (LEI)				

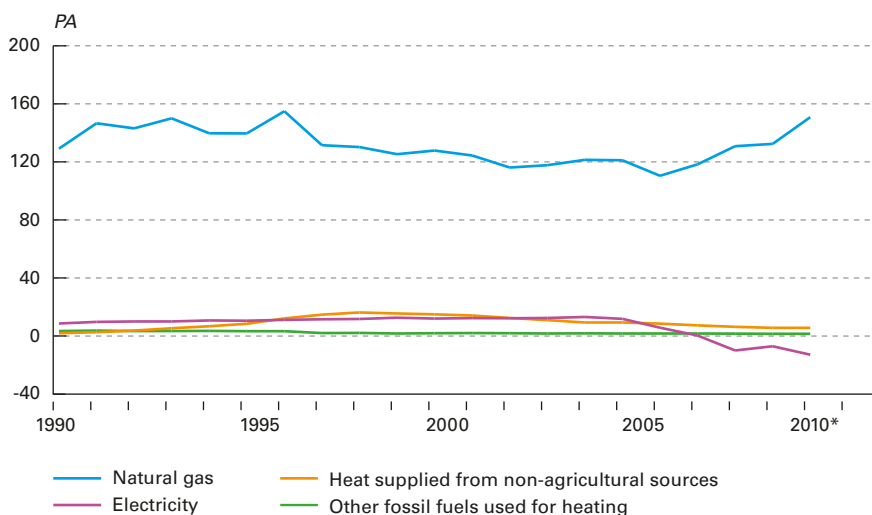
Energy consumption in the Dutch agri-chain in 2004 and 2009, including and excluding foreign agricultural raw materials, in petajoules. Source: Van Leeuwen et al., 2012.

energy consumed, with its energy meters recording nearly three times as many petajoules as in the processing industry or distribution sector.

If we include processing of imported raw materials in the agri-chain, the energy consumption totals 413 petajoules, or 14.8% of total national consumption (see Table 3). This share is high compared to the share in national added value or employment. The agri-chain's share in national energy consumption including the processing of foreign raw materials actually remained almost constant between 2004 and 2009, whereas the share relating to the segment processing domestic raw materials declined slightly. The consumption of purchased energy by the primary agriculture and horticulture sector largely concerns fossil fuels, with the exception of heat supplied from outside the sector, for greenhouse horticulture in particular. As Figure 12 shows, natural gas is by far the most frequently used energy source in the primary sector. Natural gas is used in the horticulture sector to heat greenhouses and, for several years, increasingly to generate electricity for both assimilation lighting and sale to customers outside the sector.

In a report published in late 2011 (FAO, 2011), the UN Food and Agriculture Organisation (FAO) concluded that agriculture would have to reduce its dependence on fossil fuels. This conclusion is also applicable to the Netherlands. Its significance is greater for greenhouse horticulture than for land-tied sectors, as these sectors use less energy.

Figure 12: Energy consumption by source

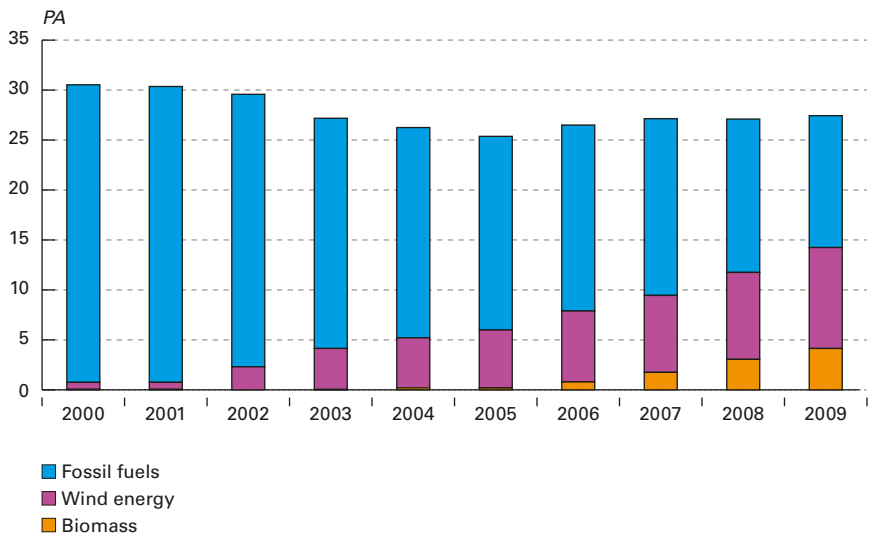


Total energy consumption in agriculture and horticulture broken down by source. The negative consumption of electricity is mainly related to electricity supplies by greenhouse horticulture enterprises. This sub-sector is a producer of energy thanks to the use of natural gas and cogeneration. This also largely explains the increase in the consumption of natural gas since 2006. Source: Netherlands Environmental Assessment Agency, 2012a.

As well as consumption, the production of energy – preferably sustainable energy – is relevant for assessing the position of the sector in the energy market. In this respect, the agriculture and horticulture sector has undergone a striking change since the turn of the century, partly as a result of the Agriculture Covenant concluded in 2008 (Ministry of Agriculture, Nature Management and Fisheries, 2008). This led to the sector accounting for 44% of the sustainable energy produced in the Netherlands in 2010, if we include the biomass supplied to enterprises classified under other sectors (NL Agency and Agricultural Economics Research Institute at Wageningen University and Research Centre, 2011). In the arable farming, open-land horticulture and livestock farming sectors (i.e. the agriculture sector excluding greenhouse horticulture), the consumption of renewable energy after 2000 increased to half the total energy consumption in 2009, as Figure 13 shows. Since 2007 sales of energy in the form of electricity, especially from wind and biogas, have even exceeded electricity purchases in these sectors.

The same is also true of greenhouse horticulture since 2006, as discussed earlier in this section. In this case, however, it is not wind energy or biogas underlying the electricity surplus, but a higher consumption of natural gas. Gas is used in this sector to power energy-efficient cogeneration systems, which produce much more electricity on balance than the sector can use for assimilation lighting. The surplus is sold to energy companies.

Figure 13: Rise of sustainable energy in agriculture



Final energy consumption by agricultural sectors, excluding greenhouse horticulture, between 2000 and 2009. Source: NL Agency / Agricultural Economics Research Institute at Wageningen University and Research Centre, 2011.

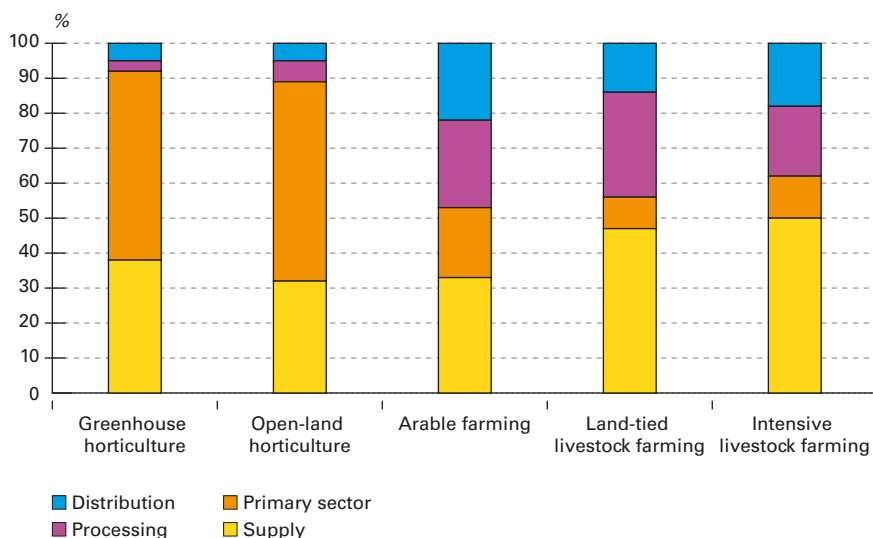
As has already emerged in this section, greenhouse horticulture is so different from the other agricultural sectors that a separate analysis of this sector provides a more reliable picture than a combined analysis. Unlike the arable farming, open-land horticulture and livestock farming sectors, greenhouse horticulture as a major consumer of energy still uses very little sustainable energy. In 2010, the sustainable energy share was 1.6% (Luijt & Voskuilen, 2011), just one tenth of a percentage point higher than the year before. Total consumption of sustainable energy in 2010 amounted to 2,110 terajoules, of which 37% was solar energy, 28% represented the purchase of renewable electricity, and 13% and 14% were derived from the use of geothermal heat and biofuels, respectively.

Although greenhouse horticulture still does not have an impressive track record with respect to sustainable energy, considerable progress has been achieved in the area of energy efficiency. In 2010, the sector consumed 53% less primary fuel per product unit than in 1990. Energy efficiency has therefore increased by 47%, just four percentage points under the 43% target agreed for 2020 in the environmental covenant for the greenhouse horticulture sector.

3.1.5 Raw materials

Earlier in this section, it emerged that the trade and industry sectors related to the agri-chain gradually began to account for an increasingly large share of added value. For example, Table 1 in section 3.1.1 shows that the added value of primary agriculture and horticulture decreased slightly from EUR 9.5 billion to

Figure 14: Added value in five production chains

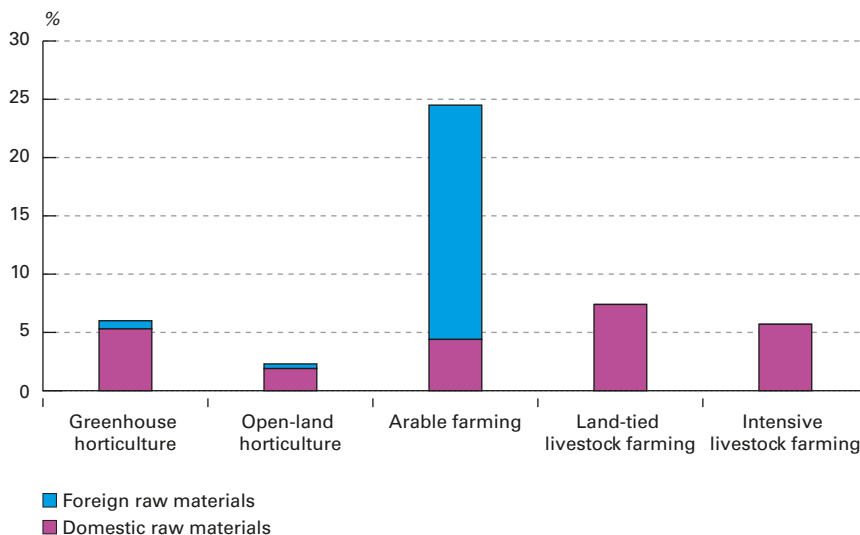


Percentage distribution of added value in five agricultural production chains, based on domestic raw materials, 2011. Source: Van Leeuwen et al., 2012.

EUR 8.9 billion between 1995 and 2009, while the added value of the related trade and industry sectors increased from EUR 23.9 billion to EUR 42.5 billion in the same period. As a result, the associated trade and industry sectors maintained their share of national added value at 10%, whereas the primary sector's share declined further from 3.5% in 1995 to less than 2% in 2009. In this respect, too, the combined added value of the agri-chain actually consists of widely different components. As Figure 14 shows, the division of added value between the primary sector, on the one hand, and the supply industry, processing industry and distribution, on the other, varies significantly from sector to sector.

The figure presents a clear distinction between the plant-based sectors and the livestock farming chains. Although the former accounts for a significant share of supply, its share is smaller than that of the livestock farming chains. A much greater difference is apparent in processing and distribution, both of which account for much smaller shares in the two horticulture chains (greenhouse horticulture and open-land horticulture) than in the arable farming and livestock farming chains. By contrast, the primary sector's shares in the horticulture chains are substantially larger than in the other chains. None of this is especially surprising, as flowers and plants undergo virtually no processing and vegetables relatively little processing between production and their appearance in the stores. Nevertheless, the difference is striking. The important role of auction houses and trading firms in the marketing and distribution of horticultural products is therefore included in the relatively small shares of 8% and 11% of total added value in greenhouse horticulture and open-land horticulture, respectively.

So far in this analysis, a distinction has been made between the agri-food chain to the extent that its processing industry uses domestic raw materials, and the same chain plus those segments that use imported raw materials. The first category comprises the activities logically associated with Dutch agriculture and horticulture, such as the production and processing of milk, meat, vegetables, flowers, sugar, potatoes and cereals. The second category comprises companies operating in areas having little or no connection with domestic agriculture and horticulture, such as firms engaged in the production of coffee, beer, chocolate, margarine and tobacco. This distinction is essential in order to assess the significance of the primary sector for the agri-food chain, specifically to determine whether any particular segment of the chain depends on the Dutch primary sector. Figure 15 illustrates this distinction and shows that most economic activity based on imported raw materials is included in the statistics as part of the arable farming chain. This is not entirely unexpected, since the distinction between domestic and foreign raw materials derives from the processing industry, in particular, where that industry sources its raw materials. Accordingly, the arable farming chain also includes activities such as those of the extensive margarine and beer industries.

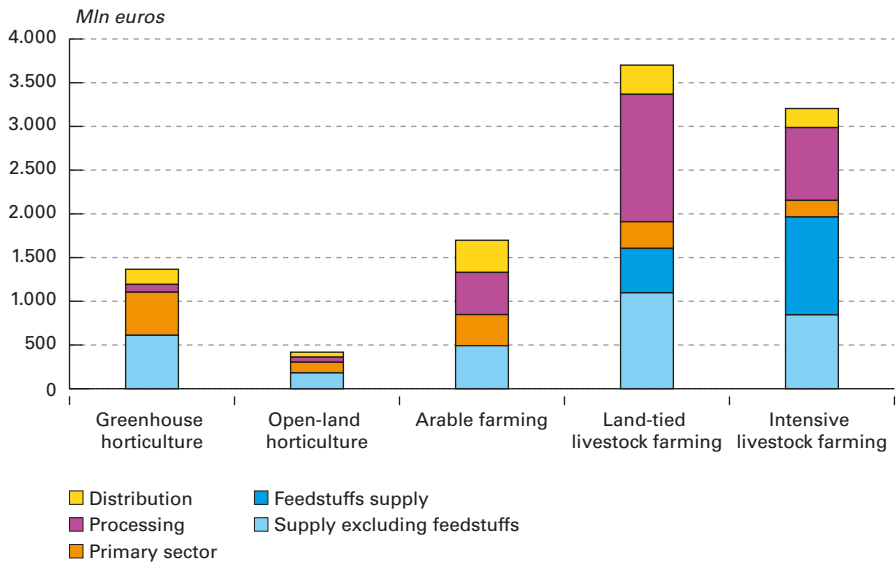
Figure 15: Added value and source of raw materials

Added value for five sub-chains in billions of euros, broken down by domestic or foreign source of raw materials for the processing industry. Source: Van Leeuwen et al., 2012.

Another way of analysing the role of imported raw materials is to examine specifically their supply to the primary sector. From this perspective, the issue is not whether a particular segment of the agri-food sector can manage without Dutch agriculture and horticulture, but whether there is any indication that the transport of these raw materials might affect the national and global footprints. The latter issue is regularly raised in connection with, for example, the Dutch intensive livestock farming sector, which is among the largest importers in the agri-food sector. In combination with land-tied livestock farming and recipients of exported feedstuffs, this sector is responsible for the Netherlands' position as one of the world's largest importers of soy.

Figure 16 shows the value of imports for each segment of the different sub-chains, and confirms that the livestock farming chains are actually responsible for most of the imports. The figure also makes it clear that this is largely attributable to the supply industry, with its imports of raw materials for feedstuffs playing a prominent role. In the intensive livestock farming chain, feedstuffs represent as much as one third of the total import figure of EUR 3.2 billion. To assess the relative importance of imports for the entire sub-chain, they must naturally be compared with the economic size of the chain concerned, as shown in Figure 14.

Figure 16: Breakdown of import value in five production chains



Breakdown of import value in millions of euros in five agricultural production chains. Source: Council for Environment and Infrastructure, based on data from the Agricultural Economics Research Institute.

Two conclusions may be drawn from the above analysis. Firstly, when assessing the importance of the primary sector for the agri-food chain, a clear distinction has to be made between the segment of the chain based on the processing of raw materials not originating in the Netherlands, and the segment that utilises raw materials supplied by domestic agriculture and horticulture. Previous sections have already shown that especially the latter segment of the agri-food chain is growing less rapidly than the segment that processes raw materials supplied by foreign suppliers.

Secondly, it is very clear that imports account for a significant part of the added value of mainly the livestock farming sectors and that the share of feedstuffs in these sectors is substantial, particularly in intensive livestock farming.

The first distinction applies at the level of the processing industry, and is important for assessing the interconnections between primary production and the subsequent segments of the chain. This distinction is clearest in the arable farming chain. The second distinction applies at the level of primary agriculture and horticulture and is especially relevant in the livestock farming sectors. It can be applied when assessing the footprints of the various subsectors or chains.

3.1.6 Logistics

The flourishing of key agricultural sectors in the Netherlands, such as pig farming, poultry farming and dairy farming, as well as greenhouse horticulture, is closely related to the proximity of urban centres in Northwest Europe, for example, the Ruhr area, and the major cities in Belgium, Northern France and the UK. As regards the distribution within the Netherlands, additional factors such as availability of land, soil type, entrepreneurship and socio-historical background play a role. Figure 17 shows the national distribution of dairy farming, including the companies involved in processing as well as the production units.

Intensive livestock farming is concentrated in North Brabant province, which enjoys a favourable location in relation to both the Randstad conurbation and the major urban centres in Northern France, Germany and the UK. In the 1960s and 1970s, the proximity of the Port of Rotterdam, where the imported feedstuffs entered the Netherlands, also helped stimulate the soaring growth of this sector. During that period, the grain prices on the internal EU market were still significantly higher than prices on the world market. It was therefore attractive to import feedstuff raw materials that enjoyed little or very limited European protection, soy and tapioca being two examples. This attractiveness was further increased when the raw materials only needed to be transported a short distance from the port (i.e. Rotterdam) to their eventual destination.

This set of circumstances was referred to as the 'Rotterdam Gap', a gap which has now closed because price support (for cereals in this case) under the Common Agricultural Policy (CAP) has been replaced by income support in the form of deficiency payments.

Historically, the location of large greenhouse horticulture centres close to the cities of Amsterdam, Rotterdam and The Hague was undoubtedly influenced by the proximity of these cities, as well as by climate-related factors such as sunlight and the moderating effects of the sea. However, enterprises in this sector are now so firmly export-oriented that the proximity of Schiphol Airport and good connections with the motorways to the east have become more relevant in this respect than the proximity of the Randstad conurbation.

Utilising Michael Porter's theory of competition, the Agricultural Logistics Platform has drawn up a league table of Dutch export products with the largest shares of the world market. Partly thanks to the high standard of Dutch agricultural logistics, the Netherlands enjoys a strong international position for a number of agricultural products. For the record, a large proportion of these products involve foreign raw materials that are processed and traded by the segment of the agri-food sector having little or no connection with primary agriculture and horticulture. According to the Platform, the Netherlands is the global hub for floricultural products (84% of the world market) and flower bulbs (83%), while products such as coconut oil, cocoa butter and cocoa powder also have a high

Figure 17: Distribution of dairy farming and dairy industry

Dairy industry

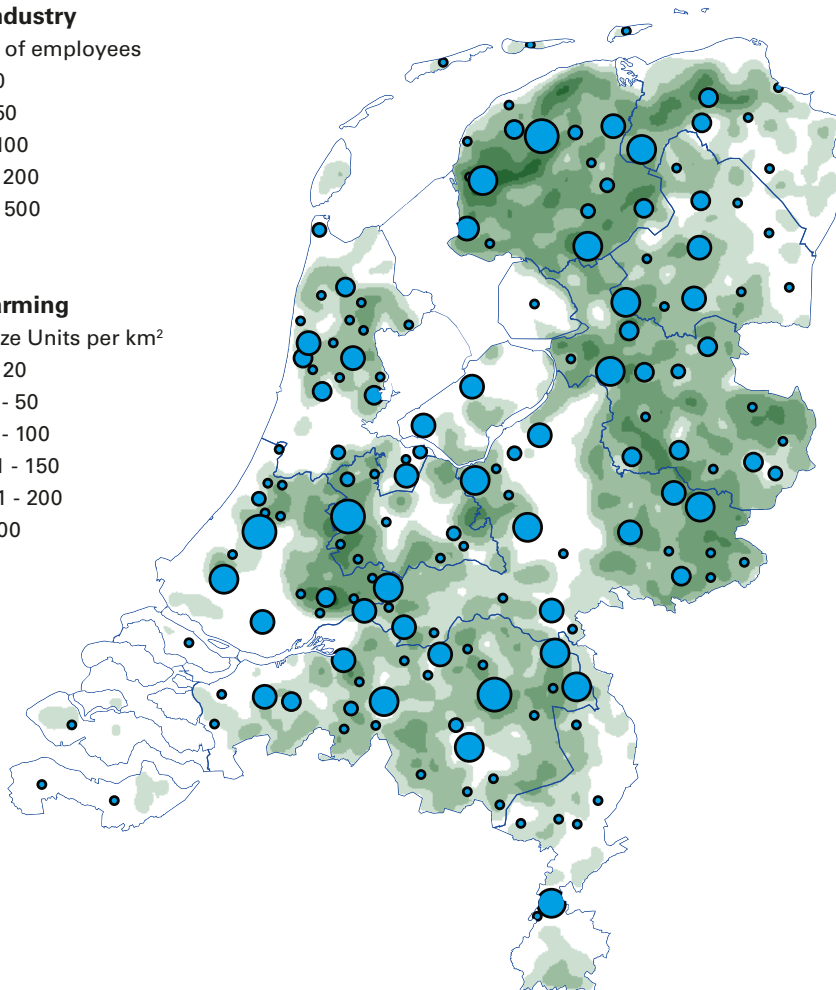
Number of employees

- 1 - 20
- 21 - 50
- 51 - 100
- 101 - 200
- 201 - 500
- >500

Dairy farming

Dutch Size Units per km²

- 1 - 20
- 21 - 50
- 51 - 100
- 101 - 150
- 151 - 200
- >200



Dairy industry establishments by number of employees and concentration of dairy farms by economic size in DSUs per square kilometre. Source: Kuhlman, 2004.

profile from a global perspective (Holland International Distribution Council and Netherlands Organisation for Applied Scientific Research, 2009). The hub effect for floriculture may be illustrated by the fact that compared with exports totalling EUR 8.1 billion (in 2011), imports now represent EUR 1.3 billion.

Locally, too, agricultural logistics has reached an impressive level of sophistication. Whereas ten years ago supermarkets were stocked two or three times a week, this now takes place daily, or even several times a day. Moreover, the product range has also changed, with more ready-to-use products, more packed items and more fresh produce. All these developments demand new logistical concepts (Van der Vlist, 2007).

Accounting for 95% of agricultural products shipped from the Netherlands to the rest of Europe, road transport dominates other types of transport (Van der Vorst, 2011). In terms of tonnage, the share of agricultural logistics in Dutch road transport is 28%. Its share in road transport within the EU amounts to 20%. It is useful to remember in this context that the Netherlands, as the largest exporter of agricultural products in the EU, has a large stake in the transport of such products within the EU, partly because such exports are often delivered by Dutch haulage firms, albeit not always using Dutch drivers. According to data from the Dutch Agricultural Logistics Platform, there were about 1,600 carriers operating in the Netherlands in 2008, employing 126,000 full-time staff entirely or partially in agricultural logistics.

3.1.7 Institutional framework

The importance and the technically and economically prominent position of Dutch agriculture and horticulture are difficult to understand without considering the institutional framework. This comprises primarily a range of government and semi-government institutions that, even though they have retreated somewhat into the background over recent years, were extremely important for the development of the sector for a long time and to some extent still are. This is illustrated by the existence of a separate Ministry of Agriculture (sometimes covering fisheries, nature and food quality as well) alongside the Ministry of Economic Affairs until the formation of the Rutte-Verhagen cabinet (Ministry of Agriculture, Nature and Food Quality, 2009). The decision to pursue a policy focused on education, information provision and research was made as early as the end of the nineteenth century (see also Chapter 2), as a strategic move to foster the competitive strength and development capacity of agricultural enterprises. In the wake of the natural attrition in the number of farms and successors, the quantitative role of independent primary and secondary agricultural education also declined, likewise that of agricultural information provision. In a political climate characterised by an economic crisis and a less prominent role for government, cuts in agricultural research are also currently also under consideration. This does not alter the fact, however, that the creation and dissemination of technical knowledge have always been essential for the sector's development, and still remain so within a more network-based structure. This is evidenced by the prominent international position of Wageningen University and its affiliated research institutes. Until well into the 1990s, Dutch agricultural and horticultural organisations also played a key role in distributing

knowledge via their own (government-subsidised) information services and powerful Dutch and EU government lobbies.

Also of major importance for the development of the primary sector was the cooperative structure, which since the end of the nineteenth century had been a feature of nearly all aspects of supply, processing and, last but not least, funding. While the standard size of operation in primary production remained that of the family farm (see also Chapter 2), cooperatives were able to evolve over time into large-scale and powerful, often internationally leading groups, responsible for the procurement of raw materials and adding value to agricultural products. The names VION Food Group (meat)¹⁶, Royal FrieslandCampina (dairy), AVEBE (starch), HZPC (seed potatoes), Flora Holland (flowers) and Rabobank (finance) are sufficient to illustrate the point in this 'International Year of Cooperatives' (2012). Although the presence of these cooperatives or former cooperatives did not block the development of private enterprise, cooperatives developed into market leaders for nearly all types of production. In many cases they were by far the largest processor or supplier in their field.

Many agricultural cooperatives have information specialists on their staff and are actively involved in the business operations of their members, either voluntarily, through financial incentives or simply subject to binding conditions. They are thus involved in chain integration, where the question of priorities sometimes arises when deciding on the type and scale of production. Primary producers increasingly depend on the requirements and specifications of their customers, who in turn have to rely on these same requirements and specifications in the struggle to gain a strong position in the market. More and more cooperatives (and private customers) are starting to recommend or impose the specifications for accepting deliveries from their primary suppliers. Whereas cost control and marketing were originally the main driving forces behind this, nowadays, market demands in the area of Corporate Social Responsibility and sustainability are gaining importance. Two examples are VION's CSR strategy and FrieslandCampina's sustainable dairy farming programme.

3.1.8 Significance of the primary sector for the agri-food sector

Earlier sections (3.1.2 and 3.1.3) argued that, in terms of added value and employment, the growth of the agri-food sector in recent decades was largely attributable to the supply and processing industries, while by contrast the relative importance of the primary sector was declining. However, this is no reason to underestimate the importance of the primary sector for the associated industry and trade sectors. By virtue of its proximity and efficiency, the primary sector provides extensive input and output flows that form the physical base from which purchasers and suppliers can expand their operations abroad. Of no less importance is the fact that the Netherlands' knowledge-intensive and

¹⁶ Not a cooperative in its current form, but under the indirect ownership of the agricultural organisation ZLTO.

innovation-oriented primary sector provides a fertile environment for developing innovative technologies and systems that can subsequently be exported. This is true, for example, of the feedstuffs industry, not to mention suppliers and constructors of livestock buildings, milking systems, greenhouses, refrigeration and heating systems, as well as machinery for the globally operating breeding organisations, and seed growers and producers of improved strains.

3.1.9 Conclusion

Surveying the position of the agri-food sector in the Netherlands, we can conclude that it is an economically strong and innovative sector that makes a significant contribution to the country's national income, employment, and undeniably to its exports. This same conclusion emerged clearly from the Agro & Food Top Sector Report (2011) and the Horticulture & Source Materials Top Team Report (2011).

A comment applies here, though, in order to place the relative importance of the primary agriculture and horticulture sector in the right perspective. The growth of income, employment and contribution to exports is increasingly attributable to the associated trade and industry sectors. If these related segments of the chain are included, the economic importance of the agri-food sector remains stable or displays a slight decline. If we exclude these segments, i.e. if we only consider primary agricultural and horticultural production, a consistent and occasionally steep decline may be observed in the sector's relative importance, illustrated by the fact that its share of national employment has fallen to around 2%.

Against this background, the question arises as to what extent the Dutch agri-food sector is truly dependent on the processing and trading of Dutch agricultural products.

In order to answer this question, we must look at the growth potential of the segment that utilises imported raw materials as compared to the growth potential of the segment engaged in processing Dutch raw materials. Between 1995 and 2009 the gross added value of the entire agri-chain climbed by over 50%, while the comparable growth rate for the chain utilising domestic raw materials did not even reach 20%.

At the same time, it has to be pointed out that the agri-food sector insofar as it is based on domestic agricultural raw materials also continues to have significant economic importance. It is true that its importance for the Dutch economy as a whole has declined in relative terms, but this is no reason to underestimate the sector's significance.

In this context, it must be remembered that trade and foreign supplies can only thrive in certain sectors (e.g. in floriculture) thanks to the existence of extensive, high-quality and knowledge-intensive primary production in the Netherlands.

3.2 Dutch primary agriculture and horticulture sector in its setting

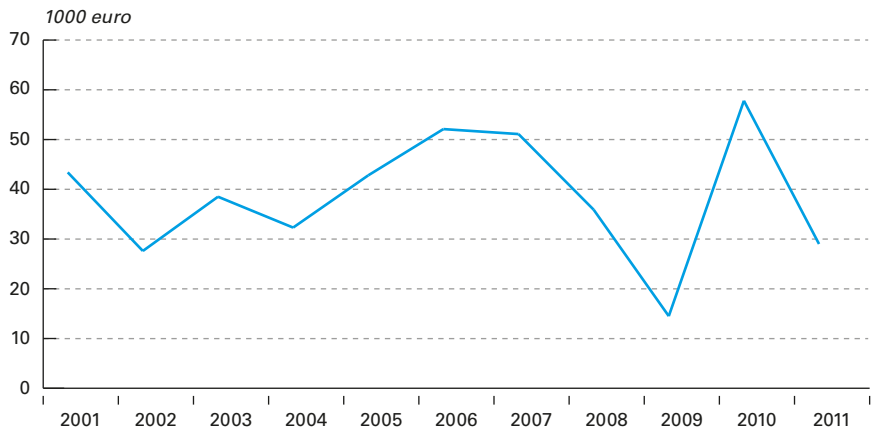
This section focuses on Dutch agriculture and horticulture in its setting. The subjects discussed include the sector’s strained relationships with other land users and with nature, the environment, and sustainability requirements. As will become clear, substantial progress has been made in most of these areas. However, the need for continuing sustainable development is now so urgent that society’s judgment and future policy choices no longer depend on how much has been achieved, but on how much remains to be achieved.

3.2.1 Income from farming and other sources

If a common characteristic of incomes in Dutch agriculture and horticulture had to be named, it would surely be their high variability – over time, among farm types and within farm types.

As such, this variation is not remarkable if the differences between markets, farm sizes, conditions and, of course, the entrepreneurs’ capacities are considered. Nevertheless, the variation in the incomes of farms of the same type, or in incomes for two successive years, remains striking. Figure 18 shows the volatility of the average family income over the past ten years in the entire Dutch agriculture and horticulture sector. The level of volatility is substantial, the ratio of the best year to the worst being 3.25. However, because the differences between the various subsectors have always been substantial, it can be assumed that this had some dampening effect on the average figures. Serving as an admittedly extreme example is the difference between family incomes derived from laying-hen farming (EUR 233,000) and greenhouse vegetable cultivation

Figure 18: Volatility of family income



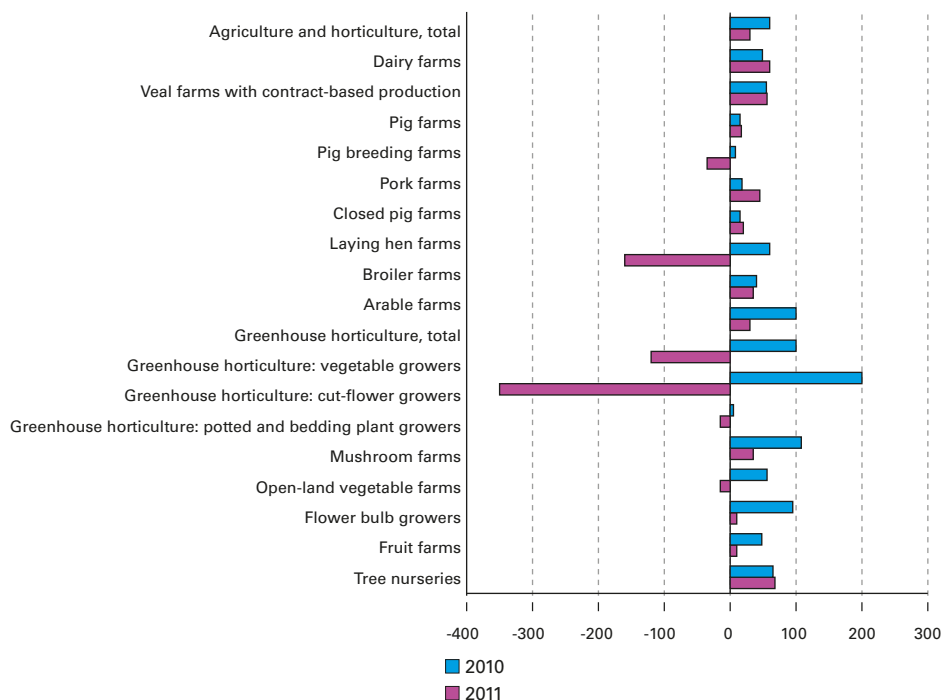
Family income from farming, averaged over all agriculture and horticulture sectors, 2001-2011. Source: Agricultural Economics Research Institute / Statistics Netherlands, 2012.

(EUR 165,000 negative) in 2009, or that between closed pig farms (EUR 108,000) and mushroom farms (EUR 17,000 negative) in 2005. Figure 19 shows the differences between two successive years by sector, and also provides an indication of the extreme income fluctuations.

Figure 18 might therefore lead to the conclusion that entrepreneurs in the Dutch agriculture and horticulture sector earn neither exceptionally poor nor exorbitantly high incomes. In practice, both extremes occur, but it is difficult to predict where that will happen in any particular year as the impact of fluctuating selling and purchasing prices is too large. Now that the Common Agricultural Policy is based predominantly on deficiency payments rather than price support, virtually all agricultural products are subject to free market pricing, with all the annual or long-term volatility that entails. When purchasing raw materials, farms have to contend with the same volatility.

There are of course farms that find themselves more often than not at the lower or upper end of the spectrum. This depends on relatively constant factors such as size of farm, operating conditions and entrepreneurship. As discussed in Chapter 2, these differences are not simply a result of development and innovation, but also constitute a powerful force driving development and innovation. A farm that goes out of business generally frees up resources (land and quota) that entrepreneurs in a growth phase can use for expanding their own operations. Although the level of income is certainly not the only factor that determines whether a farm will continue in business, it is definitely an extremely important one. Statistics more often ascribe the cessation of business to the lack of an available successor, than to the level of income. These two variables are highly correlated, however. Farms with good income prospects are more likely to appeal to potential successors. Conversely, a farm with no potential successor is more likely to be downsized, thus ending up in the statistical category for below-average incomes.

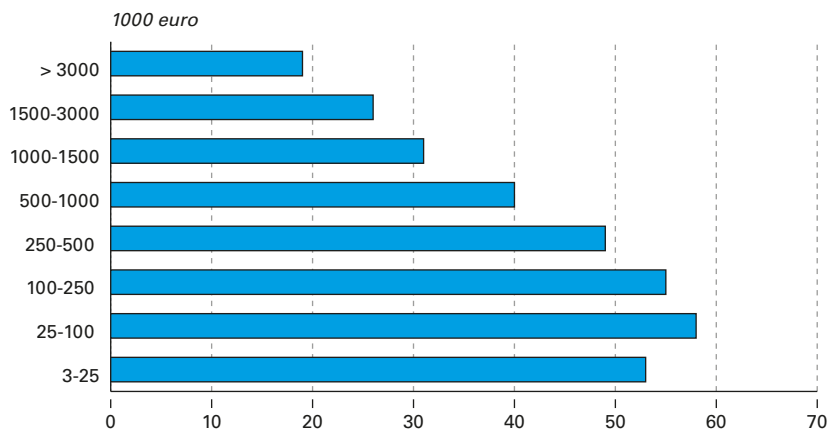
The indicator 'family income from farming' is based on the aggregate income of all family members on the farm, thus providing a somewhat rosy picture of earning capacity compared with incomes outside the agricultural sector. On the other hand, the incomes of family members earned away from the farm are not included in this indicator. The actual income position of many farms is therefore healthier than can be inferred from the indicator 'family income from farming'.

Figure 19: Differences in incomes between sub-sectors

Average family income from farming by sub-sector in the years 2010 and 2011. Source: Agricultural Economics Research Institute / Statistics Netherlands, 2012.

As Figure 20 shows, there are indeed a relatively large number of Dutch farms benefitting from 'supplementary income' within the meaning defined by Statistics Netherlands. Moreover, such incomes can be higher than those from agricultural activities, so that strictly speaking, the agricultural income is supplementary to the non-agricultural principal income in such situations. Nor does the supplementary income actually have to consist of earnings from supplementary activities. It can also represent social security or other benefits. Insofar as the income is derived from supplementary activities, family farms (the most common type in the sector) are relatively flexible about permitting such work. Of course, this applies mainly if there are surplus production factors, and the supplementary activities are related to some extent to farming, for example, selling products on-farm or offering accommodation.

Family members who are mainly involved in supplementary activities are usually, but not always, required to remain available on the farm to help out when necessary. Increasingly, supplementary or other additional income is generated by a partner working outside the home, as a nurse or teacher for example.

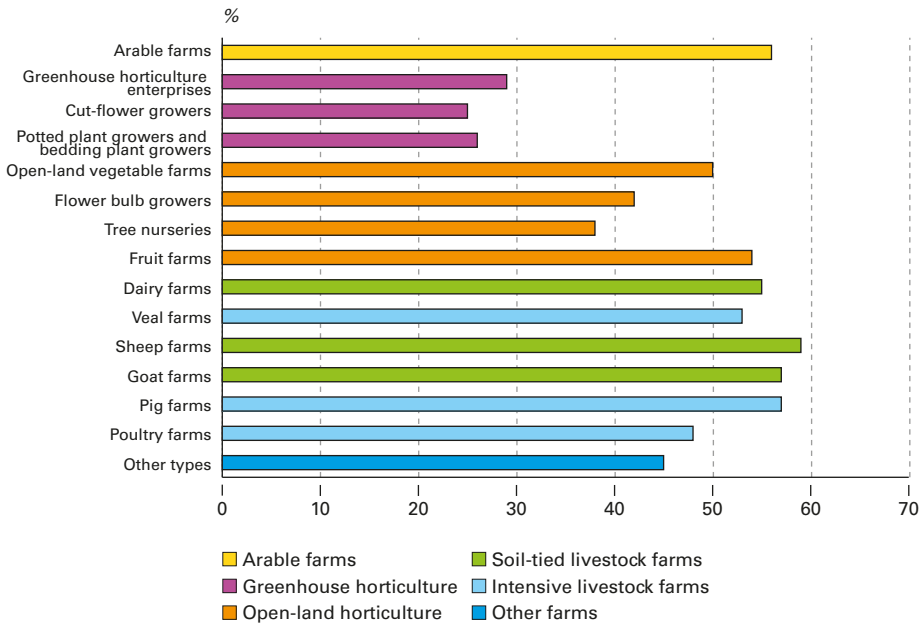
Figure 20: Supplementary income and farm size

Proportion of farms receiving supplementary income classified according to the farm's Standard Output, 2010. Source: Statistics Netherlands, 2012c.

Farming does not just permit supplementary activities; such activities are often necessary if the farm does not produce sufficient income to provide a decent living. Such conditions regularly go hand-in-hand with a farm that is not large enough to keep the available family members fully occupied. Figure 20 also makes it clear that supplementary income is more common at relatively small farms. Supplementary income can actually come from any type of economic activity, including those unconnected with farming, possibly even a job outside the home. The definition of supplementary income is therefore considerably broader than just 'expansion', which implies a clear link with the farm. As discussed elsewhere in this analysis, activities representing diversification are developed relatively often at dairy farms. The greenhouse horticulture sector stands out with its distinctly lower percentages of enterprises receiving supplementary income. At the other end of the scale are land-tied livestock farming and arable farming, which have the highest percentages.

Apart from these economic considerations, the agriculture and horticulture sector are also affected by general social changes in the past decades, in the form of more and more two-income households. It is no longer taken for granted that a woman who marries a farmer will automatically take up work on her husband's farm.

Figure 21: Supplementary income per farm type



Proportion of farms receiving supplementary income per farm type, classified into arable farming, greenhouse horticulture, open-land horticulture, soil-tied livestock farming and intensive livestock farming, 2010. Source: Statistics Netherlands, 2012b.

According to data from Statistics Netherlands (2012a), 63% of couples in the Netherlands consist of two working partners. With this in mind, it is not surprising that, according to the same organisation, supplementary income is earned at 52% of all Dutch agricultural and horticultural enterprises. Assuming the likely scenario that the supplementary income is more often earned by the partner than by the farmer, it seems that the supplementary income percentage in agriculture and horticulture is slightly trailing the social trend that is resulting in a greater proportion of two-income households. However, this conclusion does not take into account the fact that a large number of partners in the agricultural sector work on their spouse's farm, and so are not classified as engaging in a 'supplementary activity'.

Some insight into the prevalence of supplementary activities over time is provided by Table 4, which is also based on data from Statistics Netherlands. However, the table is lacking the most important supplementary activity, i.e. a job outside the home. In general, such a job is certainly considered a supplementary activity, but not as an activity representing 'diversification', the key concept

Table 4: Changes in diversified farms

	1998		2005		2011	
	n	%	n	%	n	%
On-farm sales	4101	3.9	4529	5.5	3300	4.7
Storing goods or boarding animals	.		2929	3.6	3349	4.8
Agri-tourism	2955	2.8	2893	3.5	2884	4.1
Processing agricultural products	1261	1.2	1057	1.3	1211	1.7
Care farming	318	0.3	541	0.7	931	1.3
Aquaculture	.		50	0.1	27	0.0
Paid work for third parties	.		3617	4.4	4357	6.2
Agricultural nature and landscape management	3454	3.3	13210	16.2	8280	11.8
Childcare	.		.		209	0.3
Farm education	.		.		791	1.1
Total number of farms	104873	100	81750	100	70392	100

Numbers and percentages of diversified farms in the Netherlands, according to diversification activity, 1998-2011. Source: Statistics Netherlands, 2012b.

underlying the table and one that assumes a clear relationship between farm and supplementary activity. From the table, it appears that all categories apart from aquaculture, agricultural nature management and on-farm sales have experienced a relative increase over the past thirteen years in the number of farms engaging in supplementary activities, but that the increase is not always in a straight line.¹⁷ The absolute numbers are either decreasing or stable as regards the traditional diversification activities such as agricultural nature management, processing and selling agricultural products, and agri-tourism. The provision of social services such as care farming, childcare and farm education is on the rise, although the total figure is no more than a few hundred farms. The farms engaged in supplementary activities such as storing goods, boarding animals and/or paid work for third parties show an increase in number as well percentage (see also section 3.2.7.4). These activities represent an obvious potential source of supplementary income for farms that can free up storage space, livestock accommodation and/or labour, possibly in combination with farm machinery. Farmers engaged in such activities are unlikely to regard their farms as a diversified enterprise, unless they combine these activities with social and/or more traditional diversification activities.

¹⁷ Owing to different definitions, the picture presented by Table 4 differs sharply from the one that emerges from section 3.2.7.4, which is based on figures compiled by the Multicultural Agriculture Task Force.

3.2.2 Dynamics within and between sectors

An obvious question about the flexibility of entrepreneurs and sectors concerns inter-sector dynamics. Will an entrepreneur readily change sectors if it appears that his income is going to continue to fall short? Are new entrepreneurs entering sectors where incomes have been developing favourably for some time? And has this often occurred?

Dutch arable farming underwent a shift to more intensive crops in the 1990s, when the EU gradually reduced its support for grain prices. This shift did not take place everywhere at the same time. Small arable farms turned sooner than the larger farms to the cultivation of sprouts, chicory or bulbs. Although there is no empirical data on the motivation of these arable farmers, a clear and observable shift is certainly occurring in this sector.

Inhibiting factors may include investments in machinery, or long-term contracts concluded with trading companies for the sale of potatoes or onions. Other factors such as soil type also limit the range of options for arable farmers, as not every crop can grow successfully on every type of soil and yield a profit. In many cases, however, the investments remained the financial responsibility of the contractors and/or no long-term contracts had been concluded. Of course, arable farmers also invest in equipment sheds, which can be used for other purposes as well, and in storage sheds. The latter are more expensive because of the refrigeration costs and are less suitable for other purposes.

Still, such investments are not comparable in size to those made in dairy farming, for example. Investments in dairy farming often exceed EUR 1 million for sheds that are hard to use for a different purpose and are generally depreciated over a 30-year period. Similar considerations apply to intensive livestock farming, where the volatility of prices serves as an additional constraint to a possible change of sector. To illustrate the point, even if prices during several years are low in the pork sector and relatively high in the pig breeding sector, this is still no guarantee that the pattern will continue for the number of years required to recoup the cost of shed conversion.

An example of movement from one Dutch agricultural subsector to another is the mass migration of greenhouse vegetable growers to greenhouse floriculture in the 1980s and 1990s, the consequence of persistent low prices and incomes in the former subsector. Although hard data on the migration itself are not available, the number of farms concerned provides an idea of its extent, as illustrated by Figure 22. While the total number of greenhouse horticulture firms declined by 8% over a period of 10 years, the number of greenhouse vegetable growers contracted by 24% and greenhouse floriculture recorded an expansion of 6% (with an increase of no less than 11% between 1985 and 1990).

Figure 22: Shift within greenhouse horticulture

The numbers of greenhouse vegetable growers and greenhouse floriculture enterprises in the Netherlands from 1985 to 1995 show a shift from vegetable cultivation in favour of floriculture. Source: Agricultural Economics Research Institute / Statistics Netherlands, 2012.

Such a move often involved substantial disposal of obsolete stock and expenditure on new stock, as well as investments in knowledge and skills relating to the new crops. However, as the greenhouses could be retained, a relatively large portion of the invested capital could be transferred to the new business activities.

Apart from this relatively large shift in the last decades of the twentieth century, it therefore appears that the dynamics within the primary agricultural sector are fairly limited in scope owing to the combination of the disposal of investments in the old farm type, increasingly large investments in the new activities, and the high level of specialised knowledge required in each of the individual types of production. However, mobility can be observed between closely related sub-sectors where a shift requires less investment and disposal, as well as less new knowledge.

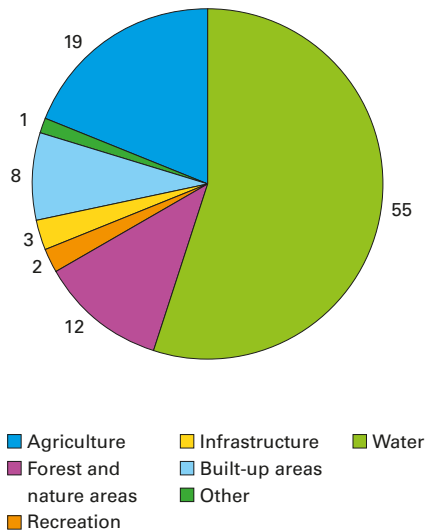
Theoretically, dynamics are also conceivable in the form of the entry of entrepreneurs from outside the agricultural sector. In practice, such movements are rarely observed to a statistically relevant extent. On the one hand, this is connected with the above-mentioned relatively high investment threshold, which also hinders a switch between sectors and forms an even-greater constraint on external entrants without the comparative advantage of their own land and favourable financing from within the family. On the other, the relatively low

profitability of the various sectors is also part of the explanation. The fact that profitability rarely exceeds 100% over the course of time means that both labour and capital will be deployed for a return that is on average below the market level. This objection can be overcome if the proportion of loan capital remains limited due to the availability of equity capital, and if a relatively large amount of family labour is deployed. However, entrepreneurs from outside the sector who are considering running an agricultural business will find it difficult to satisfy these conditions.

Well-known but poorly documented is that in the 1960s and 1970s meat-pig farming, which was then practiced on a much smaller scale than today, was a powerful magnet drawing employees to the countryside. They were often construction workers who in their free time were able to put up a sty themselves and start to keep pigs on a limited scale. Some continued with meat-pig farming alongside their paid employment, while others grew to become full-time pig farmers. Despite this, the development seems to be limited to that period and to this sector, mainly because here, too, the investment thresholds and required level of professionalism increased owing to the greater scale necessary to realise profitable production.

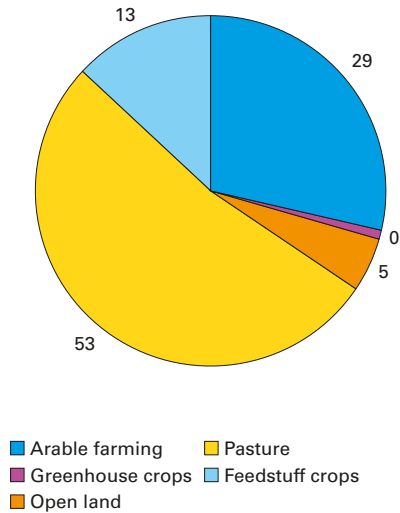
A type of dynamics that seems to have spread, especially over the past ten years, could be called ‘vertical dynamics’. This refers to a situation where a primary

Figure 23: Soil usage



Percentage breakdown of the Netherlands' surface area, including water, by soil usage. Source: Agricultural Economics Research Institute / Statistics Netherlands, 2012.

Figure 24: Use of cultivated land



Percentage breakdown of the Netherlands' cultivated land, excluding water, by sub-sector. Source: Agricultural Economics Research Institute / Statistics Netherlands, 2012.

producer takes on certain activities that were previously carried out further along the chain. This development can take the form of potato growers who clean and pack their own potatoes, or vegetable growers who clean and cut their own produce and often sell it under a brand name, possibly under a contract with a retail chain. Some greenhouse flower growers have also formed groups that collectively market and sell their members' products under a joint brand name.

3.2.3 Land use

Despite the steady growth of cities, industrial sites and infrastructure, over half the surface of the Netherlands is still used for agricultural production. Figure 23 shows that the current acreage of cultivated land occupies 55% of the total surface area of the Netherlands, if water is included. If dry land only is considered, as much as 67% is in use as farmland. The farmland area has hardly changed in recent years and currently amounts to almost 2 million hectare. This means that most of the land of farms that go out of business is acquired by farmers who are expanding their activities.

The gradual reduction of farmland area in the Netherlands mainly results from the increase in the surface area of land used for urban development, industrial sites and infrastructure. From the 1930s to the 1970s, large quantities of farmland were created through the reclamation of Yssel Lake (IJsselmeer). Since the draining of Southern Flevoland, however, no more land has been created and the total acreage has gradually declined.

In the Dutch agricultural sector, dairy farming accounts for the largest use of farmland. More than half the farmland is pasture and a further 13% is used for feedstuff crops such as maize. Arable farming accounts for over a quarter of the total acreage and open-land horticulture for 5%. This category includes a wide variety of sectors such as, on the one hand, high-intensity arboriculture and flower-bulb cultivation, and, on the other, the less intensive open-land cultivation of vegetables. The share of greenhouse horticulture stands out. The output of this sector per unit of area far exceeds that of any other sector, even though it covers a total acreage of just 10,000 hectares. This area is so small that it can be represented in the pie chart of Figure 24, but not expressed as a whole percentage.

Over the past ten years, the acreage for open-land vegetables as part of the total farmland acreage has grown slightly, whereas the area for arable crops has contracted relatively sharply. Partly offsetting the most recent decline was an increase in the number of arable farms. The acreage for feedstuff crops such as silage maize, alfalfa and fodder beets also increased. Table 5 presents a summary of these intra-sectoral shifts.

Table 5: Changes in agricultural land use

	Agricultural land use ^a 2000-2010				
	Acreage (x 1,000 hectares)				Change (% per annum) 2000-2009
	2000	2005	2009	2010 ^a	
Pasture	1.036,7	1.000,0	1.017,1	995,3	-0.2
Green-fodder crops ^b	212,8	241,7	248,0	237,5	1.7
Arable farming	634,4	604,1	554,1	542,1	-1.5
Open-land horticulture	81,1	81,4	87,9	87,1	0.9
Greenhouse horticulture	10,5	10,5	10,3	10,3	-0.2
Total farmland	1.975,5	1.937,7	1.917,4	1.872,3	-0.3
^a The plot register was modified in 2010, resulting in a reduction in farmland acreage					
^b Silage maize, alfalfa and fodder beets					

Agricultural land use 2000-2010, acreage in thousands of hectares. Source: Statistics Netherlands Agricultural Census, adaptation by the Agricultural Economics Research Institute.

3.2.4 Environment

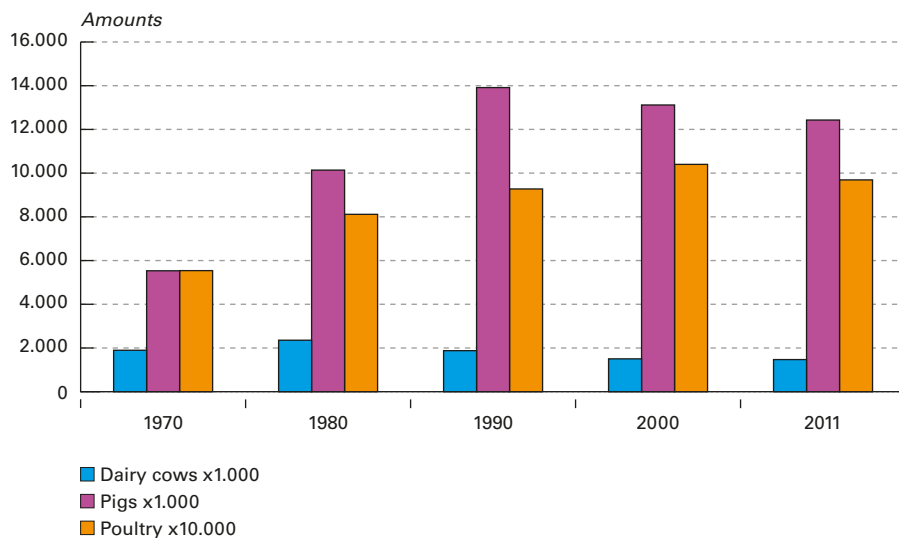
Agriculture and horticulture contribute significantly to the pressure on the environment in the Netherlands due to the production of manure and greenhouse gases, the requirements imposed on production conditions (water level management, soil decontamination, etc.) and the production methods (chemical fertilisers, crop protection, tillage, etc.).

The number of animals kept in the Netherlands from year to year exhibits large fluctuations owing to changing laws and regulations, and to the culling of animals during outbreaks of epidemics such as swine fever, foot and mouth disease and bird flu. Overall, since 2000 there has been a slight decline in the number of livestock.

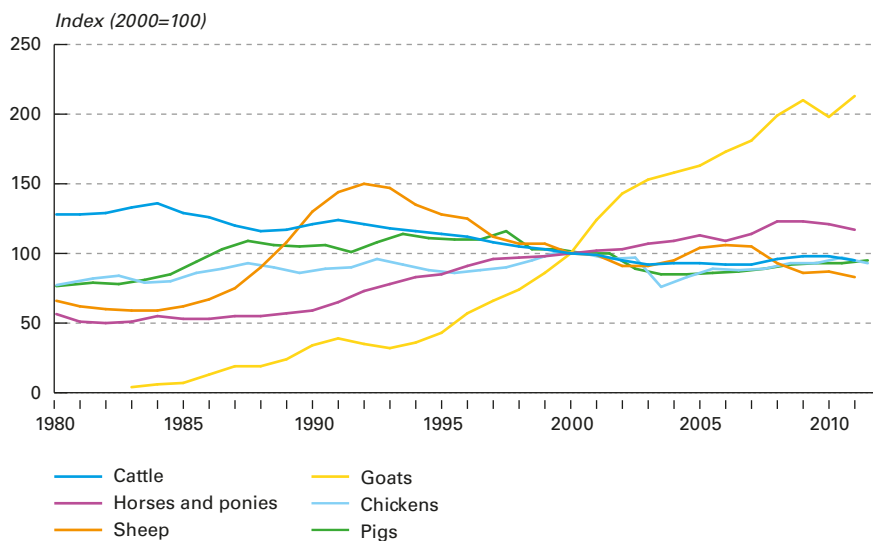
Increases have still been seen since then in the number of goats, veal calves and laying hens, as well as in the number of recreation animals such as horses and ponies. In 2010, the number of livestock in the Netherlands in 2010 was as follows:

- 4 million head of cattle, 25% less than in 1980, when 5.2 million were counted
- 12 million pigs, 20% more than in the 1980 reference year, but 3 million less than in the peak year, 1997
- Over 100 million chickens (25% more than in 1980), as well as 350,000 goats and 1.1 million sheep (see also Figures 25 and 26)

Thanks to laws and regulations and a shrinking number of animals, manure production is back at its 1970 level. Due to the reduction of the mineral content in feedstuffs, the nitrogen and phosphate levels in animal manure that impact the environment fell even more sharply. Following steep growth in the 1970s and 1980s, the level peaked in 1986.

Figure 25: Changes in number of livestock

Change in the numbers of dairy cows, pigs and poultry, 1970-2011. Source: Agricultural Economics Research Institute / Statistics Netherlands, 2012.

Figure 26: Indexed changes in number of livestock

Index (2000 = 100) of the changes in the number of livestock on Dutch farms. The numbers of cattle, pigs, chickens and sheep have declined; the numbers of horses, ponies and especially goats have grown. Source: Netherlands Environmental Assessment Agency, 2012a.

As a result of the so-called Super-Levy Decree of 1984 (Beschikking Superheffing), manure legislation (1987) and measures to reduce the phosphate content of feed concentrates, the excretion of minerals fell after 1986 and remained stable as from 2005. This is apparent from Table 6 (see also Figure 28).

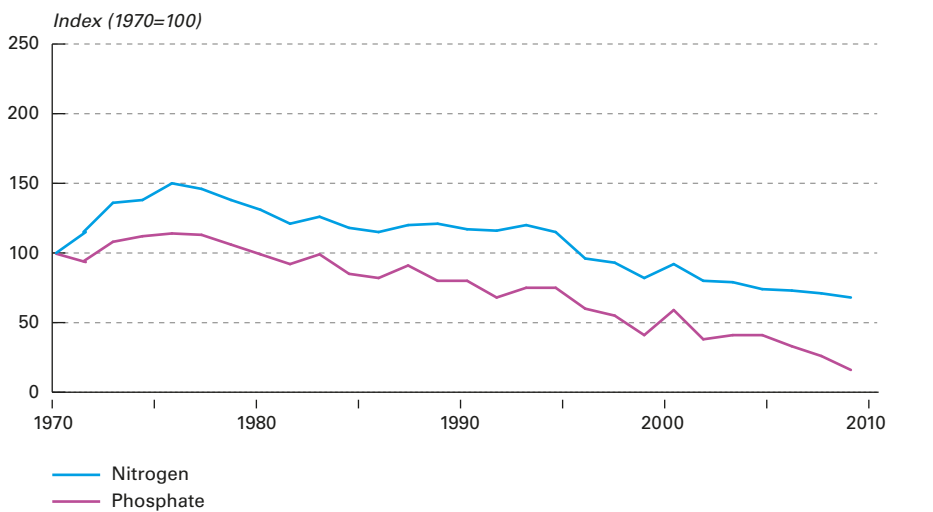
The impact of the steep rise in the excretion of manure and minerals until the mid-1980s is still being felt. The use of excessive amounts of animal manure as well as chemical fertilisers leads to an accumulation of nitrogen and phosphate in the soil, and leaching into groundwater and surface water, with all the consequences

Table 6: Minerals in manure

	1986	2005	2011
In animal manure:			
Nitrogen	545	420	423
Phosphate	260	170	171
In chemical fertilisers:			
Nitrogen	500	279	220
Phosphate	81	49	31

Amounts of minerals in animal manure and chemical fertiliser, 1986-2011, in millions of kilograms.
Source: Netherlands Environmental Assessment Agency, 2012a.

Figure 27: Nitrogen and phosphate content per agricultural area



Nitrogen and phosphate content per agricultural area, 2010. Source: Netherlands Environmental Assessment Agency, 2012a.

that entails for drinking water supplies and the ecological quality of surface waters. Nitrogen and phosphate production varies greatly by region, as shown in Figure 27. The highest concentrations are found in areas with sandy soil, where intensive livestock farming is the most developed.

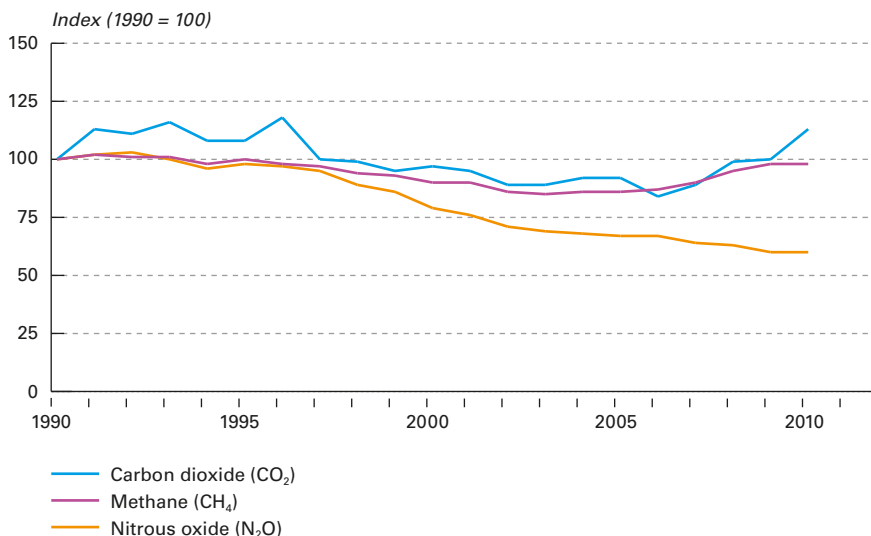
Due to the accumulation of minerals in the past, the Netherlands has 1.3 million hectares of phosphate-saturated soil. Out of a total area of around 2 million hectares, that is well over half of all the agricultural land. The phosphate concentration in the soil has adverse effects on surface water quality and aquatic ecosystems.

The soil in Dutch agricultural areas also suffers from the effects of waste processing (urban and industrial) and of atmospheric deposition, with an accumulation of heavy metals as the result. This has adverse effects on the soil ecosystem and can have implications for agriculture and open-land horticulture.

Ammonia emissions have fallen thanks to the decrease in livestock, and especially the introduction of regulations for the spreading of manure and of requirements applying to new buildings for housing livestock. Greenhouse gas emission are related to the number of livestock and/or the production methods. Emissions of methane, which is mainly released by cows while digesting their feed, have decreased mainly due to the reduction in the number of cattle since 1990.

Commencing a few years ago, these emissions have started to increase again owing to the growth in the number of livestock and, above all, to the wider use of

Figure 28: Changes in nutrient surplus

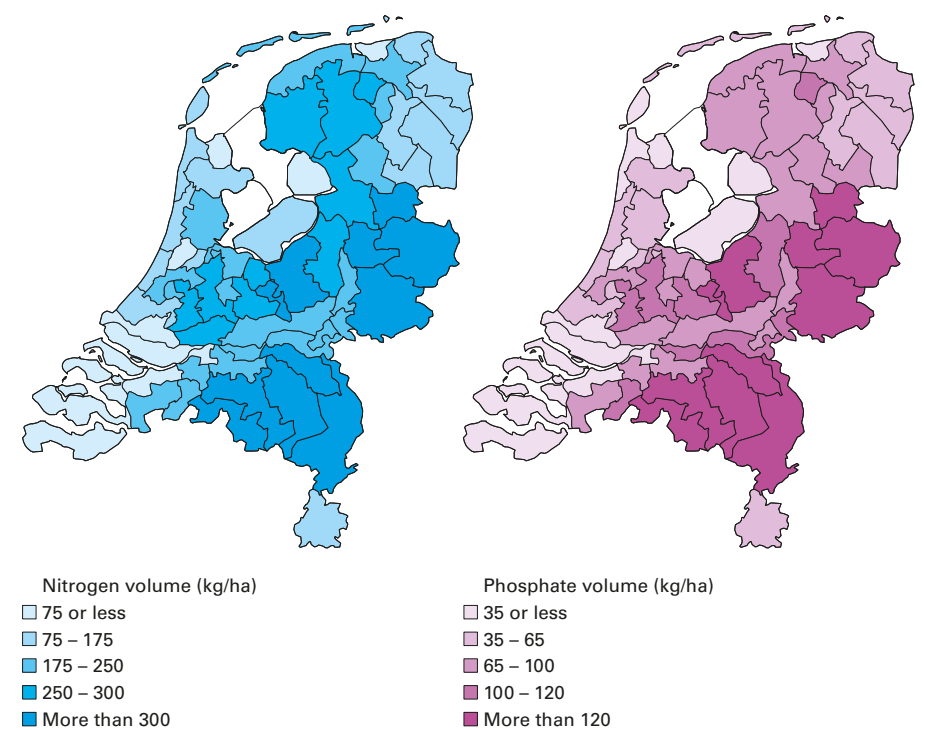


Index (1970 = 100) of the nitrogen and phosphorus surpluses in agriculture. Source: Netherlands Environmental Assessment Agency, 2012a.

cogeneration in greenhouse horticulture. The same applies to dioxide emissions in this sector, which incidentally have shown a decline since 1990. Emissions of nitrous oxide (laughing gas) have fallen by over 35% since 1990 (source: Netherlands Environmental Assessment Agency, 2012a).

Apart from the impact of livestock farming in the Netherlands, the footprint of this sector outside the country's borders also deserves attention from a sustainability perspective. Many of the feed concentrates for livestock are imported.¹⁸ For instance, 90% of all soy imported into the Netherlands is added to feedstuffs, which are then partly exported. Most of this soy originates from the United States and from South American countries such as Brazil and Argentina. In 2010, the Netherlands imported almost 4% of all soy beans produced worldwide. This represents over 3 billion kg of soy beans, almost 6 billion kg of soy meal and nearly 0.1 billion kg of soy oil (Van Oorschot et al., 2012). As the Netherlands only exports approx. 15% of all

Figure 29: Greenhouse gas emissions



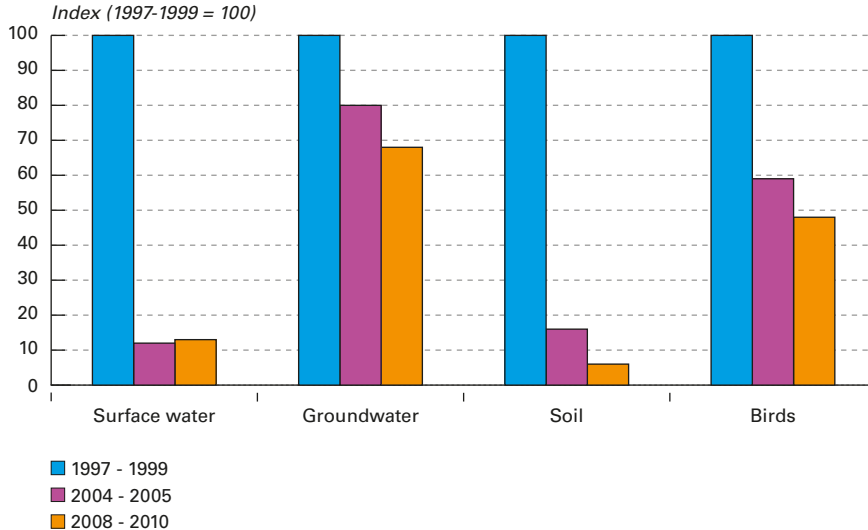
Index (1990 = 100) of carbon dioxide, methane and nitrous oxide emissions into the air from agricultural and horticultural activities. Source: Netherlands Environmental Assessment Agency, 2012a.

18 In 2005, the Louis Bolk Institute calculated that over 70% of all feed concentrate was imported.

manure nominally produced in the country (Berkhout and Roza 2012, p. 120), the soy contributes to the national mineral surplus. This problem has also been recognised by Dutch industry, which has created a joint task force to find solutions (see www.taskforceduurzamesoja.nl).

Arable farming and horticulture also have an environmental impact – not just from the use of animal manure and chemical fertilisers, but also from the application of crop protection products. Although the impact on surface water caused by such products has fallen sharply, the targets for 2010 have still not been met. Crop-free zones, emission-reducing equipment and different combinations of crop protection products resulted in a reduction of 85% between the periods 1997-1999 and 2008-2010. (The reduction target specified in the policy document on sustainable crop protection was 95%; Lower House of the Dutch Parliament, 2004). Despite this, readings performed in 2009 at more than half the measuring locations showed concentrations of one or more crop protection products that did not meet the applicable water quality standards (see Figure 30).

Figure 30: Environmental burden of crop protection products



Burden of crop protection products used in open-land cultivation on surface water, groundwater, the soil and bird life, calculated based on sales of these products. Source: Netherlands Environmental Assessment Agency, 2012a.

3.2.5 Landscape and nature

3.2.5.1 Landscape

The development of Dutch agriculture and the related changes in production methods affect nature and landscape. The appearance of farmland in the Netherlands has changed over the decades: hedges have been removed, streams straightened, plots enlarged, fields sown with grass, and pastures broken up. Farmers begin mowing the land earlier in the year, and mow it more often. Equipment is heavier and ploughs cut deeper. In addition, the land is dryer due to deeper drainage.

The public is less inclined to accept changes to landscape and nature, odour nuisance, light pollution, movements of heavy agricultural machinery, milk and feedstuff lorries, transport of livestock, and extremely large pig and poultry sheds. The extent to which the 'original' landscape has changed is also one of the measurable criteria against which the impact of agriculture and horticulture can be measured.¹⁹ According to the National Nature Outlook report (Netherlands Environmental Assessment Agency, 2002), the historical identity of half of all man-made landscapes in the Netherlands had already been harmed by the end of the twentieth century. This damage also concerns landscapes of international significance, including land reclamation areas, old marine clay polders, and peat extraction areas in low-lying parts of the Netherlands.

Urbanisation, intensification and upscaling in agriculture were mentioned as causes in the report. And since then, these same causes have continued to operate. The Netherlands Environmental Assessment Agency has analyzed the extent to which the historical identity of man-made landscapes is damaged (Netherlands Environmental Assessment Agency, 2012b). Expressed in percentages, this damage becomes very serious in various areas of the Netherlands, as Figure 31 illustrates on the basis of data provided by Alterra.

However, the extent to which a landscape's historical identity is preserved is not the only criterion for measuring its quality. The landscape's utility and amenity value for citizens and visitors is also relevant. Farmland in the Netherlands is also part of the identity of the Dutch, and the 'backyard' of both city dwellers and people who live in rural areas. Their involvement seems to be receiving more emphasis than previously in the new vision for nature being developed by the Ministry of Economic Affairs. Polders and dikes, canals and ditches, cows in the meadows and tulips in the bulb fields, all the cultural-historical features of the landscape – they all contribute to a sense of identity and belonging. Citizens enjoy the open landscape, its peace and quiet and the rhythm of the seasons, they see the history of the Netherlands reflected in the landscape, and they increasingly hold an opinion on developments that they perceive as threats to these qualities.

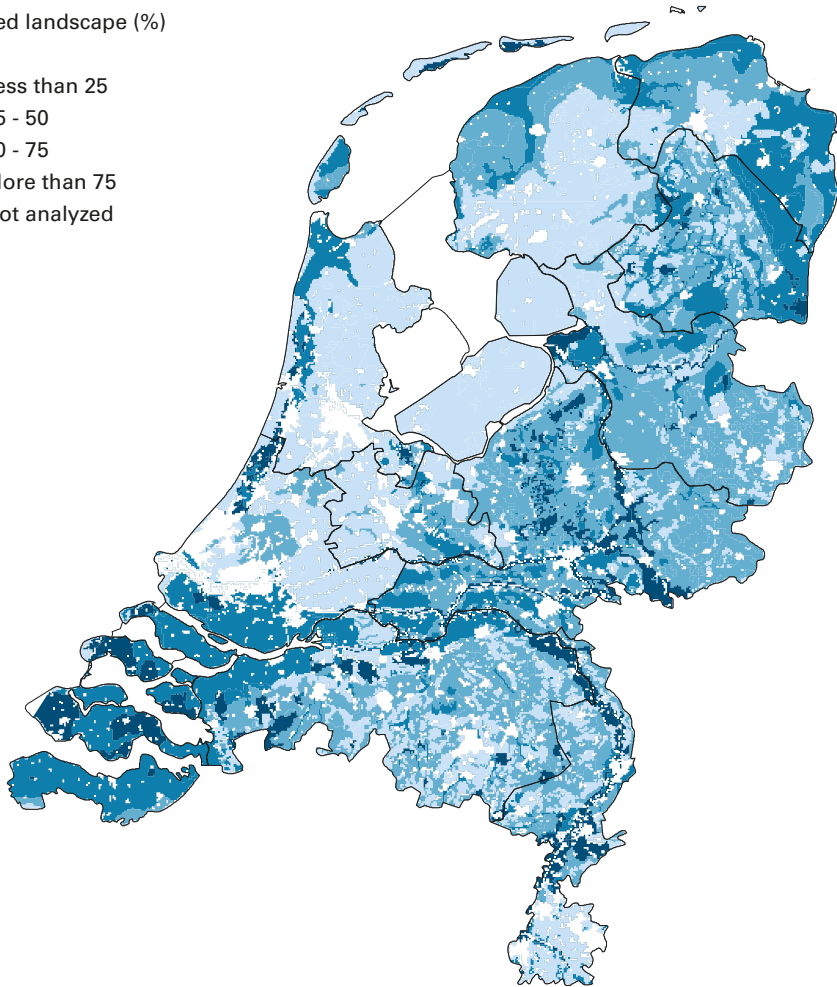
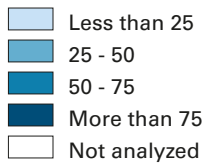
The Council for Housing, Spatial Planning and the Environment (2011) defined

¹⁹ See www.landschapsbeheer.nl for examples.

the concept of 'spatial quality' as the balance ('fit') between utility value, future value and amenity value. Supplemented by the criterion of historical identity, this definition is also useable for landscape quality. It also immediately reveals the potential for internal tension when assessing the quality of the landscape, as preservation of a landscape's historical identity is not automatically compatible with enhancing its utility and future value.

Figure 31: Changing landscape

Damaged landscape (%)



Degree of deterioration of the 'original' landscape (at time of land reclamation): percentage of the surface area that has been excavated, raised or levelled, and the degree to which the reclamation history of the landscape is still discernible. Source: freely adapted from Alterra, 2001.

3.2.5.2 Nature

The changes in the landscape over time also affect its suitability as a habitat for a variety of plants and animals. Many kinds of animals find their food and have shelters or breeding places on farmland.

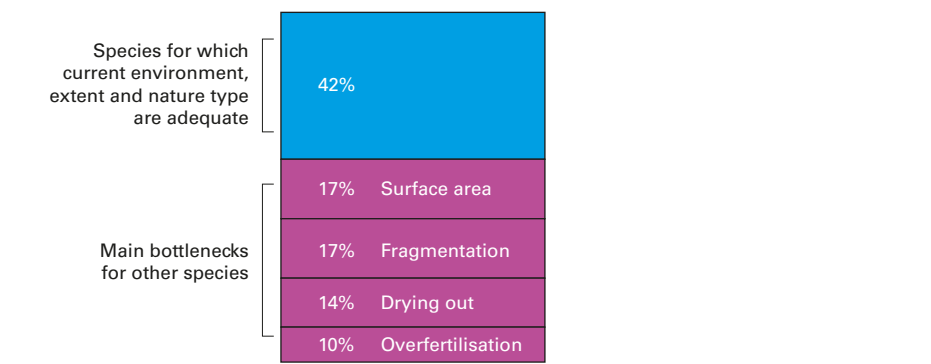
Since the 1980s, this biodiversity as such has increasingly become a benchmark for nature quality. Biodiversity has become an essential criterion for evaluating the quality of our natural environment – not just in the Netherlands, but worldwide. Alongside urbanisation, infrastructural development and industrialisation, agriculture plays a separate and significant role in the threat to biodiversity. Of importance in this connection is the similarly measurable impact of three processes: drying out (insufficient water level for proper nature development), overfertilisation (due to excessive application of nitrogen and phosphate fertilisers) and acidification (due to the precipitation of ammonia from animal manure). In the twentieth century, the quality of nature in agricultural areas therefore declined by as much as 60% after 1950, according to the Nature Balance 1999 published by the National Institute for Public Health and the Environment.

As Figure 32 shows, the implementation of various policy measures has resulted in substantial progress in counteracting the three processes described above. However, the targets are a long way from being achieved. Nevertheless, the degradation of biodiversity has measurably slowed down (although this is affected by more factors than just agriculture), but still not enough to create a safe situation for most of the target species defined in nature policy. (See also Figure 33, in which drying out and overfertilisation in particular reflect the impact of agriculture.) Progress has therefore been achieved with respect to the impact of agriculture and horticulture on biodiversity. The progress has not yet advanced sufficiently, however, to claim a sustainable recovery of target species diversity. Such a recovery requires more than just promoting a type of agriculture that is specifically aimed at this goal.

Nevertheless, primarily production-oriented agriculture and horticulture sectors are increasingly asked to operate within limits that help advance the recovery of biodiversity in the Netherlands, in accordance with the objectives of the EU's Natura 2000 policy. In practice, the sector already operates within these limits, given that expansion of nitrogen-emitting livestock farms in or near the 133 nitrogen-sensitive Natura 2000 areas is almost impossible. Permits for such expansions are generally susceptible to cancellation on the grounds of conflict with the conservation objectives ensuing from the EU's Birds and Habitats Directives. The programmatic approach to the nitrogen problem (Programmatie Aanpak Stikstof)²⁰, on which the Ministry of Economic Affairs, the Ministry of Infrastructure and the Environment, and the regional governments

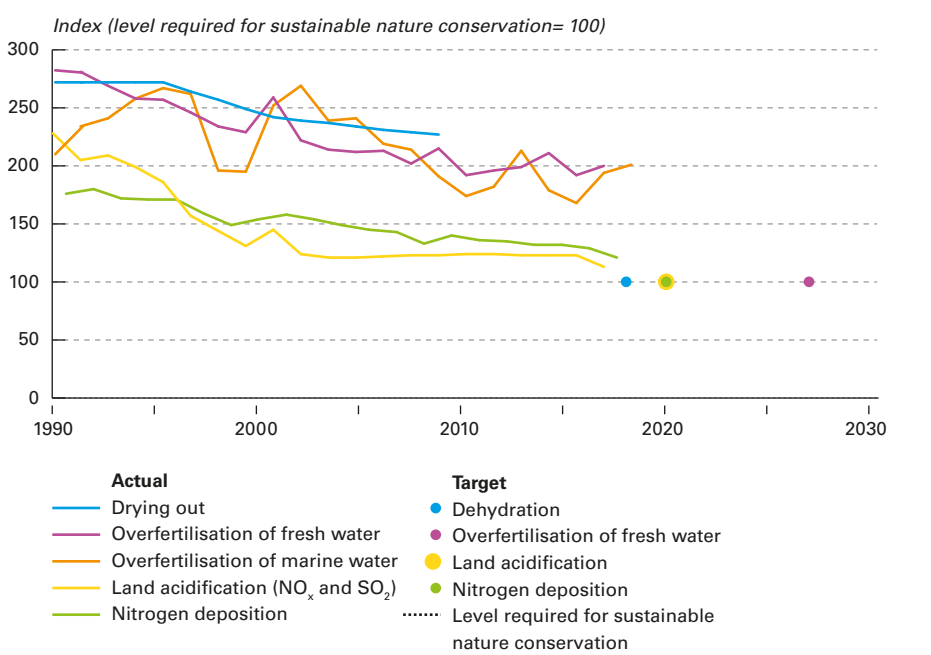
²⁰ See the website pas.natura2000.nl.

Figure 32: Changes in environmental burden in relation to target



Status of various agriculture-related environmental burden indicators (except NO_x) compared with the sustainable target level. Source: Bredenoord et al., 2011.

Figure 33: Bottlenecks in preservation of biodiversity



Bottlenecks in the preservation of biodiversity in 2011 according to the Netherlands Environmental Assessment Agency. At present, the conditions in the Netherlands are sustainable for over 40% of the target species (breeding birds, butterflies and plants). At present, conditions in the Netherlands are sustainable for over 40% of the target species (breeding birds, butterflies and plants). This means that there is enough habitat of adequate quality to accommodate a robust population nationwide. Other species are threatened by surface area reduction, fragmentation, drying out and overfertilisation. Source: Netherlands Environmental Assessment Agency, 2012a.

are collaborating, envisages such expansions being possible again, but subject to strict conditions that have to guarantee the realisation of the above objectives.

3.2.6 Organisational and legal forms

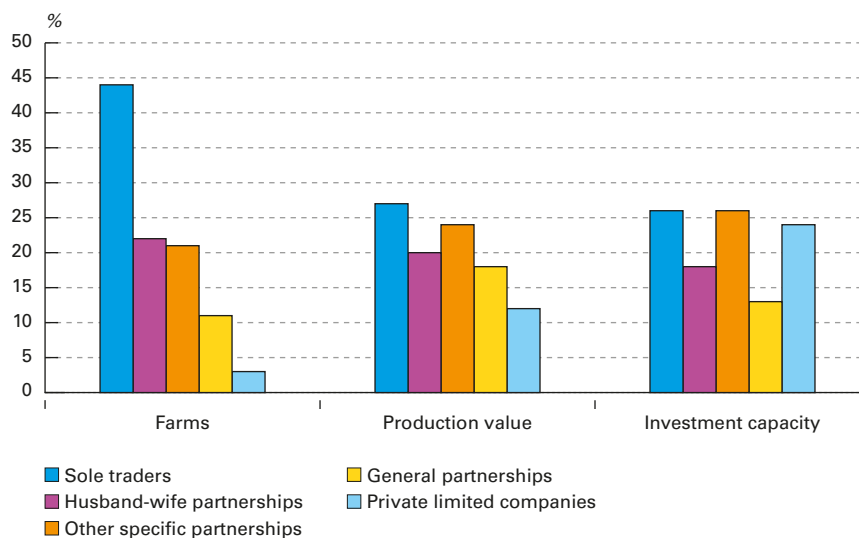
Earlier in this chapter, it emerged that the family farm has always been and still is the dominant business model in Dutch agriculture and horticulture. This model was seen as a type of business in which at least half the non-paid labour was provided by family members in the broad sense of the term (husband, wife, brothers, children, parents, sisters, brothers-in-law). Other descriptions are in use, such as the somewhat less clearly distinctive one from the Agricultural Economics Research Institute at Wageningen University and Research Centre: "A traditional family farm is an enterprise where almost all labour is provided by the entrepreneur and family members, and that is largely financed with private capital of the entrepreneur. Business decisions are made 'at the kitchen table' and the family and farm are interwoven."

Most Dutch family farms are sole traders or small partnerships. The traditional family farm has been in the family a long time and the preferred succession route is from parents to children. The definition of 'family farm' has gradually expanded. A farm with one or a few employees and a limited proportion of loan capital is now regarded as a family farm, as long as labour and capital are largely provided by the entrepreneur and his family, and business decisions are made 'at the kitchen table' (Backus et al., 2009).

In practice, a family farm is usually operated as a sole trader, but a partnership – between husband and wife, father and son, or between brothers – is also a common legal form. Although it is theoretically possible for a family farm to be operated as a private limited company, this legal form is hardly ever found with this type of enterprise. Private limited companies or general partnerships are almost always larger enterprises, as evidenced by the results of a study on the subject performed by the Agricultural Economics Research Institute (see Figure 34).

The private limited company, in particular, is a suitable form for farms requiring investments that are so high that it becomes attractive for the entrepreneurs to have only limited joint and several liability. In line with the distinction between family farms and quasi-industrial companies made in Chapter 4, the private limited company as a legal form is found mainly in the building-tied sectors and especially in greenhouse horticulture, which has by far the largest number of this type of enterprise. Intensive livestock farming also has extremely large farms and the occasional quasi-industrial company, and stands out for its relatively large number of private limited companies (see Table 7).

Even so, public as well as private limited companies have started to appear among the multifunctional farms, albeit to a lesser extent than in the agriculture and horticulture sector as a whole. This could indicate that farms of well-above-average size and possibly of a quasi-industrial nature are developing among multifunctional farms.

Figure 34: Legal forms

Percentage distribution of legal forms by number of farms, production value and investment capacity.
Source: Backus et al., 2009.

Table 7: Legal entities by farm type

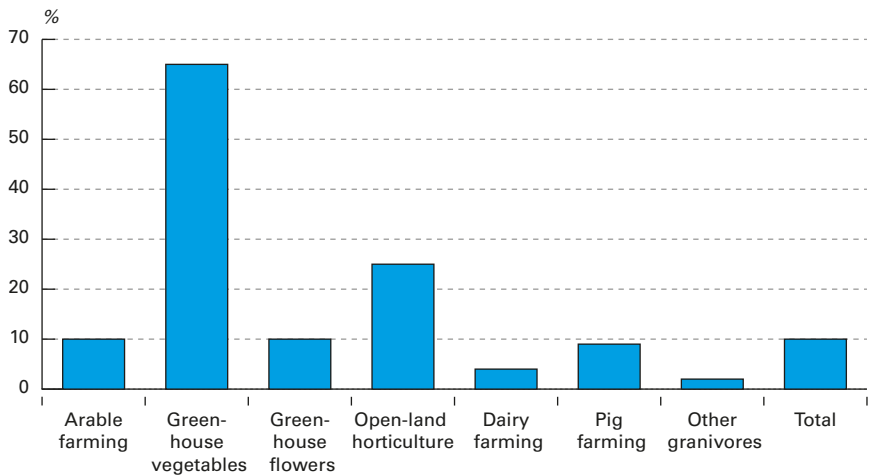
	Number of farms		Number of legal entities		Percentage of legal entities	
	All farms	Multifunctional farms	All farms	Multifunctional farms	All farms	Multifunctional farms
Arable farming	10.923	1.146	547	34	5	3
Dairy cattle	18.326	3.737	134	20	1	1
Other grazing livestock	18.797	2.361	677	116	4	5
Intensive	5.336	215	566	11	11	5
Other agriculture	7.402	999	348	51	5	5
Greenhouse horticulture	4.464	101	1.061	7	24	7
Other horticulture	7.760	745	794	31	10	4
Netherlands total	73.008	9.304	4.127	270	6	3

Numbers of (multifunctional) farms registered as legal entities (private or public limited company) by sub-sector. Source: Roest and Jager, 2011.

One way to achieve economies of scale in parts of the production process, or even in the entire process, is collaboration without having to relinquish the responsibility of an individual entrepreneur. Collaboration in the form of production cooperatives with farms as members is often suggested as a way to reduce the pressure on incomes in the sector. Yet in the primary sector, this legal form has never really taken off, apart from small-scale cooperatives for the use of harvester, or a small number of entrepreneurs jointly engaging contract workers. The Agricultural Economics Research Institute has found that entrepreneurs are increasingly opting for legal forms where arrangements are laid down in writing. Agricultural nature management is largely organised in the form of local nature associations, where farmers and citizens collaborate to promote and implement agricultural nature management. Around 10% of the country's farmers are involved and more than a hundred local associations are affiliated with the umbrella organisation Natuurlijk Platteland Nederland.

Collaboration in specific areas of production or marketing such as packaging, quality assurance, branding and sales is increasingly prevalent in growers' associations and producers' organisations. Some forms of advanced collaboration are very widespread in parts of the agriculture and horticulture sector. By way of illustration, growers' associations are particularly popular in horticulture and even dominant in greenhouse horticulture, as shown in Figure 35. Notable examples are TastyTom (tomatoes) and Purple Pride (aubergines), associations that successfully combine forces to market their own brands.

Figure 35: Collaboration among farms



Proportion of collaborating farms in total number of farms per farm type. Source: Backus et al., 2009.

3.2.7 Differences between subsectors

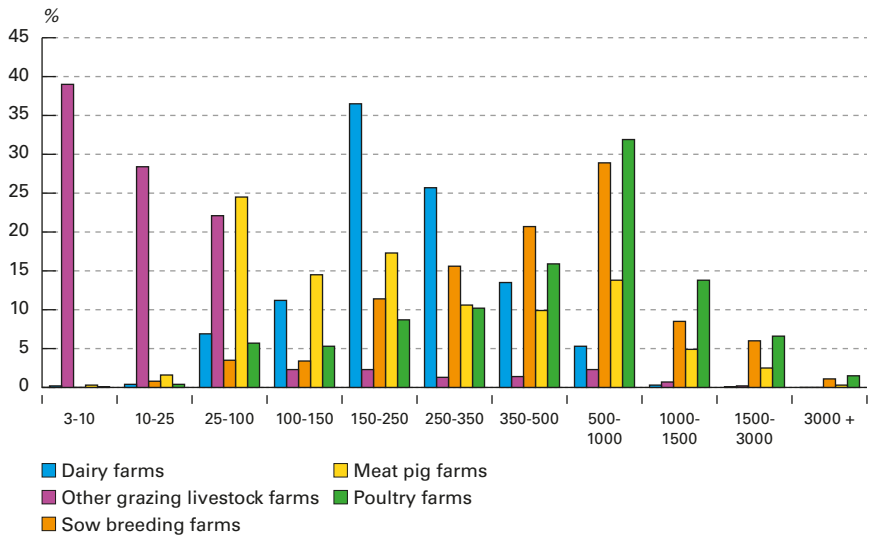
3.2.7.1 Family farms and quasi-industrial farms

The preceding sections have already brought to light significant differences between the sub-sectors in Dutch primary agriculture and horticulture. In some areas, the differences are so large that it is justified to ask whether we can still refer to one overarching agriculture and horticulture sector. This question is particularly relevant in the case of greenhouse horticulture. Its advocates also regularly raise the issue, which, for example, led in the first decade of the twenty-first century to the establishment of the Glaskracht association for greenhouse horticulture, and its subsequent temporary withdrawal from the sector-wide Dutch Federation of Agriculture and Horticulture (LTO Nederland). Farmers and market gardeners are generally grouped together as entrepreneurs. However, because of the much larger economic size of their businesses, investments and workforces (see section 3.1.2), entrepreneurship in greenhouse horticulture does mean something different than in other areas, particularly the land-based sectors.

The employer's role, conclusion of collective labour agreements, and the constant resurfacing of the employment of illegal aliens, are issues specific to the various horticulture sectors (including mushroom growing). In contrast, arable and dairy farmers hardly need to be concerned about such issues. Poultry farming, sow breeding and other intensive livestock farming sectors also exhibit distinctive characteristics compared to other livestock sectors.

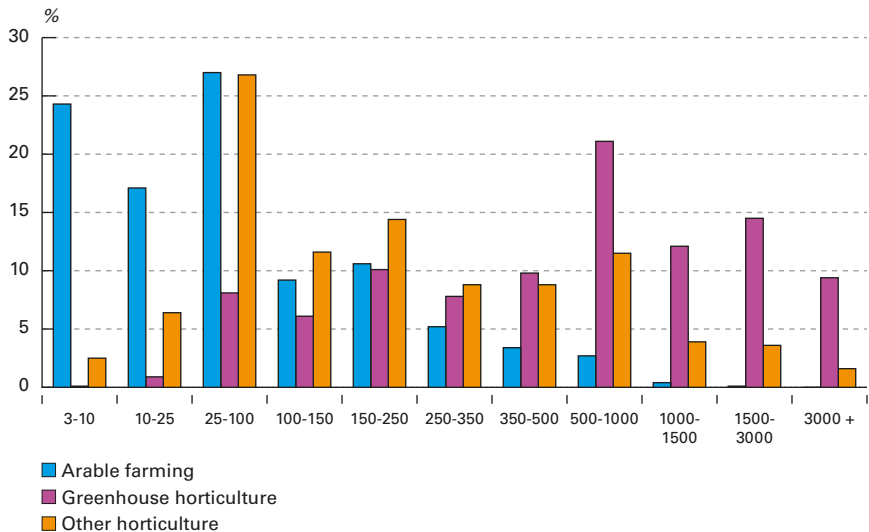
It can be broadly stated that in land-tied livestock farming and arable farming, the family farm (a farm using predominantly non-paid labour provided by family members) is by far the dominant business model. In greenhouse horticulture, flower-bulb cultivation and open-land horticulture, the majority of businesses have a workforce in which the proportion of paid outside labour is about the same or greater than that of family labour. Family businesses are still clearly in the majority in the intensive livestock farming sector. However, unlike the situation in arable farming and land-tied livestock farming, the aforementioned sector also provides scope for the development of farms that are much larger than the average family farm.

Figure 36: Economic size in livestock sectors



Percentage distribution of farms in livestock sectors by economic size, expressed in DSUs. Source: Agricultural Economics Research Institute / Statistics Netherlands, 2012.

Figure 37: Economic size in vegetable sectors



Percentage distribution of farms in vegetable sectors by economic size, expressed in DSUs. Source: Agricultural Economics Research Institute / Statistics Netherlands, 2012.

3.2.7.2 Differences in Dutch farm sizes

Figures 36 and 37 show that Dutch farms in the livestock sectors as well as the vegetable sectors are tending towards the average economic size. The category 'Other grazing livestock farms', which includes all farms with grazing livestock apart from dairy farms, stands out in particular because of the relatively small size of farm. Incidentally, this small size is caused in part by the fact that this category also includes many spare-time and downsizing farms with a small number of animals.

Above 100 DSU, the percentages quickly decrease.²¹ Around this level, the proportion of dairy farms begins to grow rapidly, and only at its peak, between 150 DSU and 350 DSU, does the percentage of poultry farms and sow breeding farms start to increase. The two latter farm types have their highest percentages in the category 500-1000 DSU, and fairly large percentages in the higher categories. Relatively speaking, meat pig farms are the most evenly distributed over the categories.

A similar difference in distribution by size can be seen in the vegetable sectors, where arable farms and to a lesser extent non-greenhouse horticultural enterprises are predominantly found in the lower categories, whereas the majority of the greenhouse horticultural enterprises are found in the categories above 350 DSU.

3.2.7.3 Land-tied and building-tied farms

The significance of these differences is discussed further in Chapter 4, where a distinction is drawn between farms that must expand their acreage to increase their scale of operations (land-tied farms) and those for which changes in scale translate primarily in terms of buildings (building-tied farms). Noteworthy in this connection is that upscaling beyond the average size of the family farm (i.e. more or less on an industrial scale) seems in the Netherlands to be limited to building-tied farms. Intermediate forms, where many seasonal workers are hired, also occur in open-field cultivation.

Greenhouse horticulture farms become more industrial in nature when factors such as workforce size, land use, non-land-tied cultivation, added value, lighting, energy consumption, legal form and location flexibility (the possibility of establishing one or more additional farms at other locations) are considered. Leaving aside energy consumption, the same considerations apply to the very large intensive livestock farms found mainly in the breeding sow and poultry sectors. Although the majority of these farms might still occupy a few hectares of land – just over half had five or more hectares in 2011 – this surface area is

²¹ The Dutch Size Unit (DSU) is an economic unit used by the Agricultural Economics Research Institute. It is based on the standard gross margin (i.e. revenue less certain specific costs) and allows for measurements and comparisons of the economic magnitude of various agricultural activities.

not generally in proportion to their feedstuff requirements or capacity to absorb manure. These farms, too, can therefore be considered as building-tied farms where production takes place on a very large scale on a very small area of land, and where the location is actually of secondary importance. This last point is reflected in the admittedly unsuccessful attempts to create areas of concentration in various provinces, and by the fact that politicians and policy-makers regularly raise the question as to whether the larger intensive livestock farms might not be better located on industrial sites than in rural areas.

3.2.7.4 Multifunctional farms

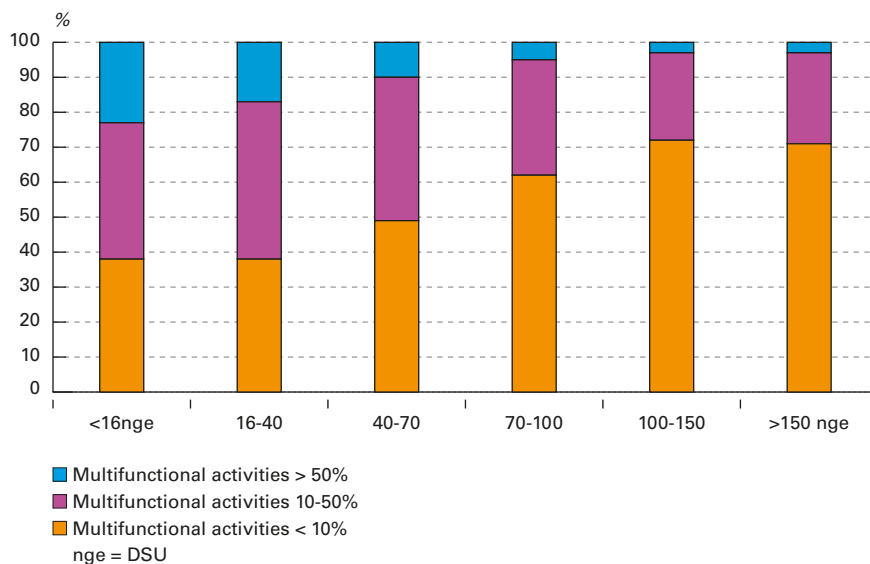
Differentiation may also be observed in the degree of activity specialisation in the chain. Since the 1990s, recreation, on-farm sales and other parts of a farm's operation that could be classified as supplementary activities (see also section 3.2.1) have increasingly been regarded as essential components of a new development model that is based specifically on the optimum use of all possibilities offered by a rural business. Agricultural or other types of nature management are also key elements in this model, which was initially referred to as an 'expanded business operation', but nowadays as a 'multifunctional farm' (see Table 8). Relatively new activities with a less direct link to the agricultural nature of the enterprise, such as childcare and care farming, are common on multifunctional farms. These activities are now widely accepted and widespread, and have even been promoted over the past four years by a special Task Force of the then Ministry of Economic Affairs, Agriculture and Innovation. According to the latest data compiled by this Task Force, 9300 multifunctional farms existed in 2009, broadly defined as farms that carry out one or more multifunctional activities (see also section 3.2.1). If the key activity of agricultural nature management is excluded, this number shrinks by slightly less than 50% to almost 4700 farms. Other data from the same Task Force (Roest and Jager, 2011) show that multifunctional farms, as defined above, differ only marginally in size, whereas their distribution over the sub-sectors is certainly very different from that of the non-multifunctional farms.

The fact that the size of multifunctional farms is close to the average of all Dutch farms seems to contradict the frequently heard claim that supplementary activities are found mainly on small farms. The supporting argument is that these activities are carried out by agricultural enterprises that are too small to provide a good income and/or lack the resources to increase the scale of operations by expanding the business. The share of a farm's total turnover attributable to multifunctional activities clearly decreases, however, as the farm grows in size (see Figure 38).

Table 8: Turnover of multifunctional farms

Sectors	Number of farms			Total turnover in millions of euros		
	2007	2009	2011	2007	2009	2011
Care farming	756	870	1.050	45	63	80
Childcare	20	64	209	4	14	20
On-farm sales	2.850	3.000	3.300	89	128	147
Nature management	13.700	13.660	14.000	90	79	86
Recreation	2.432	2.240	2.884	92	121	156
Education	500	500	800	1,5	1,7	2,2
Total				322	407	491

Numbers of multifunctional farms and turnover in millions of euros, by type of activity.
Source: Roest et al., 2010.

Figure 38: Multifunctionality and farm size

Distribution of multifunctional companies by share of multifunctional activities in turnover, per size class. Source: Roest and Jager, 2011.

Grazing livestock farms, followed by arable farms, clearly dominate the multi-functional segment. This dominance is not surprising, given the nature of the major activities in this segment. Although on-farm sales, nature management, childcare and providing accommodation can be combined with every type of farm, they seem more suitable to livestock farms in particular. Table 9 shows that large differences are found especially regarding accommodation. If we consider multifunctional agriculture as a whole, the contrast between the land-tied sectors and the building-tied sectors is particularly noticeable (see Figure 39).

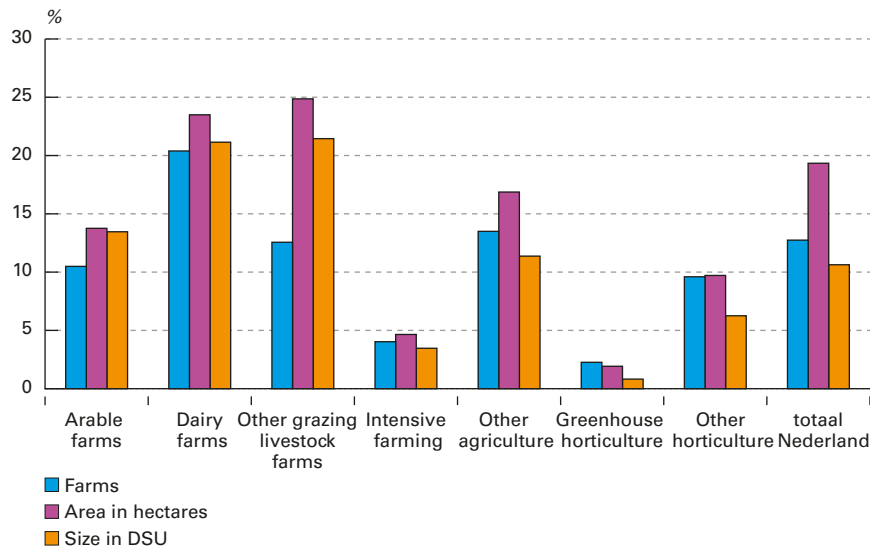
3.2.7.5 Public support

The above contrast is also reflected in the different levels of public support enjoyed by the sub-sectors. The available research data show that dairy farms at any rate are relatively well regarded by Dutch citizens, who mostly regard such farms as more traditional and smaller in scale, but also more modern than other livestock farms. These farms are also regarded as somewhat more environmentally friendly and animal-friendly, while the citizens polled believe that landscape management is a better fit with this business model than intensive livestock farming (TNS NIPO, 2005). This last point also applies to arable farms that are likewise seen as traditional, as well as export-oriented and modern. Although being labelled ‘traditional’ is not likely to be taken as a compliment within the sector, it probably helps rather than hurts the sector’s image in society. Dairy and other grazing livestock farms also top the list of farms offering accommodation, as Table 9 in section 3.2.7.4 shows. Trailing them at a distance in this table are arable farms. A similar picture emerges from a recent image survey that was conducted on behalf of the LTO magazine *NieuweOogst*. The results showed that dairy farming, food horticulture, arable farming and floriculture were the sectors most valued by the Dutch population, with ratings of 7.2 to 7.5. Following at some distance were sheep and goat farming, pig farming and poultry farming, with ratings between 6.5 and 6.8. The only sector to receive a failing score was fur farming, with a rating of 4.5 (Magris, 2012).

Table 9: Accommodation on farms

Arable farms	327
Grazing livestock farms	938
Intensive livestock farm	79
Mixed farms	191
Greenhouse horticulture	10
Open-land horticulture	125
Netherlands total	1670

Number of farms offering accommodation, by main farm type, 2005. Source: Oltmer et al., 2007

Figure 39: Share of multifunctional agriculture

Share of the number of farms, surface area and economic size of farm, by type.

Source: Roest and Jager, 2011.

The image of intensive livestock farming among the general public is clearly less positive than that of dairy farming, but still not negative on average (Lower House of the Dutch Parliament, 2007). For example, in 2007 six out of ten Dutch citizens believed that poultry farmers and pig farmers cared properly for their animals, while more than one in three categorised the care as 'poor' or 'rather poor'. Dairy farms are valued significantly higher. Nine out of ten citizens believe that farmers in this sector care properly for their animals.

Also revealing is the following passage from a report prepared by market research firm Veldkamp (Verhulst et al., 2011) for the public debate in 2011 on mega-farms: "The livestock farming sector invokes positive and as well as negative feelings. Positive associations relate to the visibility of animals in the landscape and the impression that people in the sector are hard-working. Negative associations often derive from the sector's industrial nature in the eyes of many citizens. Dairy farms enjoy the most positive image among the public. Respondents see the beneficial effects on the landscape, estimate the level of animal welfare as high, see few risks to public health, and regard dairy farming as a cornerstone of the Dutch economy. People are less positive about the Dutch pig farming and poultry farming sectors. While they have concerns about these sectors as regards animal welfare and the impact on the landscape, they are also aware that the sectors represent substantial economic value."

The widely shared reservations about intensive livestock farming have now led to almost all provinces in the Netherlands placing restrictions on the expansion of existing farms and the establishment of new farms in this sector.

Vegetable cultivation and floriculture receive higher scores than the other sectors in the area of environmental impact. In addition, vegetable cultivation is perceived as large-scale, competitive, export-oriented and modern. Greenhouse floriculture earns the additional distinctions of being regarded as 'innovative' and 'profitable'.

Although Dutch citizens in their role of consumer have confidence in greenhouse horticulture products, they are rather indifferent about the sector as a whole. Alongside confidence in the products and a relatively positive opinion on the sector's environmental impact, there are also negative images, especially regarding individual subjects such as operating processes, transport congestion, crop protection, employment of illegal workers, and energy consumption.

3.2.7.6 Energy

Finally, if we look at energy consumption (also see section 3.1.4), we see that the Dutch agri-food sector consumes substantial amounts of energy but generates only a small amount of renewable energy. However, the differences between greenhouse horticulture and all the other sub-sectors are so significant that it actually makes little sense to talk in a general sense about the energy consumed by the entire agriculture and horticulture sector. In 2009, all the sub-sectors excluding greenhouse horticulture accounted for a total of 18 petajoules, which was consumed by 70,000 enterprises. By contrast, greenhouse horticulture with just over five thousand enterprises consumed 122 petajoules. Total consumption in the greenhouse sector horticulture sector is roughly six times that of the arable farming, open-land horticulture and livestock farming sectors. Particularly in these three sectors, generation of renewable energy in the form of wind energy and biogas has already taken off to the extent that they now account for a substantial and rapidly growing share. Although greenhouse horticulture is certainly a leader in the use of energy-efficient cogeneration, renewable energy generation in this sub-sector is still in its infancy.

3.2.8 Conclusion

As the preceding sections made clear, the differences between the various primary agriculture and horticulture subsectors are so large that it is often difficult to draw reliable conclusions for the sector as a whole. Especially striking are the differences between greenhouse horticulture businesses and to some extent also the largest intensive livestock farms, and all other farms. These two categories are poles apart in the areas of employment, energy consumption, renewable energy, incomes and land use.

One notable difference is the emergence of very large farms in the land-tied sectors, where the share of paid outside labour exceeds that of family labour. In greenhouse horticulture, such farms constitute a substantial group. We can also see them emerge in intensive livestock farming, but upscaling in the land-tied sectors does not exceed the limits of the family farm. Because of their size alone, quasi-industrial farms are vulnerable to public criticism, with their building-tied character making this vulnerability even greater. The fact that these farms are building-tied contributes to doubts about the need to establish a farm on a particular spot rather than somewhere else, given the controversial impact on the surroundings.

Although there are major differences with respect to impact on the environment and landscape, it is clear that no sub-sector entirely escapes the conclusion that it has an impact, and that this is a major factor in assessing the outlook for the next few decades. The manure problem dominates the picture in the Dutch livestock farming sectors. In the case of intensive livestock farming, this is compounded by the landscape-related and ethical objections to large farms perceived as factories. In greenhouse horticulture, energy consumption and the related CO₂ emissions are the problems that stand out the most, although environmental and landscape impact is often the subject of debate as well. In land-tied open-land cultivation, the environmental impact of the crop protection products employed receives the most attention, along with the landscape effects of upscaling and specialisation.

Although the negative environmental impacts of various agricultural and horticultural sectors (due to drying out, overfertilisation, acidification, greenhouse gas emissions, effects of crop protection products) have been significantly reduced in recent years, they have certainly not been eliminated. There is still a way to go, and that way will not always be easy. This is because the final stage of such adjustment processes is generally more difficult and demands more effort than the first stage. Progress can definitely be achieved by using raw materials more efficiently. A similar conclusion can be drawn with respect to ecological values (see Figure 33), and the overall development of biodiversity both inside and outside the sector.

This is balanced by the fact that an innovative agricultural sector willing and able to change also offers many opportunities, particularly because of the sector's unique role as custodian of rural areas that the public increasingly regards and acknowledges as a source of important ecological and environmental values. Agricultural activity does not have a structurally negative impact on the use of space. Rather the reverse, because it is generally farms that have to make way for other users. Empty farm buildings and impoverishment are a recurring issue in areas with a declining population. Aside from effects perceived as questionable or threatening, agriculture and horticulture also play a creative and preserving role in the survival of 67% of all open landscapes in the Netherlands. This does not alter the fact, however, that competition for space in a densely populated country like the Netherlands is becoming increasingly intense, and that all kinds of social aims and values are emerging that may require agricultural land for their fulfilment. Whereas contradictions may be observed between agricultural and various socially defined purposes, it is equally true that these new purposes also offer new opportunities for innovative entrepreneurs.

THREE BUSINESS MODELS

4

Society's pursuit of sustainability is now itself a sustainable phenomenon, as became increasingly clear towards the end of Chapter 2. Sustainable development has become increasingly rooted in government policy, corporate strategy and consumer behaviour. Government policy on sustainability also supports the trend towards larger farms. Compulsory investments in fertiliser injection equipment on dairy farms (via contractors or otherwise) or in air scrubbers in the intensive livestock farming sector do not result in additional revenue, but incur higher costs that have to be recouped.

Farms that want to stay in business will have to meet these sustainability requirements one way or another, and many are already making efforts to achieve this goal. They do not all adopt the same approach, however. Three business models can be distinguished, depending on a number of factors, a key one being whether an enterprise is soil-tied or building-tied. Each model offers its own perspective for the future under the new conditions of sustainability and social acceptance.

Farms that have gone far along the path of upscaling are not able to reverse this process. These farms market their products to consumers outside their towns or regions, in some cases through cooperatives. They produce for the chain, and commit to the quality requirements laid down by the chain. This applies equally to large-scale family farms in the arable farming and dairy farming sectors, as it does to greenhouse horticulture enterprises or intensive livestock farms with more or fewer employees. On-farm potato sales or a crèche at a sizeable livestock farm are of course certainly conceivable and also found in practice, but such activities will generally not hinder a farm from increasing the scale of its agricultural production. In this group, farms seeking to secure their future by means of upscaling fall into one of two categories: the specialised rural farm and the quasi-industrial farm. Both types, which are discussed in the sections below, will increasingly have to align with the sustainability requirements imposed by society. Irrespective of the differences between their business models, they will necessarily have to carry out this realignment using the same technological approach, even though innovation is increasingly based on collaboration with stakeholders rather than the closed world of laboratories and research departments. The third business model largely, though not exclusively encompasses farms that are unwilling or unable to increase the scale of their business to the same level. This type is referred to below as the 'urban-oriented farm'.

4.1 Specialised rural farms

In the soil-tied sectors, a group to which most Dutch farms can be assigned, and in intensive livestock farming, the family farm remains the dominant business model despite all the increases in scale. Because of this upscaling and the aim of staking as much as possible on a specialism with strong market potential, we refer to these farms as 'specialised rural farms'. Within the proportions of this type of farm, entrepreneurs continue to aim for increases in scale and forms of sustainability compatible with this upscaling. This means high-tech solutions will be chosen in order to pursue continuing sustainable development (see footnote 1 in section 1.1 of Part 2). In turn, these high-tech solutions entail costs for the producer that cannot always be recouped on the market, partly because the solutions cannot be translated into product features recognisable to the market, and partly because consumers will not pay more, or will only pay more for a short time. These costs in their turn will also exert influence in the direction of larger-scale production because they have to be recouped. In the soil-tied sectors, the pursuit of sustainability mainly translates into a series of technical measures underpinned by research into animal welfare, animal health, the environment, working conditions and traceability. These measures make the products more acceptable to distant, anonymous markets, but do not satisfy the regionally oriented consumers' need for transparency and a small scale. This need is being satisfied by the products of many diversified or urban-oriented farms (see section 4.3) that try to realise continuing sustainable development through closer alignment with nature and biodiversity, and by integrating more stages of production on a single farm.

4.2 Quasi-industrial farms

Among the farms furthest advanced in large-scale operations and orientation towards anonymous global markets, those in the building-tied sectors also include the type of farm that grows beyond the proportions of the family farm by taking an industrial approach and is able to continue the upscaling process using outside labour and loan capital. Irrespective of its proximity to other parts of the chain, the large scale of such a 'quasi-industrial' farm makes it even better equipped than a specialised family farm to be integrated into biobased processes and take a technological approach to finding solutions to enhance human and animal health and welfare.

Greenhouse horticulture offers a good example of this high-tech sustainability, with working conditions, environmentally friendly production, and energy saving and recovery already highly advanced. This sector also devotes considerable attention to consumer relations in the form of brand policy and special products (traceable or otherwise), and always reaches far beyond marketing at the town or regional level. Greenhouse horticulture does not appear to offer scope for

small-scale cycles and a local-for-local approach involving local consumers and mixed activities that make use of the livestock concerned to take care of waste products from other parts of the chain. The same applies to intensive livestock farming, the other building-tied sector where we find this type of quasi-industrial farm. Production in this sector is on too large a scale and too concentrated in relation to the number of potential consumers in the vicinity. In addition, the technology used to achieve sustainability and closed cycles is also different.

4.3 Urban-oriented farms

There is also a third alternative, however, which seems to be an option mainly for family farms. These are predominantly farms that are less oriented towards the national or international chains for their sales, and more towards their own surrounding, whether it be town, region, or especially city. These farms are mainly oriented towards the city, because this is where the greatest interest lies in this type of farm, also referred to as a 'multifunctional' or 'extended' farm.

These farms may focus on higher margins and/or more turnover by taking on processing or sales, or by engaging in additional activities which are often regionally oriented. They can also be farms that are more or less forced into this category because they are too small and lack expansion opportunities. Such multifunctional farms can still continue to develop by taking on agricultural nature management, sales of local products, making farm cheese, or activities in the areas of childcare, care farming and/or recreation in a variety of combinations. Such 'sidelines' actually harmonise well with the aforementioned existing supplementary activities, such as storage of caravans and boarding of horses, contract work, and wind-energy generation, which are not always considered obviously 'multifunctional'. According to some definitions (Van der Ploeg & Frouws, 1990), a farm is also multifunctional if part of the available family labour is deployed on non-agricultural activities. As a result, the involvement in the local community generally becomes greater and the agricultural components of the multifunctional farm decrease in importance. In any case, the additional sources of income reduces the need to invest in upscaling, and this is the aspect shared with supplementary activities more closely linked to primary production.

Most of these multifunctional variants have a strong regional character and address the interests of citizens. As such, farms that develop according to this model most closely resemble the local-for-local model that has captured the attention of the media and part of the urban population. The 'three Ps' and the application of technology are on a smaller scale in this context and thus meet the expectations of a different, more nearby and more demanding subgroup of consumers who focus on sustainability. At the same time, this subgroup is willing and able to spend more on products that possess the characteristics they expect. The resulting higher margins partly offset the small scale of operations, and thus improve the prospects for this type of farm.

4.4 Occurrence of the three business models

Of the three distinct business models described above, the most common in all subsectors is the specialised rural farm. Greenhouse horticulture has the largest number of enterprises that have evolved into quasi-industrial farms. The latter type is therefore dominant in greenhouse horticulture, although the extent of this dominance depends on the limits chosen to distinguish specialised rural farms from quasi-industrial farms. This applies to an even greater extent to intensive livestock farming, where many farms have grown to become very extensive within the proportions of the family farm. In addition, there are now also some very large farms where non-family labour and capital represent significant shares of their respective totals, although their share in the sector remains small in terms of absolute numbers. In the soil-tied sectors of arable farming and livestock farming, the share of non-family labour and capital is close to zero. On these farms, whether small or large, virtually all the work is performed by family members, occasionally supplemented by one or two paid employees. Although loan capital is now fully accepted, its share at these farms rarely exceeds that of family capital. Accordingly, these sectors include almost no quasi-industrial farms, if any. Borderline cases exist in the areas of open-land cultivation, such as specialised open-land vegetable cultivation, flower bulb cultivation and arboriculture. Production in these sub-sectors is often on a large scale, employing a considerable amount of outside labour. However, this labour is generally provided by seasonal workers, who are only on the payroll for a relatively short time. All things considered, such farms should be classified as specialised family farms rather than as quasi-industrial farms.

Urban-oriented farms can theoretically engage in any type of farming, and this does occur in practice. Yet there are clear differences in the extent to which such farms are present in the various subsectors, as already described in section 3.2.7.4. The dividing line in this case mainly separates the soil-tied from the building-tied sectors. Farms in the building-tied sectors conform less to the picture that city dwellers and non-agrarians have of a 'typical farm', due to their intensive practices, their size, and for those engaged in livestock farming, their mostly closed character for reasons of hygiene. Combinations with nature management, recreation and, again in the case of livestock farming, on-farm product sales is also difficult to realise in practice. Exactly the reverse is true, however, for soil-tied sectors. Hence, by far the largest number of urban-oriented farms can be found in soil-tied sectors (see Figure 40).

Figure 40: Business models

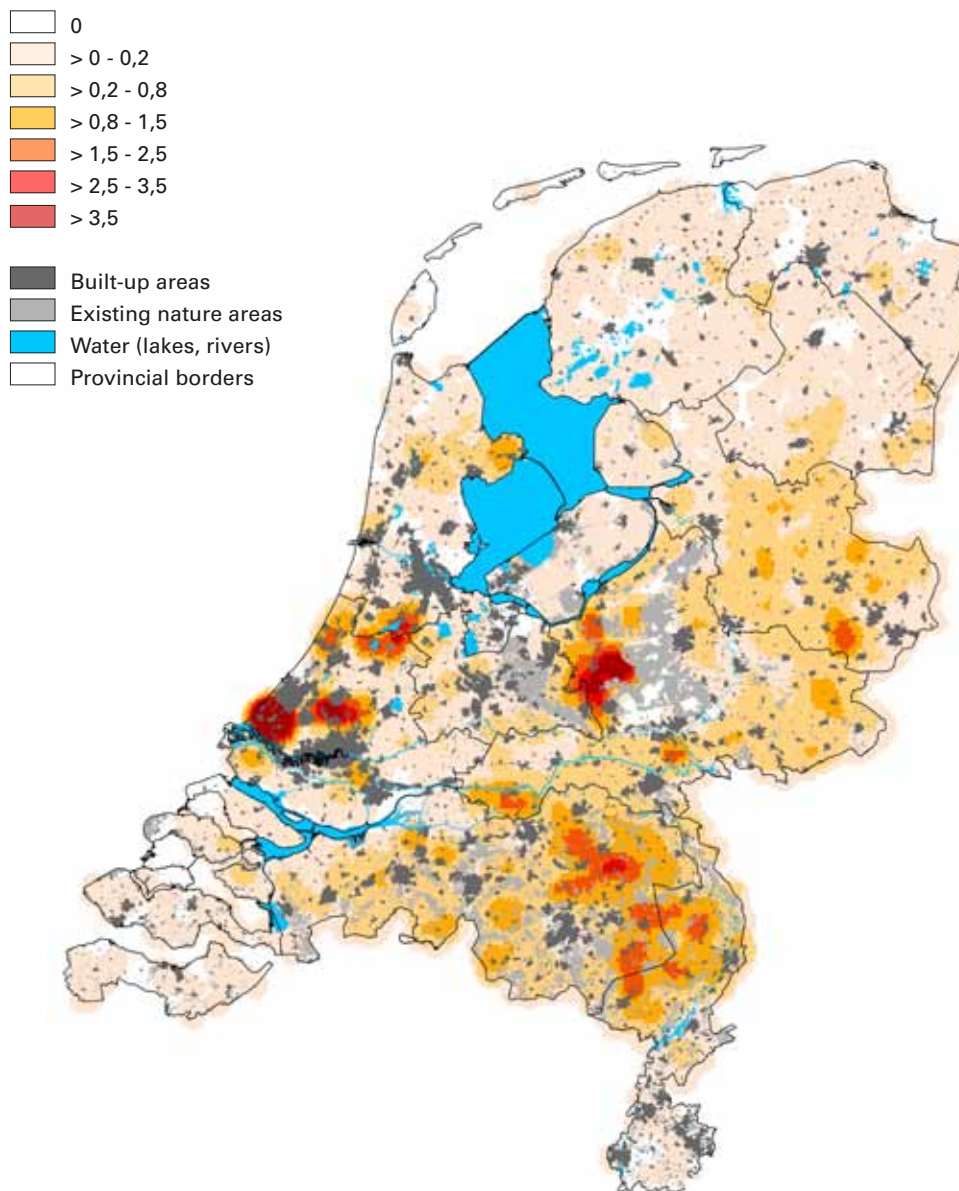
Soil-tied sectors	Cattle farming	Specialised rural farms
		Urban-oriented farms
	Arable farming	Specialised rural farms
		Urban-oriented farms
	Open-land cultivation	Specialised rural farms
		Urban-oriented farms
Building-tied sectors	Greenhouse horticulture	Specialised rural farms
		Urban-oriented farms
		Quasi-industrial farms
	Intensive livestock farming	Specialised rural farms
		Urban-oriented farms
		Quasi-industrial farms

Occurrence of different business models by sector.

Quasi-industrial farms and urban-oriented farms deviate somewhat from the standard as regards development, and are mostly found where they should be expected based on their historical background (see Figures 41 and 42). Very large quasi-industrial enterprises in the intensive livestock farming sector are found in regions where such farms are historically concentrated, such as the eastern part of Brabant province, the northern part of Limburg province, and the western part of the Veluwe region. In the case of greenhouse horticulture, they are the traditional concentration areas: Westland, Oostland, Aalsmeer and to a lesser degree the northern part of North Holland province, and the northern part of Limburg province.

Figure 41: Density of building-tied farms (per km²)

Total (12.432)



Numbers of building-tied farms (n = 12,432) per square kilometre in the Netherlands in 2010, livestock and vegetable cultivation farms. Source: Alterra, Wageningen University and Research Centre, H. Naeff, T. Hermans, 2012.

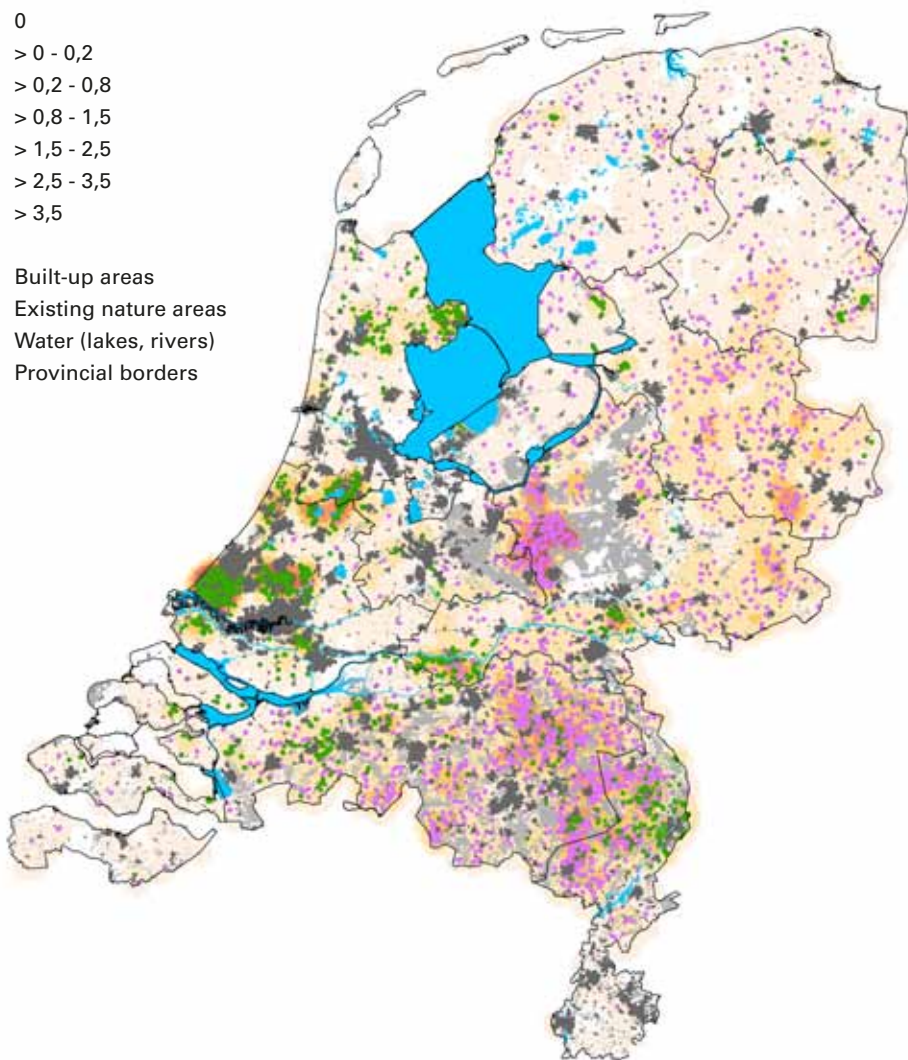
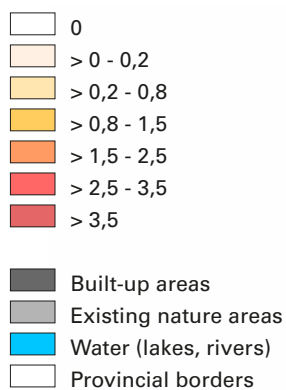
Figure 42: Density of large building-tied farms (per km²)

Total (12.432)

Groot Bedrijf (\Rightarrow 750 kSO)

● Vegetable (1.937)

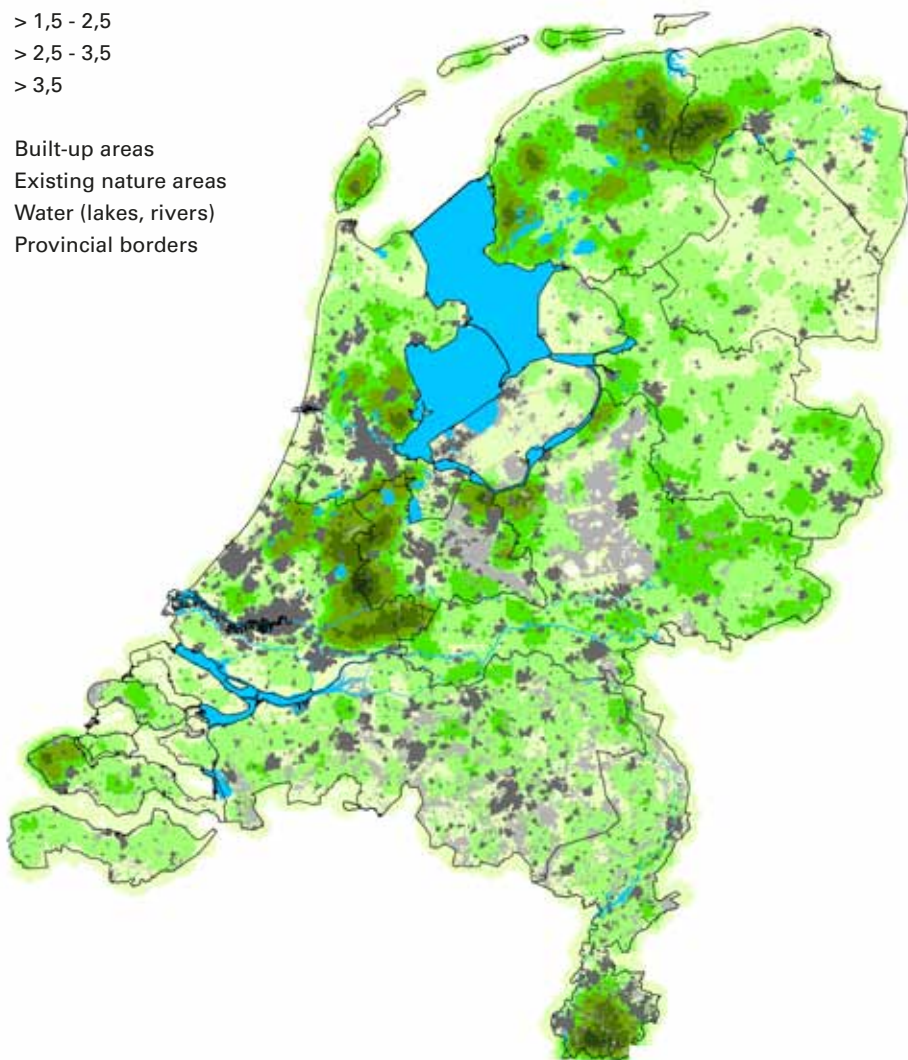
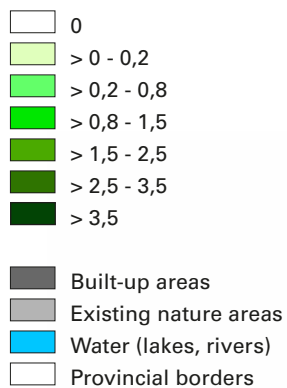
● Livestock (1.800)



Dot map of the distribution of large building-tied farms (Standard Output in excess of EUR 750,000, $n = 3,737$) in the Netherlands in 2010, livestock and vegetable cultivation farms. Source: Alterra, Wageningen University and Research Centre, H. Naeff, T. Hermans, 2012.

Figure 43: Density of multifunctional farms (per km²)

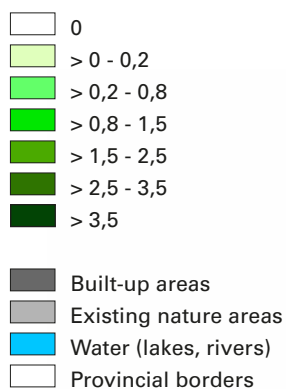
Total (14.041)



Number of multifunctional farms (n = 14,041) per square kilometre in the Netherlands in 2010.
 Source: Alterra, Wageningen University and Research Centre, H. Naeff, T. Hermans, 2012.

Figure 44: Density of multifunctional farms not engaging in nature management (per km²)

Other activities (4.740)



Number of multifunctional farms ($n = 4,740$) not predominantly involved in agricultural nature management, per square kilometre in the Netherlands in 2010. Source: Alterra, Wageningen University and Research Centre, H. Naeff, T. Hermans, 2012.

It is striking that the largest number of multifunctional farms (see Figure 43) are found in the traditional livestock farming regions where operational conditions are not particularly favourable for large-scale farm development: peatland areas in the provinces of Utrecht, South Holland and North Holland, the north-eastern part of Fryslân province and the south-western part of Groningen province. The percentages of multifunctional and urban-oriented farms are high on Walcheren, which has a long tradition of camping on farms, and in the southern part of Limburg province.

These are not surprising data, of course, but they do show where bottlenecks can occur in the future. This applies especially to intensive livestock farming, which in recent years has had to contend with opposition, specifically in rural areas, against investments in farms that greatly exceed the size of the specialised rural farm (Ministry of Economic Affairs, Agriculture & Innovation, 2011). Partly because of current spatial planning policy, such farms have so far been established precisely where many intensive livestock farms already exist, and not, for example, on industrial sites that might be more suitable in terms of logistics and scale.

A similar conclusion holds for multifunctional farms, which appear mostly to develop in areas where operational conditions offer little scope for increasing the scale of primary production – but not necessarily close to cities, where the demand for multifunctional services is greatest.

Besides the operational conditions, the presence of ‘consumable’ agricultural nature is a key explanation for the concentration of multifunctional farms. According to Table 8 in section 3.2.7.4, over 60% of such farms are active in the field of agricultural nature management. Figure 44 thus shows that the above-mentioned regional concentration disappears if we consider multifunctional agriculture without nature management. However, Figure 44 also shows that there is no clear concentration of the other urban-oriented farms around cities. For the time being, city dwellers will have to go to the countryside to satisfy their demand for rural culture and rural products.

This is not a problem in the case of agricultural nature and recreation, but a large distance from urban centres could hinder the development of other multifunctional activities such as on-farm sales and childcare.

4.5 Sustainability challenges for the three business models

Each of the three business models has its own strengths and weaknesses regarding sustainability, and hence its own challenges. They are in a sense a reflection of different paths for attaining a higher level of sustainability, each path with its own restrictions.

4.5.1 Challenges for specialised rural farms

The strengths of the specialised rural farm are mainly along the economic and social dimensions of sustainability. This type of farm generally has a good reputation among local residents and enjoys substantial respect in the community. As these farms are generally run as a family business or along the lines of a comparable business model, by a hardworking couple usually with children, the large-scale aspects of such farms still retain the human dimension to which the public attaches so much importance. Although farms go out of business every year, often due to a lack of economic prospects, this business model is still relatively sustainable in economic terms, precisely because the family farm enjoys a high level of economic resilience compared with other business models. Due to the large share of family labour and family capital which does not always need to be remunerated in line with market rates, this business model can withstand worse setbacks and has greater resilience than, for example, private or public limited companies, which are more common among quasi-industrial farms (also see section 3.5).

A typical specialised rural farm in the north of the Netherlands

- Family: father (44), mother (44), son (15), daughter (12), father-in-law (76)
 - External labour: evening milker, works four evenings a week
 - Quota: 1,165,000 kilos of milk
 - Land use: 56 hectares of grassland, 11 hectares of maize, 2.5 hectares of other uses
 - Number of cows: 133
 - Number of cows with four or more lactations: 65
 - Number of heifers: 60
 - Annual production per cow: 8,691 kg of milk with 4.62% fat and 3.64% protein
 - Lifetime production per cow: 46,833 kg of milk
 - Number of cows that have given more than 100,000 kg of milk: 4
 - Number of cows that have reached an annual production of 10,000 kg of milk: 1
 - Percentage removed: 15
 - Tank cell count: 80,000 cells/ml
 - Calving interval: 399 days
 - Spacious, airy shed with water beds and straw pens ensures the cows live longer
 - Lots of grazing
 - 'Consuming as little energy as possible to produce as much milk as possible'
 - Farm is open to visitors²²
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²² Data taken from *Veeteelt Magazine*, January 1/2 2012, www.veeteelt.nl/node/55808.

In the pursuit of sustainable production methods, the weak spot of the specialised rural farm seems to be mostly in the area of ecology. As a consequence of the often soil-tied character of these farms, considerable pressure is placed on the resilience of soil, groundwater and surface water, since they absorb most of the fertilisers, boosters and supplements that are not absorbed by crops. This applies to crop protection products as well as fertilisers (both natural and chemical), which caused the nitrogen surplus and phosphate saturation now prevalent in large areas of cultivated land in the Netherlands. Although the use of fertilisers and crop protection products has been reduced considerably over the past 20 years, not to mention the many advances in the field of spraying technology, these products will probably remain necessary on this type of farm and therefore continue to demand attention.

In addition, aiming for the most efficient production possible within the limitations of this type of rural farm places constant pressure on the surrounding landscape and local biodiversity. The effect of this pressure can be reduced by means of grants, arrangements for landscape maintenance and other measures, but the pressure itself will not easily disappear. Specialised rural farms simply depend for their economic survival largely on technological solutions that utilise increases of scale, and that partly have to be financed from such increases. A further limitation compared to quasi-industrial farms is that the scale of specialised rural farms, their integration in the landscape, and their financial resilience often stand in the way of the solutions implemented by quasi-industrial farms: physical linking to other production stages in the chain and large-scale technological solutions to close the chain in a sustainable manner. The search for innovative applications, technologies and business models (possibly as a collaborative effort to overcome scale limitations) that permit sustainable production methods on the scale of the specialised rural farm will therefore remain a major challenge for farms using this business model.

4.5.2 Challenges for quasi-industrial farms

Thanks to their scale and greater financial resilience, quasi-industrial farms in principle have the potential and are in a position to invest on the ecological front in large-scale resources for closing the raw-materials chain in an economically responsible way. Such resources may include on-farm heating systems or the use of solar energy by horticultural enterprises, manure processing in a biogas plant on the property, or combining different stages of the production chain at one location, such as the production of piglets, fattening of meat pigs, and slaughtering. Farms with very large numbers of animals are generally better able to prevent and control diseases (Leenstra et al., 2010), and to implement measures that prevent the spreading of diseases to humans, especially in the case of combined breeding and keeping of meat pigs.

In greenhouse horticulture, measures relating to the recycling of substrate, closed systems, biological pest control, and reduction of light emissions are already

widely applied. This sector has also made substantial progress in the 'People' dimension of sustainability, including good working conditions for large numbers of employees. Here, too, it is often the very largest farms that more readily find the financial resources for major investments in heat storage, external heat and CO₂ supply (often in collaboration with groups of other farms) and other high-tech applications in the areas of environmental protection, energy saving, and reduction of the ecological footprint. Logically, such farms also more readily and more easily bear the costs of responsible and modern human resources management.

Although the sustainability conditions for a quasi-industrial farm are favourable from an ecological and economic standpoint thanks to high-tech solutions, scale and financial resilience, this business model has a weakness on the People dimension.

A large scale is difficult to combine with precisely those factors that often ensure public sympathy: transparent relationships, family labour, proximity to nature, traditional production methods. Moreover, this large scale itself is often the cause of increasing controversy surrounding individual and government positions on landscape integration, odour nuisance, visual pollution, light pollution, traffic nuisance, animal welfare and public health. Accordingly, there are more points of criticism relating to these farms and less tolerance from society. This double-edged sword of greater criticism and less tolerance may be illustrated by the protests against intensive livestock farms perceived as excessively large. Issues of animal welfare, public health and odour nuisance often play a role in these

A typical quasi-industrial intensive livestock farm in the south of the Netherlands

- Number of employees: 35
 - 4,500 breeding sows, capacity for 20,000 meat pigs
 - 65,000 meat pigs sent to the slaughterhouse in conformity with 'Beter Leven' animal welfare quality mark
 - 100,000 piglets of 25 kg sent to pig farms each year
 - Biogas plant running on pig manure and food residues produces sufficient electricity for 3000 households, with a carbon footprint that is 30% below average
 - 95% of feedstuff derived from food industry by-products unfit for human consumption
 - Antibiotic usage reduced by 60% in three years through strict hygiene
 - Air scrubbers in the sties²³
-

²³ Data taken from the 'Food & Agri High Tech Tour' at www.hightechtour.com/nl and from www.houbensteyngroep.nl

protests as well, even though the largest farms generally have these factors under control to the same extent as average-sized (specialised rural) farms. In some cases, extremely large farms even perform better in this respect than average-sized farms.

In the greenhouse horticulture sector, the largest enterprises are not criticised by society to a significantly larger extent than smaller enterprises on issues such as light pollution, damage to the landscape, or the employment of illegal aliens. In case of the latter issue, the reverse is more likely to be true, as smaller enterprises are generally criticised more for the employment of illegal aliens than larger ones. However, larger enterprises can certainly suffer from a lower level of

A typical urban-oriented fruit farm in the west of the Netherlands

- 18 hectares of orchards
 - Predominantly dwarf apple trees, also pear, plum and cherry trees, standard-tree orchard planted in 1996
 - Production is entirely biological and in conformity with EKO labelling requirements
 - Apple varieties: Alkmene, Rode Boskoop (Goudreinette), Cox's Orange, Elstar, Jonagored, Jonagold, with recently planted varieties including Santana, (Rode)Topaz (Evita), Dalinco, Rubinola, Autento and Collina
 - Pear varieties include Conference, Doyenné du Comice, Triomphe de Vienne, Beurré Alexander Lucas, Doyenné du Comice Bronzée and various cooking pear varieties
 - Fruit picking by the public is the most important sales channel, in the form of free access and a variety of arrangements
 - It is also possible to adopt an apple tree or give one as a present
 - There is a farm shop with products from the farm itself and other traditional businesses in the area. The shop also functions as a natural-food store for a large area
 - Activities are organised for visitors, including cycling on and around the farm, Halloween events, children's parties, walks, art on the farm, guided tours, workshops and a nature hunt
 - Artists and other artisan businesses enlarge the range of products
 - There are several rooms that can be rented (capacity from 12 to 200 people), such as a period room, the Apple Room, the Forest House, and even a complete farm. These rentals are targeted at the business market (meetings, training courses, seminars) as well as the private market (functions, parties and weddings)²⁴
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²⁴ These data concern Landgoed De Olmenhorst, see www.olmenhorst.nl.

social goodwill. An enterprise with dozens of employees and a large parking lot in front will not easily be able to elicit public sympathy on account of its 'traditional production methods' in the event of an imminent conflict with the local community. However, such a distinction between larger and smaller enterprises does apply in the intensive livestock farming sector, as illustrated by the debate on the size of farm plots. Those aspects that enable quasi-industrial intensive livestock farms to take the lead in animal health and prevention of zoonoses are precisely the ones that count to their disadvantage when it comes to public appreciation. Such farms are often closed to the public for reasons of hygiene, and thus acquire an air of secrecy that results in a loss of public support. Quasi-industrial farms therefore face a major challenge in gaining public support by demonstrating transparency and implementing innovations and improvements that resolve these social issues.

4.5.3 Challenges for urban-oriented farms

The aspect of openness together with the resulting public support is one of the strengths of an urban-oriented farm. Allowing and encouraging visitors to learn about the farm and its operations is an integral part of the business model, whether the farm includes a campsite, offers (child)care facilities, sells products or offers bed and breakfast accommodation. It should be noted that these considerations apply to a lesser extent to farms engaged in agricultural nature management.

The 'People' dimension is therefore by far the strongest aspect of many urban-oriented farms, insofar as this dimension is interpreted to mean that a farm enjoys public support. Many of these farms are ecological or biological, specifically with visitors and sales to non-farmers in mind, and are often seen to be involved in more than one line of production or link in the production chain. Some examples of this are cultivation of fodder beets for livestock, rearing of calves, and on-farm processing of raw milk on dairy farms or fruit processing on fruit farms. Because of their smaller average size and focus on the interests of city dwellers and local residents, the integration of these farms in the landscape and natural environment will result in fewer problems than for either specialised rural farms or quasi-industrial farms. A similar line of reasoning applies to animal welfare, which on these community-minded farms will always be perceived as better than on larger farms offering less public access.

Although urban-oriented farms certainly achieve high scores on the People and Planet dimensions of sustainability, this does not apply to the Profit dimension. Although both small and larger farms can be multifunctional (which in this report has the same meaning as 'urban-oriented'), Figure 38 in section 3.2.7.4 already showed that multifunctional activities account for over 20% of turnover only on farms smaller than 16 DSU. Conversely, farms of 100 DSU and above on average generate less than 5% of their turnover from multifunctional activities. This means that farms relying on multifunctional activities for a substantial

portion of their incomes will generally be the smaller farms. According to land price researcher Jan Luijt of the Agricultural Economics Research Institute, these are often farms with an uncertain outlook owing to expected urban expansion and the farm's size, and that can stay in business longer when supported by a broader range of activities (Luijt & Voskuilen, 2011). This broader range of activity is a way of temporarily compensating the limited potential for increasing the scale of operations, owing to lack of space and investment capital. At the same time, however, this hides the fact that the 'size gap' is becoming larger resulting in reduced agricultural prospects. Agriculture and horticulture organisations frequently cite this point as an argument against too much dependence on agricultural nature management if this activity cannot be guaranteed for a very long period. A farm puts its development wholly or partly on hold in order to engage in nature management, but if the associated financial compensation should cease at any time, the gap in terms of scale and modernity has become so great that it would wipe out any prospects for the farm.

This threat to economic resilience is further reinforced because some weaknesses of specialised rural farms are also present in urban-oriented ones. Like specialised rural farms, most urban-oriented farms are soil-tied and will therefore encounter the same challenges as regards leaching of pesticides and nutrient surpluses. If solutions cannot be combined with an increase in scale, they place an additional burden on the financial resources of urban-oriented farms, perhaps even more so than for specialised rural farms. However, it should be noted that research on multifunctional farms disputes that these farms face an uncertain future. In their research on multifunctional agriculture, Seuneke and Lans (2011) state that "multifunctional agriculture is not for farmers going out of business, but for entrepreneurs who invest heavily in the future." The same publication quotes Herman Wijffels, a former Chairman of Rabobank and Professor of Sustainability and Social Change at Utrecht University, as voicing the assurance that "multifunctional agriculture serves as role model for the twenty-first-century economy" (Seuneke and Lans, 2011).

CURRENT AND FUTURE DEVELOPMENTS

5

5.1 More stringent demands imposed by society

Consumers and users are paying more attention to the way farmers and market gardeners conduct their business and produce their products. When it comes to the purchase of products, demands are becoming increasingly specific and more concerned with sustainability: health, animal welfare, 'natural' character of the product, and protection of the environment. The citizens' viewpoint leads to more than just different products in the stores, however. Its effect extends to the Dutch countryside, which is now home to many more people with a non-agricultural background. Greater numbers of people have an opinion about the organisation and management of the countryside, including issues such as water levels, the cultivation of maize, and turning pasture soil over for flower bulb cultivation. This is reflected in demands that apply not only to products, but also to business operations. Some demands are enacted as laws and regulations (e.g. legislation concerning manure or crop protection), while in other areas they are reflected in covenants or requirements for the processing industry (e.g. cows in the pasture, environmental covenant concluded by the greenhouse horticulture sector), or in licensing policy applying to large farms and farm buildings. Society's demands also form the basis of voluntary initiatives or partnerships of primary producers (e.g. organic farming, 'Zeeuwse Vlegel' wholemeal bread, 'Beter Leven' animal welfare label). The related control issues that arise form the subject of extensive debate (Scientific Council for Government Policy, 2012; Hajer, 2011). Assuming the perspective of citizens and increasing the opportunities for public involvement are the main challenges in this context.

5.2 Care for common goods

There is increasing support both within and outside the agriculture and horticulture sector for the notion that the natural elements of agricultural production actually represent a common good. The use of air, water, livestock and land for economic purposes has implications that extend far beyond the accounting ledgers of farmers. The relationship between agriculture, on the one hand, and the landscape, the environment, biodiversity and nature, on the other, is being rediscovered. This relationship is being 'reintegrated' into agricultural production, in various forms and at different speeds. This process is playing out along the axes of 'mandatory vs. voluntary', and 'collective vs.

individual'. Agricultural interests conflict with other interests such as those of nature conservation or of citizens in the case of odour nuisance, with disputes sometimes even reaching the courts. Whereas farmers used to protest against being assigned a role as 'nature managers', they now incorporate nature in their business model, partly motivated by national and EU legislation (KPMG, 2012b). This motivating factor will only increase in importance in light of the environmental protection measures in the European Commission's legislative proposals, which will be ruled on in 2013.

5.3 Food becoming part of lifestyles

Food is becoming a part of people's lifestyle, and as such it is a focal point for the public debate on the sustainable development of agriculture and horticulture. Food is prominent in consumers' minds, and lends itself to the formulation of quality requirements relating to products and production methods. The relationship between food and health further accelerates this process. The links between food quality and topical health problems such as obesity are frequently discussed in the public and scientific debate. The castration of piglets, use of chicken breeds not able to live longer than the six weeks during which they are fattened for slaughter, the conditions under which chickens and pigs are kept, the use of crop protection products, living space per animal, debeaking, tail docking, policy on meadow birds, topping of willows, the felling of hedgerows – these issues are all reflected in regulations, brands, labelling and consumer choices in stores. In turn, these choices may be mapped along the axis of 'slow food vs. high-tech'. The market shares of alternative products are still modest, however, which might partly explain why NGOs such as the animal welfare organisations *Dierenbescherming* and *Wakker Dier* take a more active role in the debate and increasingly address chain stores and the processing industry directly.

5.4 Primary production oriented towards the chain or the environment

Within primary agricultural production, an increasingly clear distinction is emerging between integrated, sustainable high-tech production and an operating approach more geared towards the relationship with the surrounding area.²⁵ The first type of production focuses entirely on the chain, with high investment levels to be offset by large-scale production, which usually means specialisation. Chain-oriented production is more focused on ingenuity, efficiency and closing cycles by imparting value to residue streams in new value chains. By contrast, a small scale and less use of technology are in fact regarded as qualities in the second type of production. This approach dovetails better with the consumer's desire for 'natural' production and consumption, reinforcing the quality of the local

²⁵ See Blonk et al., 2011.

environment, and closing local cycles as much as possible, with specialisation more likely to count as a disadvantage. The focus on the local area and the short chain between producer and consumer also offer opportunities to develop supplementary activities such as recreation, care farming or childcare services, making it possible to earn additional income. This approach also aligns with local food strategies, which various local authorities are developing to raise knowledge and awareness about the origin of food and how food production can bolster sustainable development (Agricola et al., 2011). Besides the quality of food, the main issues here are shorter chains, less waste, waste recycling, and a smaller carbon footprint.

5.5 Advanced technology is changing the behaviour of producers and consumers

In every part of the chain, advanced technology ('high tech') is becoming a more significant feature of production. Applied research in genomics, biotechnology, nanotechnology, sensor technology, robotics and ICT is making more and more inroads in production (Leenstra et al., 2009, Silvis et al., 2009). In the primary sector, this is evident from precision farming, plant tissue culture in floriculture, and robotic milking systems, computer-controlled feeding and health monitoring in the livestock farming sector. Further along the chain, new methods are being applied to give products health-promoting properties or to create new products with a vegetarian or carbon footprint proposition, such as half or fully vegetarian 'meatballs' and 'smoked meat'. This type of technology requires both the primary sector and its adjacent industries to make investments that will place a burden on financial resources. Some producers will see a threat to their future because of the associated high level of investment. Technological developments also reveal differences in the respective meanings that producers and consumers attach to the concept of sustainability. Subgroups on both sides strongly associate sustainability with shorter chains and the reduction or absence of technological interventions. A clear example is immuno-sterilisation, a technique that renders the castration of meat pigs redundant. The technique is ready for use, but is not applied owing to the expected objections from consumers against the use of a technique that interferes with the animal's hormonal regulation system.

5.6 Market parties and NGOs as change leaders

Clear choices and regulations at the global level (Round Table on Responsible Soy, GlobalGAP) as well as at the national level (chicken meat from Unilever) and the European levels are increasingly being made and drawn up by market parties, and no longer by government bodies. Governments can no longer cope with the size of public demand and the rapid developments in this area, while

the industry is increasingly taking measures, sometimes under pressure from NGOs and action groups. Market leaders are often especially criticised by such organisations, as the latter have discovered that this is an effective approach to achieve market- or sector-wide changes. Examples in the Netherlands include the 'Beter Leven' quality mark promoted by the animal welfare organisation Dierenbescherming, and the impact of that action groups like Wakker Dier have on supermarket chains regarding the decision to sell chickens of fast growing breeds. The strong market orientation of the Dutch agriculture and horticulture sector promotes Corporate Social Responsibility (CSR). It is no coincidence that Netherlands-based multinationals are leaders in CSR, with the encouragement of the Social and Economic Council of the Netherlands (Social and Economic Council, 2008). New partnerships have been formed against this background, such as the Dutch Sustainable Growth Coalition (Davos, February 2012). Scarcity and the growing need to impart value to residue streams are resulting in greater efficiency at all stages of the production process, crossovers between agriculture and other sectors (biobased economy), and further integration and sustainable development of trade and production chains.

5.7 Greater price volatility and higher average prices

Greater price volatility and rapid price changes are dominating the world market, and price movements are based on higher average price levels than previously. The reasons cited for this increase in price volatility include climate change, crop failures, desertification, insect plagues, rising energy prices, volatile exchange rates, trade restrictions, speculation and rising demand (OECD-FAO, 2011). A steadily growing world population and especially rapidly increasing purchasing power in many parts of the world lead to a continuously rising demand for food, and consequently upward pressure on prices. The scale of food production obviously plays an equally important role in price formation, but it is certain that rising demand will never have a downward effect on prices. In the past fifty years, global agricultural productivity has increased at an even faster rate than the world's population. Every human being theoretically had 29% more food to consume in 2009 than in 1960 (The Royal Society, 2009). The rate of increase is levelling off, however, from 2.6% per annum in the last decade to 1.7% now. The share of developing countries in the increase in food production per capita is steadily increasing, with large differences apparent between the different continents.

For many years, global food commodity prices were not only significantly lower than in Europe, but also lower than in other trading blocs of developed economies. The trend of recent years is admittedly changeable, but seems to be moving in the opposite direction and is likely to continue in the near future.

5.8 Shifting balances due to higher energy prices

The rise in energy prices looks set to continue for the next few years. In any event, it will not reverse. In addition to incentives for the generation of energy from biomass, we may expect upward pressure on transportation costs. This will in turn affect distances between production and consumption locations, and hence impact the relative competitive positions of different production areas. The Dutch agriculture and horticulture sector has a strong orientation towards international markets, and these developments will in many cases result in additional pressure on its competitive position. Naturally, this is offset by increasing incentives to innovation. The question is which force will prevail. One thing is certain: the balances will shift owing to rising energy prices, which in turn will have spatial repercussions on the locations and transportation and production methods of primary agriculture and horticulture in the Netherlands.

5.9 Scarcity of raw materials makes recovery even more necessary

Scarcity of raw materials is becoming an important issue both for world trade and for the global development of agricultural production, not to mention agriculture in the Netherlands. Phosphate, the essential ingredient in fertilisers (De Haas et al., 2009), can only be extracted in a few places in the world (Morocco, China and South Africa). With the prospect of imminent scarcity, research is being conducted into recovery methods and more efficient use of available phosphate through precision agriculture and reducing waste in the food chain. The need for efficiency and a guaranteed supply of raw materials is a driving force in the Dutch agri-food cluster and a compelling reason to innovate.

5.10 EU agricultural policy post-2013

Spring or summer 2013 will probably see decisions taken on the new EU Common Agricultural Policy (CAP). In an earlier advisory letter, the Council stressed that the Dutch agriculture and horticulture sector would benefit from a broader perspective on the CAP. EU policies on the internal market, the strengthening of the euro, and social, economic and territorial cohesion in Europe is considered by the Council to be of great importance for the future position of Dutch agriculture and horticulture (Buijink, 2011). Other EU frameworks such as those for environmental policy (Birds Directive, Habitats Directive, Nitrates Directive and Water Framework Directive), health policy (covering human, plant and animal health), competition policy, efficient use of raw materials, and knowledge and innovation policy, are at least of equal significance for the sector as the CAP policy instruments (Oskam et al., 2011).

In the Council's opinion (Council for the Environment and Infrastructure, 2011), payments under the CAP should be temporary and serve three objectives:

- Promoting innovation, competitiveness and sustainable development of production at farms in the primary sector and in production chains, especially for sectors and enterprises that are currently heavily dependent on existing supplementary payments, as they have a particular need for transition payments to enlarge their earning capacity
- Other improvements desired by society in business operations and environmental management (including improvements related to soil and land management, and animal welfare)
- Possibly promoting sector-financed risk management instruments aimed at mitigating the impact of price and income volatility and other problems, including weather-related risks and plant and animal diseases.

The need to follow a policy more focused on goals and results is also stressed by the European Court of Auditors (European Court of Auditors, 2012). Such policies within the CAP framework are also driven by the implementation of the 'Europe 2020' strategy to achieve intelligent, sustainable and inclusive economic growth that draws population groups and entrepreneurs into the transition process, rather than excluding them. In this context, the European Commission has drawn up a roadmap for the efficient use of raw materials in Europe, and is preparing a communication on sustainable food (expected in 2013). EU agricultural policy is embedded in a much broader framework, with efficient use of raw materials, the entire food system, and knowledge and innovation serving as drivers of change. The extent to which these aspects will be fully integrated into the new CAP post-2013 remains an open question. Vested interests of member states and advocacy groups will probably slow down the transition to a more sustainable and competitive agriculture and horticulture sector.

5.11 Continuing sustainable development

Agenda 21, the Rio Declaration on Environment and Development, was signed twenty years ago in Rio de Janeiro on the back of the 1972 UN Conference on the Human Environment in Stockholm. In the forty years since 1972, concern for the environment has grown from a matter to be addressed by governments through regulation into the much wider issue of the sustainable development of the economy and society. In 2012 there were two items on the agenda of the UN Conference on Sustainable Development in Rio de Janeiro: sustainable development of the economy, and governance. This was also the first time that NGOs were invited to attend. The changing relationships between governments, market parties and society have also found their way to the negotiating tables of the UN. This development is taking place at every level, from the global to the regional.

The Dutch agriculture and horticulture sector is also seeking greater balance between social, economic and ecological aspects in order to safeguard its licence to produce. Sustainable production methods and products are an increasingly important aspect of Corporate Social Responsibility. They are encouraged or even mandated by chain organisations or through other collaborative arrangements such as nature associations (Latesteijn et al., 2011). Sustainability is thus becoming an increasingly integrated component of business operations, and is expected to exert a growing influence on the economic survival strategy of farms. For instance, banks are already reducing the terms of credit facilities if the entrepreneurs concerned are not taking sufficient sustainability measures. Moreover, sustainable production can be a way to reduce costs, especially if essential raw materials become scarcer in the future. Farmers who produce sustainably can also gain a competitive advantage over other entrepreneurs who will be 'left behind' if sustainability remains a key issue in global affairs (Nidumolu et al., 2009).

The sector is devoting increasing attention to ecological aspects, in addition to economic considerations. Primary agriculture utilises soil, plants and animals, and challenges such as soil fertility, fresh-water supplies, and climate issues are increasingly prominent on the agenda. The finite supply of raw materials is also playing a growing role in the ongoing sustainable development of agriculture. The closing of cycles is regarded as a possible solution to the problem, and can also help impart value to residual streams and reduce product waste in the chain.

The sector will continue to make advances in protecting animal and human health, for example, by effectively combating zoonoses and reducing the use of antibiotics. At the same time, the position of animals in the livestock farming sector will steadily improve. These developments are increasingly taking place independent of government authorities and, as noted above, will be based more and more on agreements between society and players in the chain (Hajer, 2011). In addition, farmers will have to become increasingly aware of their role as protectors of the landscape. The countryside is no longer earmarked solely as a production resource, and the rebalancing of nature and agriculture will continue to spark debate in the future, as we seek to realise a sustainable allocation of land and land utilisation. The spatial conditions for the various development directions will have to be created in alignment with the wishes and requirements of society.

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APPENDIX



RESPONSIBILITY AND ACKNOWLEDGEMENT

In June 2011, the Dutch Council for the Environment and Infrastructure – then a partnership of the Council for the Rural Area, the Advisory Council for Transport, Public Works and Water Management, and the Council for Housing, Spatial Planning and the Environment – issued an advisory letter on the Dutch principles for the Common Agricultural Policy (CAP) of the European Union post-2013.²⁶

This advisory letter dealt with facilitating the transition to a competitive, innovative and sustainable agri-food chain in the Netherlands.

The present report is a continuation of the advisory letter. Its preparation was initiated by the Council for the Rural Area and a broad-based advisory committee comprising representatives of the scientific community, government and civil-society organisations, under the chairmanship of *ing.* A.J.A.M. Vermeer (until 1 January 2012). Many discussions were held and many field trips made, which together formed the basis for the analysis and the report.

The report was finalised by the Council for Environment and Infrastructure. In 2012, the advisory committee met eight times under the chairmanship of Prof. N.S.J. Koeman. The Agricultural Economics Research Institute, Alterra and the Netherlands Environmental Assessment Agency provided input in the form of basic material, specially created maps and constructive criticism. Two meetings were held with experts and representatives from the sector and civil-society organisations to review the recommendations. The meetings and discussions yielded much information that was used in the preparation of the report. The report as a whole is the responsibility of the Council for the Environment and Infrastructure.

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